1979

USDA SEA

Hop Research

Distribution

1. Hop Yard
2. Al
3. Sam
4. Gail
5. Lieb
6. Jack
7. O'Connor
8. Area?
9. Spare

USDA-SEA-AR

HOP RESEARCH

1979 ANNUAL REPORT

HOP BREEDING, GENETICS, CHEMISTRY AND PATHOLOGY

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1979 HOP PRODUCTION STATISTICS (HAC DATA)

The 1979 season was again a disappointment for U.S. hop growers. The total production for the four states was 54.538 million pounds, slightly below the 54.56 million pounds produced in 1968, in spite of a 3% increase in hop acreage. Production showed a severe decrease in California, a slight decrease in Idaho, a slight increase in Oregon and was nearly identical to that of the previous year in Washington. Hop prices continued their depressed levels during most of 1979 and only began to rise gradually after the 1979 crop was harvested and delivered to dealers for the most part.

Early Clusters continued to be the dominant hop variety in the United States (43%, HAC Table 2) followed by English (Brewer's Gold and Bullion, 16%), Cascades (13%), and Late Cluster (10%) in that order. Nearly 900 acres of "English" hops were planted in Washington and over 100 acres were planted in Oregon, representing a significant net increase of high-alpha hops for 1979. Clusters on the other hand showed a decrease of nearly 200 acres in Washington, over 300 acres in California and, if Talisman is also figured in with Clusters, over 200 acres in Idaho. Aroma hops, primarily Cascades and triploid "Fuggles" (Willamette and Columbia) showed a significant increase in Washington, Oregon and Idaho.

Table 3 presents an individual comparison of hop varieties, acreage, and yield by states and varieties. Washington continues to be the leading hop producer (over 40 million pounds), followed by Oregon (8.6 million pounds), Idaho (4.6 million pounds), and California (1.55 million pounds, a significant drop from the over 2 million pounds produced in 1978). Part of the reason for the production decrease in California is the fact that one hop grower has shifted his production to another state which reduced the California acreage significantly. The final overall production figures for 1979 were slightly lower than those obtained in 1978 (Table 3), in spite of a slight increase in acreage.

The average U.S. acre yields in 1979 (Table 3) were 1800 pounds for Washington, 1540 pounds for Oregon, 1710 pounds per acre for Idaho, and only 1290 pounds per acre for California with an overall average of 1727 pounds per acre. This is the lowest average hop production since 1970 when only 1656 pounds per acre were produced.

The U.S. share of world hop markets dropped slightly as compared to the previous year (Table 4). Total world hop production in 1979, however, was the highest since the large 1973 crop of West Germany (Table 4). Hop useage (Table 4) continued its encouraging trend over the last two years by registering a significant increase. This was also borne out by an increase in the hopping ratio and by increased total beer production and consumption in the United States.

The middle and late 1970's apparently showed a downward trend in the hop acreage cycle. This is reflected partially also in the decreasing trend of grower returns (Table 5). The stage is set now for a turn-around which some people in the industry expect ot occur in the early 1980's. The total value of the U.S. hop crop of the four producing states shows an increasing trend which partially reflects the slightly higher prices of future contracts. Such prices however, are only marginally adequate to permit necessary expansion of production capacity at the present time.

A comparison of world hop surfaces, yields, and production of major hop producing countries of the world is presented in Tables 7 and 8. The United States continues to rank second behind West Germany. These two major producers accounted for over 50% of total world hop production in 1979.

Hop imports (Table 9) were slightly higher in 1979 as compared to previous years, reflecting an increased demand for "noble-aroma" European hops that cannot be grown profitably in the United States. 1979 U.S. hop exports on the other hand were the highest of the last 7 years, reaching over 32 million pounds. There are indications that Cascade is being accepted by some foreign brewers as a partial replacement for European aroma hops.

Our major export outlets in 1979 (Table 11), were Russia, Brazil, Columbia, Mexico, Canada, Venezuela, Japan, Taiwan, Ireland and the Philippines in that order.

1979 Season:

U. S. HOP ADMINISTRATIVE COMMITTEE — Table 1

Total Production

Hops	Calif.	Idaho	Oregon	Wash.	Total
Actual Bales 1978	10,016	24,566	42,528	203,100	280,210
" " 1979	7,551	23,493	44,883	203,544	279,471
			-1,000 lbs.		
Production 1979 1/	1,554	4,623	8,596	39,765	54,538
Less: Fire Loss	0	0	0	0	0
Reserves	0	0	0	219	219
Total Salable	1,554	4,623	8,596	39,984	54,757
1/ Average bale wts. used	206	197	192	196	196

1979 Reserve Pool Categories (Bales)

I Hops					
Grp. A (Clstr. or higher alpha type)	--	--	--	217	217
" B (English type)	--	--	--	491	491
" C (Fuggle type)	--	--	--	--	--
" D (Cont. or lower alpha type)	--	--	--	399	399
II (Screenings)	--	--	--	--	--
III (Package Hops)	--	--	--	--	--
Total	--	--	--	1,107	1,107

Summary of Reserve Pools to Date

Reserve Pools	Hops (Bales)	Screen. (Equiv. Bales)	Total (lbs.)	Total Income
1966 thru 1978	51,440 1/	622	9,568,473	$6,683,606.99 2/
1979	1,107	--	219,063	367,460.47
Total	52,547	622	9,787,536	$7,051,067.46 2/

1/ Includes 2,054 bales from 1974 pool, 1,653 from 1975 pool, and 1,294 from 1976 pool still for sale at 73, 76 and 80¢ plus, respectively.

2/ Assuming 1974, '75 and 1976 pools are sold at established pool prices.

Parity and Grower Prices

Crop Year (9/1-8/31)	Season Average (9/1-8/31) Parity Price	Grower Price	Reserve Pool Gr. Return
	¢ per lb.		
1969-70	70.7	51.0	69.8
1970-71	73.7	56.0	69.6
1971-72	78.5	65.9	74.3
1972-73	88.6	71.4	74.2
1973-74	101.8	75.7	76.6
1974-75	113.1	79.8	80.0 for Fuggles, Eng. & Casc.; "0" for Clusters.
1975-76	119.2	83.0	1.5 to date (4.3% sold).
1976-77	123.9	84.8	57.0 to date (68% sold).
1977-78	132.7	89.6	83.4
1978-79	149.3	90.1	86.0
1979-80		97.4	169.0
1980-81			

Mo.	Parity Price	Mo.	Parity Price
	$ per lb.		
Sept. -	1.59	Mar. -	1.69
Oct. -	1.60	April -	1.69
Nov. -	1.60	May -	
Dec. -	1.62	June -	
Jan. -	1.65	July -	
Feb. -	1.67	Aug. -	

SOURCE: HAC records except for parity and grower prices reported by SRS, USDA.

U. S. HOP ADMINISTRATIVE COMMITTEE Table 2

1979 ACREAGE BY STATE (STRUNG FOR HARVEST)

	Wash.	Oregon	Idaho	Calif.	Total	Change from Prior Year
			Acres			%
1974-	21,400	5,571	4,086	1,500	32,557	3%
1975-	21,603	5,621	3,709	1,535	32,468	--
1976-	21,077	5,438	2,979	1,509	31,003	(5%)
1977-	20,707	5,480	2,912	1,508	30,607	(2%)
1978-	21,341	5,471	2,671	1,466	30,949	1%
Plantings new ground 1/	1,089	312	287	8	1,696	
Plow out(not repl.for '79 harv)	(105) 2/	(135)	(227)	(324)	(791)	
1979 (Final)	22,325	5,648	2,731	1,150	31,854	
Net Change	984	177	60	(316)	905	3%

1/ For harv. first time 1979.
2/ Some replanted to Tettnangs for harv. in '80. No harvested '78 acres idled in '79.

1979 BABY ACREAGE BY STATE

New Plantings 1979	1,089	312	287	8	1,696
Replantings for 1979	1,180	44	23	4	1,251
Total Babies	2,269	356	310	12	2,947
% of Total Acreage	10%	6%	11%	1%	9%
Baby High-Alpha Acreage 2/	455	124	146	8	733

1/ Babies were 5% of total in 1976, 3% in 1977 and 8% in 1978.
2/ English in Wash. & Ore., Galena & 34-5 in Idaho & Comets in Calif.

1979 ACREAGE -- BY STATE AND VARIETY (STRUNG FOR HARVEST)

	Wash.	Oregon	Idaho	Calif.	Total	% of Total
			Acres			
Categ. I (Med.-High Alpha)						
Clusters - Early	13,534	-0-	279	-0-	13,813	43%
Clusters - Late	2,500	-0-	814	-0-	3,314	10%
Talisman - Late	1/	138	680	-0-	818	3%
Cal. & Gr. P. Sdls. - Late	-0-	43	-0-	1,126	1,169	4%
Categ. II (Higher Alpha Type)						
English - Late	2,890 2/	2,196 3/	36	-0-	5,122	16%
Comets - Late	575	6	2	24	607	2%
Others 4/	13	2	183 5/	-0-	198	1%
Categ. III (Lower Alpha Seeded Aroma)						
Fuggles - (Incl. Triploids)	8	2,268	-0-	-0-	2,276	7%
Categ. IV (Seedless Aroma)						
Cascade - Middle	2,675	989	487	-0-	4,151	13%
Others 6/	130	6	250	-0-	386	1%
Total	22,325	5,648	2,731	1,150	31,854	100%

1/ Included with Wash. Late Clusters.
2/ Bullions - 2,570 acres (89%); Brewers Gold - 320 acres (11%).
3/ Bullions - 1,354 acres (61%); Brewers Gold - 842 acres (39%).
4/ Includes other Cat. II higher alpha-type varieties such as North Brewer, Galena and other exper. varieties.
5/ Includes 167 Galenas, 11 #34-5 and 5 experimental.
6/ Includes Hallertau M.F., Tettnang and other flavor-type varieties.

SOURCE: HAC records.

U. S. HOP ADMINISTRATIVE COMMITTEE

Table 2 A

NET ACREAGE CHANGES BY STATE & VARIETY

	1979 Changes from 1978 Wash.	Oregon	Idaho	Calif.	Total	Total 1979	Total 1973	Changes 1973/79
Bitter								
English (Late)	858	112	--	--	970	5,122	2,086	3,036
Comets (Late)	--	--	--	8	8	607	-	607
Others	13	7	150	--	170	204	139	65
Sub-Total	871	119	150	8	1,148	5,933	2,225	3,708
						% 1979 is of 1973 - 267%		
Comb. Aroma-Bitter								
Clusters (Early)	(94)	--	(53)	--	(147)	13,813	16,636	(2,823)
Clusters (Late)	(100)	--	(51)	--	(151)	3,314	5,382	(2,068)
Talisman (Late)	--	46	(121)	--	(75)	818	1,437	(619)
Cal. & Gr. P. Sdl.	--	(44)	--	(324)	(368)	1,167	1,595	(428)
Sub-Total	(194)	2	(225)	(324)	(741)	19,112	25,050	(5,938)
						% 1979 is of 1973 - 76%		
Aroma								
Fuggles (Early)	8	(3)	--	--	5	2,276	2,752	(476)
Cascades(Med.-Late)	215	64	67	--	346	4,151	1,260	2,891
Others	84	(5)	68	--	147	380	187	193
Sub-Total	307	56	135	--	498	6,807	4,199	2,608
						% 1979 is of 1973 - 162%		
TOTAL	984	177	60	(316)	905	31,852	31,474	378

SOURCE: HAC records.

BREAKDOWN OF 1979 L&S

L&S	0%	1%	2%	3%	4%	5%	6%	7%	Total	Average	Total Bales
Wash.	10%	28%	34%	20%	5%	2%	½%	½%	100%	1.92%	203,544
Oregon	4	26	36	18	8	5	3	1/	100	2.32	44,883
Idaho	12	50	28	8	2				100	1.38	23,493
Calif.	7	37	29	16	11				100	1.83	7,551
										1.93	279,471

BREAKDOWN OF 1979 SEEDS

SEEDS	0%	1%	2%	3%	4%	5%	6%	Over 6%	Total	Average
Wash.	81%	9%	4%	2%	2%	1%	2/	3/	100%	.43
Oregon	-----	-----	-----	--mostly	over	6%---	-----	-----	-----	0
Idaho	100	-	-	-	-	-	-	-	100	0
Calif.	100	-					-	-	100	0

1/ 43 bales. 2/ 446 bales. 3/ 2,166 bales.

U. S. HOP ADMINISTRATIVE COMMITTEE Table 3

ALL VARIETIES -- ACREAGE, YIELD & PRODUCTION

State	Acreage Harvested 1977	Acreage Harvested 1978	Acreage Harvested 1979	Yield Per Acre(lbs.) 1977	Yield Per Acre(lbs.) 1978	Yield Per Acre(lbs.) 1979	Product.(1,000 lbs.) 1977	Product.(1,000 lbs.) 1978	Product.(1,000 lbs.) 1979
Washington									
English	931	2,032	2,890	1,700	1,798	1,962	1,413	3,653	5,669
Cascades	2,724	2,460	2,675	1,962	2,012	1,960	5,344	4,949	5,242
Other 1/	17,038	16,849	16,760*	1,828	1,858	1,735	31,147	31,307	29,073
Sub-Total	20,600	21,300	22,300	1,840	1,880	1,800	37,904	40,044	40,140
Oregon									
English	2,047	2,065	2,196	2,203	1,919	2,009	4,509	3,962	4,411
Cascades	911	925	989	1,754	1,785	1,680	1,598	1,651	1,662
Fuggles(incl. Tripl.)	2,288	2,062	2,268	1,210	1,001	971	2,604	2,065	2,203
Other 1/	228	350	195	1,610	1,411	1,641	586	494	320
Sub-Total	5,500	5,400	5,600	1,690	1,510	1,540	9,295	8,154	8,624
Idaho									
English	--	36	36	--	139	1,111	--	5	40
Cascades	613	420	487	1,874	1,798	1,567	1,149	755	763
Other 1/	2,299	2,215	2,208	1,728	1,845	1,730 2/	3,972	4,086	3,820
Sub-Total	2,900	2,700	2,700	1,770	1,790	1,710	5,133	4,833	4,617
California									
Other(Actual)1/	1,508	1,466	1,150 3/	1,621	1,392	1,351	2,452	2,041	1,554
Sub-Total	1,500	1,500	1,200	1,630	1,360	1,290	2,445	2,041	1,548
Total									
English	2,978	4,133	5,122	1,989	1,844	1,976	5,922	7,620	10,120
Cascades	4,248	3,805	4,151	1,905	1,933	1,847	8,091	7,355	7,667
Fuggles	2,288	2,062	2,268	1,138	1,001	971	2,604	2,065	2,203
Other 1/	21,065	20,914	20,313	1,811	1,814	1,712	38,150	37,928	34,767
Total	30,500	30,900	31,800	1,796	1,782	1,727	54,777	55,071	54,929

* Includes 8 acres of Fuggles.

1/ Primarily Clusters but also Talisman, Comets, etc.

2/ 1,806 for S.W. Idaho.

3/ Additional 29 acres of Comets planted for harvest in 1980.

Note: The sum of individual items may not agree with totals because of rounding total state acreage to nearest 100 acres and state average yields to nearest 10 lbs. per acre.

SOURCE: USDA except all variety acreage figures from HAC records.

U. S. HOP ADMINISTRATIVE COMMITTEE

Table 4

U. S. World Production - 1965 to Date

	Yield per Acre					U.S. Production	W. Germany Production	Other World Production	Total World Production 1/
	Wash.	Ore.	Idaho	Calif.	U.S.				
	Pounds					Million Pounds			
1965	1,710	1,450	1,950	1,840	1,714	56.1(28%)	40.1(20%)	106.9(52%)	203.1(100%)
66	1,790	1,430	1,810	1,590	1,721	55.4(27%)	38.6(18%)	114.4(55%)	208.4 "
67	1,660	1,490	1,810	1,830	1,661	49.5(24%)	49.2(24%)	108.3(52%)	207.0 "
68	1,510	1,480	1,740	1,660	1,540	43.7(22%)	48.5(24%)	110.6(54%)	202.8 "
69	1,560	1,250	1,860	1,550	1,547	41.8(20%)	50.1(24%)	114.2(56%)	206.1 "
70	1,680	1,670	1,540	1,560	1,656	45.9(21%)	58.9(27%)	116.5(52%)	221.3 "
71	1,730	1,700	1,640	1,700	1,718	49.7(24%)	53.4(25%)	107.0(51%)	210.1 "
72	1,810	1,470	1,710	1,610	1,728	51.3(22%)	66.9(28%)	112.4(50%)	230.6 "
73	1,780	1,670	1,750	1,500	1,744	54.8(21%)	84.9(32%)	125.3(47%)	265.0 "
74	1,830	1,550	1,700	1,670	1,759	57.0(23%)	73.9(30%)	114.5(47%)	245.4 "
75	1,770	1,700	1,660	1,700	1,742	55.9(22%)	71.4(29%)	122.9(49%)	250.2 "
76	1,960	1,670	1,710	1,680	1,871	57.8(25%)	62.6(26%)	115.0(49%)	235.4 "
77	1,840	1,690	1,770	1,630	1,796	54.8(21%)	81.4(32%)	123.5(47%)	259.7 "
78	1,880	1,510	1,790	1,360	1,782	55.1(23%)	66.8(28%)	117.4(49%)	239.3 "
79	1,800	1,540	1,710	1,290	1,727	54.9(22%)	68.3(27%)	129.8(51%)	253.0 "

	Disposition of Salable Production						U.S. Brewery Usage	
	Exports +	Net Domestic Usage of U.S. Hops 3/ ±	Plus or (Minus) Unacc. Difference ±	Increase or (Decrease)in Domestic Stocks =	Salable Product. 2/		Net Usage U.S. Hops	Net Usage Foreign Hops
	1,000 lbs.						1,000 lbs.	
1966-67	26,936(50%)	23,058(43%)	1,111(2%)	2,770(5%)	53,875(100%)		23,058(74%)	8,288(26%)
67-68	21,887(49%)	22,184(50%)	1,335(3%)	(710)(-2%)	44,696 "		22,184(71%)	9,060(29%)
68-69	21,150(49%)	21,597(51%)	(1,054)(-3%)	1,090(3%)	42,783 "		21,597(67%)	10,466(33%)
69-70	18,275(44%)	22,502(54%)	1,056(2%)	(150)(-*)	41,683 "		22,502(67%)	10,915(33%)
70-71	24,504(54%)	20,940(46%)	107(*)	290(*)	45,841 "		20,940(64%)	11,776(36%)
71-72	31,902(64%)	22,415(45%)	(2,257)(-4%)	(2,170)(-4%)	49,890 "		22,415(66%)	11,588(34%)
72-73	28,061(55%)	21,774(43%)	(81)(-*)	1,410(2%)	51,164 "		21,774(63%)	12,955(37%)
73-74	25,479(48%)	23,394(43%)	2,505(4%)	2,750(5%)	54,108 "		23,394(63%)	13,584(37%)
74-75	25,215(45%)	21,701(38%)	1,749(3%)	7,700(14%)	56,365 "		21,701(62%)	13,411(38%)
75-76	27,933(51%)	22,767(41%)	(1,460)(-3%)	6,110(11%)	55,350 "		22,767(69%)	10,365(31%)
76-77	28,959(51%)	22,678(40%)	3,816(7%)	1,310(2%)	56,763 "		22,678(66%)	11,666(34%)
77-78	25,132(46%)	24,196(44%)	6,502(12%)	(1,140)(-2%)	54,690 "		24,196(66%)	12,280(34%)
78-79	32,543(59%)	27,070(50%)	2,760(5%)	(7,620)(-14%)	54,753 "		27,070(68%)	12,883(32%)

1/ FAS, USDA.

*Less than ½ of 1%.

2/ Total production less fire loss and reserves not yet sold in normal outlets.

3/ 1966-67 through 1968-69 - Total usage less imports. 1969-70 to date - Total usage less imports adjusted for year-end inventory changes.

SOURCE: SRS, FAS and HAC records.

U. S. HOP ADMINISTRATIVE COMMITTEE

Table 5

SELECTED STATISTICS ASSOCIATED WITH THE:

Mktg. Year (Begin Sept. 1)	Acreage	Prod. (1,000 lbs.)	Begin Stocks (1,000 lbs.)	Base Sal. (%)	Potent. Actual Avail. 1/ (%)	Imports (1,000 lbs.)	Exports (1,000 lbs.)	Seas. Ave. Price (¢)	Total Value ($1,000)
			(1) Decline in Acreage Cycle in latter 1960s						
1965-66	32,700	56,060	22,140	None	All	6,945	27,581	46.3	$25,937
1966-67	32,200	55,418	24,710	93%	91%	8,288	26,936	46.7	25,872
1967-68	29,800	49,498	27,480	93%	83%*	9,060	21,887	45.9	22,701
1968-69	28,400	43,733	26,770	85%	75%*	10,466	21,150	47.2	20,659
1969-70	27,000	41,763	27,860	75%	70%	11,155	18,275	50.0	21,305
			(2) Rise in Acreage Cycle in Early 1970s						
1970-71	27,000	45,863	27,950	80%	77%	13,646	24,504	56.0	25,681
1971-72	28,900	49,663	30,120	82%	84%	12,268	31,902	65.3	32,461
1972-73	29,700	51,309	28,770	85%	86%	13,055	27,969	71.4	36,631
1973-74	31,400	54,769	30,280	92%	90%	14,294	25,479	75.7	41,457
			(3) Decline in Acreage Cycle in Latter 1970s						
1974-75	32,400	56,979	33,720	100%	94%	14,161	25,215	79.3	45,138
1975-76	32,100	55,913	42,170	100%	92%	12,485	27,933	83.0	46,419
1976-77	30,900	57,774	50,400	100%	94%	10,436	28,959	84.8	48,992
1977-78	30,500	54,777	50,480	100%	90%	10,480	25,132	89.6	49,095
1978-79	30,900	55,071	47,540	100%	91%	11,164	32,543	89.8	49,479
1979-80	31,800	54,929	38,200	105%	87%	13,300 2/	28,000 2/	97.4	53,477

* Before Fire loss.

1/ HAC records.
2/ Projected by HAC at most recent meeting.

SOURCE: USDA unless otherwise footnoted.

U. S. HOP ADMINISTRATIVE COMMITTEE Table 6

Season Average Farm Price by States-1968 to Date

Crop Year	Wash.	Oregon	Idaho	Calif.	Average	Value of Production All States
	¢ per lb.					--$1,000--
1968	46.5	48.0	48.0	52.0	47.2	$20,659
1969	50.0	52.0	53.0	56.0	51.0	21,305
1970	55.0	58.0	58.0	59.0	56.0	25,681
1971	64.0	69.0	67.0	65.0	65.3	32,461
1972	69.0	79.0	75.0	72.0	71.4	36,631
1973	74.0	82.0	76.5	76.0	75.7	41,457
1974	77.0	87.0	81.0	84.0	79.3	45,138
1975	82.0	86.0	82.6	88.0	83.0	46,419
1976	82.7	91.4	88.1	88.5	84.8	48,992
1977	85.8	105.0	88.0	93.9	89.6	49,095
1978	86.7	103.7	89.9	96.1	89.8	49,479
1979	94.6	111.0	96.4	95.7	97.4	53,477
1980						

Leaf & Stem Content (%)

1969	1.63	2.14	1.10	.31	1.55
1970	1.87	1.93	1.08	.53	1.79
1971	1.63	1.69	1.70	.60	1.60
1972	1.71	1.69	1.32	.39	1.60
1973	2.05	2.29	1.22	.71	1.93
1974	1.95	1.57	1.02	.56	1.72
1975	1.75	1.24	.97	.65	1.53
1976	1.23	1.43	1.16	.88	1.24
1977	1.46	1.91	1.15	.90	1.49
1978	1.38	2.19	1.34	1.07	1.48
1979	1.92	2.32	1.38	1.83	1.93
1980					

Down and Unharvested Acreage

	Rounded Prod. for Harvest	Actual Prod. for Harvest	Unharvested			Actual Harvested	Rounded Harvested
			Down 1/	Standing	Total		
1976	31,000	31,003	0 1/	100 2/	100	30,903	30,900
1977	30,600	30,601	0 3/	59 4/	59	30,542	30,500
1978	31,000	30,948	0 5/	86 6/	86	30,862	30,900
1979	31,800	31,854	0 7/	48 8/	48	31,806	31,800
1980							

1/ 35 acres of down yards that were harvested in Washington.
2/ 60 acres in Washington and 40 in Oregon.
3/ 56 acres of down yards in Washington harvested.
4/ All Washington.
5/ 100 acres of down yards harvested in Washington and 10 in Oregon.
6/ 10 acres in Washington and 76 in Oregon.
7/ No down yards.
8/ 36 in Washington, 12 in Oregon.

SOURCE: First Table SRS, USDA; Second Table, Grain Div., USDA; Third Table HAC Records.

U. S. HOP ADMINISTRATIVE COMMITTEE

Table 7

WORLD HOP SURFACES, YIELD & PRODUCTION

Country	Hectares			Zntrs per Hectare			Prod. (zntrs. of Hops)			% Alpha			Met.Tons Alpha Acid		
IHGC	1977	1978	1979	1977	1978	1979	1977	1978	1979	'77	'78	'79	1977	1978	1979
W. Germ.	19,250	17,622	17,306	38.4	34.4	36.0	740,137	606,602	622,259	6.1	5.6	6.1	2,253	1,705	1,881
France	1,010	887	775	33.9	33.9	41.0	34,287	30,027	31,770	7.3	6.3	6.0	125	95	90
Belgium	982	851	803	36.7	32.6	44.2	36,003	27,727	35,457	6.7	6.3	6.9	120	86	108
U.K.	5,925	5,837	5,709	24.4	32.1	36.1	144,662	187,612	206,259	6.7	7.7	7.2	484	724	734
Ireland	65	65	65	25.8	22.3	25.1	1,674	1,450	1,635	7.2	7.5	7.1	6	6	6
EEC	27,232	25,262	24,658	35.1	33.8	36.3	956,763	853,418	895,420	6.3	6.1	6.4	2,988	2,616	2,819
U.S.A.	12,344	12,525	12,890	40.3	39.9	38.7	496,930	499,496	498,308	7.2	6.2		1,789	1,550	N.A.
Austral.	950	915	915	44.2	40.6	42.6	42,000	37,180	39,000	10.5	10.0		221	186	"
Yugo.	3,240	3,137	3,106	27.7	27.9	28.3	89,710	87,616	88,046	5.6	6.3		250	274	"
Spain	1,803	1,803	1,852	22.7	23.2	27.9	40,942	41,796	51,718	7.0	7.5		143	156	"
Czech.	10,200	10,400	10,400	23.9	19.4	22.7	244,236	201,757	236,265	4.0	3.5		488	366	"
E. Germ.	2,175	2,104	2,160	27.1	22.7	33.4	58,892	47,730	72,208	6.5	5.7		190	135	"
Poland	2,328	2,400	2,447	21.2	16.2	16.4	49,460	38,840	45,000	5.2	4.1		128	80	"
Hungary	504	550	568	20.3	21.5	21.9	10,256	11,800	12,446	4.7	6.3		24	37	"
IHGC*	60,776	59,096	58,996	32.7	30.8	32.9	1,989,189	1,819,633	1,938,411	6.3	5.9		6,221	5,400	"
Non-IHGC															
Japan	1,286	1,238	1,200	35.6	36.2	37.1	45,760	44,800	44,500	5.3	6.0		121	134	N.A.
U.S.S.R.	12,000	12,000	12,250	19.2	16.7	18.4	230,000	200,000	225,000	4.0	4.0		460	400	"
Romania	1,100	1,100	1,200	21.8	20.0	20.8	24,000	22,000	25,000	5.5	5.0		66	55	"
Bulgaria	1,400	1,500	1,500	10.7	14.0	16.0	15,000	21,000	24,000	4.5	4.5		34	47	"
Others	2,700	2,800	3,000	19.3	22.9	19.6	52,000	64,000	58,920	6.3	6.8		164	216	"
Non-IHGC	18,486	18,638	19,150	19.8	18.9	19.7	366,760	351,800	377,420	5.1	5.3		847	852	"
TOTAL	79,262	77,734	78,146	29.4	27.8	29.6	2,355,949	2,171,433	2,315,831	6.0	5.8		7,068	6,252	"
% CHANGE FROM PERVIOUS YEAR							10.3%	(7.8%)	5.6%				14.8%	(11.0%)	

* Plus Ireland

SOURCE: Figures as of May 1, 1980 prepared by Hop Section, EEC Commission, for EEC Annual Hop Report.

U. S. HOP ADMINISTRATIVE COMMITTEE

Table 8

WORLD HOP ACREAGE, YIELD & PRODUCTION

Country	Acres			Lbs. per acre			Prod.(Mill. lbs.of hops)			% Alpha			Metric Tons Alpha Acid		
IHGC	1977	1978	1979	1977	1978	1979	1977	1978	1979	1977	1978	1979	1977	1978	1979
W. Germany	47,567	43,543	42,761	1,715	1,534	1,597	81.6	66.8	68.3	6.1	5.6	6.1	2,253	1,705	1,881
France	2,496	2,192	1,915	1,522	1,505	1,723	3.8	3.3	3.3	7.3	6.3	6.0	125	95	90
Belgium	2,426	2,103	1,895	1,648	1,474	1,889	4.0	3.1	3.5	6.7	6.3	6.9	120	86	108
U.K.	14,640	14,423	14,107	1,086	1,435	1,592	15.9	20.7	22.5	6.7	7.7	7.2	484	724	734
Ireland	161	161	161	1,242	1,242	1,242	.2	.2	.2	7.2	7.5	7.1	6	6	6
EEC	67,290	62,422	60,039	1,568	1,507	1,600	105.5	94.1	97.8	6.3	6.1	6.4	2,988	2,616	2,819
U.S.A.	30,500	30,900	31,800	1,797	1,783	1,730	54.8	55.1	55.0	7.2	6.2		1,789	1,550	N.A.
Australia	2,347	2,261	2,261	1,960	1,813	1,902	4.6	4.1	4.3	10.5	10.0		221	186	"
Yugoslavia	8,006	7,752	7,806	1,237	1,251	1,230	9.9	9.7	9.6	5.6	6.3		250	274	"
Spain	4,455	4,455	4,576	1,010	1,033	1,224	4.5	4.6	5.6	7.0	7.5		143	156	"
Czech.	25,206	25,698	25,698	1,067	860	988	26.9	22.1	25.4	4.0	3.5		488	366	"
E. Germany	5,374	5,199	5,337	1,210	1,019	1,274	6.5	5.3	6.8	6.5	5.7		190	135	"
Poland	5,752	5,930	6,046	956	725	810	5.5	4.3	4.9	5.2	4.1		128	80	"
Hungary	1,245	1,359	1,359	884	957	1,030	1.1	1.3	1.4	4.7	6.3		24	37	"
IHGC*	150,177	145,976	145,722	1,460	1,374	1,447	219.3	200.6	210.8	6.3	5.9	—	6,221	5,400	
Non-IHGC															
Japan	3,178	3,058	2,965	1,573	1,602	1,653	5.0	4.9	4.9	5.3	6.0		121	134	N.A.
U.S.S.R.	29,652	29,652	30,270	857	742	819	25.4	22.0	24.8	4.0	4.0		460	400	"
Romania	2,718	2,718	2,965	957	883	944	2.6	2.4	2.8	4.5	4.5		38	65	"
Bulgaria	3,459	3,707	3,707	491	620	701	1.7	2.3	2.6	4.5	4.5		34	47	"
Others	6,672	6,919	7,413	854	1,026	958	5.7	7.1	7.1	6.3	6.8	—	164	216	
Non-IHGC	45,679	46,054	47,320	884	840	892	40.4	38.7	42.2	4.7	5.4	—	817	862	
TOTAL	195,856	192,030	193,042	1,326	1,246	1,311	259.7	239.3	253.0	6.0	5.8	—	7,038	6,262	
% CHANGE FROM PREVIOUS YEAR							10.3%	(7.8%)	5.6%				14.8%	(11.0%)	

* Plus Ireland

SOURCE: Figures as of Dec. 1, 1979 prepared by Hop Section, EEC Commission, for the IHGC Economic Commission meeting in Prague on Dec. 1, 1979.

U. S. HOP ADMINISTRATIVE COMMITTEE

Table 9

U. S. IMPORTS OF HOPS AND HOP EXTRACT
BY COUNTRY OF ORIGIN BY MARKETING YEAR (SEPT. 1 - AUG. 31)

Imports of Hops - Monthly

Marketing Year (1979-80)	West Germany	Yugoslavia	Belgium	France	Others	Total
			Pounds			
Sept.	57,919	—	—	—	—	57,919
Oct.	3,186	—	—	—	22,740	25,926
Nov.	240,043	—	—	—	307,749	547,792
Dec.	2,363,408	—	—	39,998	925,467	3,328,873
Jan.	4,187,093	400,884	—	280,028	520,743	5,388,750
Feb.	2,182,168	158,682	—	200,061	520,402	3,061,612
March						
April						
May						
June						
July						
August						
Total						

Imports of Hops - Annual

	(1,000 lbs.)					
1972-73	8,639	3,233	57	811	305	13,045
1973-74	9,255	3,583	39	801	464	14,142
1974-75	9,088	3,596	73	662	736	14,157
1975-76	8,204	2,677	74	480	1,049	12,485
1976-77	6,971	1,785	20	402	1,258	10,433
1977-78	7,054	1,764	20	359	1,282	10,480
1978-79	7,314	2,175	20	320	1,332	11,161
1979-80						

Imports of Hop Extract (Hop Equiv.) - Annual

	Conversion Factor						
1972-73	2.7-1	5	0	0	0	5	10
1973-74	3.5-1	149	0	0	3	0	152
1974-75	3.5-1	3	0	0	0	1	4
1975-76	3.5-1	0	0	0	0	0	0
1976-77	3.5-1	1	0	0	0	2	3
1977-78	3.5-1	0	0	0	0	*	*
1978-79	4.0-1	0	0	0	0	2(U.K.)	2
1979-80	4.0-1						

Total Imports - Annual

1972-73	8,644	3,233	57	811	310	13,055
1973-74	9,404	3,583	39	804	464	14,294
1974-75	9,091	3,596	73	662	737	14,161
1975-76	8,204	2,677	74	480	1,049	12,485
1976-77	6,972	1,785	20	402	1,260	10,436
1977-78	7,054	1,764	20	359	1,283	10,480
1978-79	7,314	2,175	20	320	1,334	11,163
1979-80						

Note: Totals may not agree with addition of individual items because of rounding.
* Less than 500 lbs.
SOURCE: USDA Hop Market News Reports (Monthly) and Bureau of Census (Annual).

U. S. HOP ADMINISTRATIVE COMMITTEE

U. S. EXPORTS OF HOPS & HOP EXTRACT (1,000 lbs.)

Table 10

Mktg. Year	Brazil	Mexico	USSR	Canada	Columb.	Japan	E. E. C. Ireland	E. E. C. W. Germ.	E. E. C. Other	Africa	Other World	Total
						SEPT. THRU						
1978-79						HOPS						
1979-80												
						HOP EXTRACT (ACTUAL)						
1978-79												
1979-80												
						TOTAL (INCL. HOP EQUIV. OF EXT.)						
1978-79												
1979-80												
						ANNUAL						
						HOPS						
1973-4	2,806	2,160	2,438	2,426	95	585	447	110	717	761	2,700	15,245
1974-5	2,881	1,753	2,023	3,350	34	700	994	100	275	562	1,910	14,582
1975-6	2,292	876	599	3,203	97	773	1,269	164	159	628	2,481	12,541
1976-7	3,138	983	3,366	3,058	-0-	864	1,208	1,539	583	464	2,027	17,230
1977-8	4,122	435	3,058	2,292	212	839	883	36	231	636	1,159	13,903
1978-9	4,270	999	5,745	2,193	-0-	851	451	77	345	411	1,994	17,336
						HOP EXTRACT (ACTUAL)						
1973-4	272	484	-0-	1	591	1	-0-	144	194	478	755	2,920
1974-5	539	512	-0-	-0-	461	-0-	13	38	128	355	992	3,038
1975-6	242	1,341	559	77	512	24	-0-	98	265	353	927	4,398
1976-7	252	734	51	7	798	-0-	-0-	75	193	181	1,060	3,351
1977-8	214	627	199	8	484	-0-	-0-	-0-	42	258	1,376	3,208
1978-9	273	602	557	13	1,252	-0-	-0-	1	49	161	894	3,802
						TOTAL (INCL. HOP EQUIV. OF EXT.)						
1973-4	3,758	3,854	2,438	2,430	2,164	589	447	614	1,397	2,438	5,348	25,477
1974-5	4,766	3,545	2,023	3,350	1,648	700	1,039	233	724	1,805	5,382	25,215
1975-6	3,139	5,569	2,555	3,472	1,889	857	1,269	507	1,086	1,863	5,727	27,933
1976-7	4,018	3,553	3,544	3,083	2,796	864	1,210	1,802	1,254	1,097	5,738	28,959
1977-8	4,872	2,632	3,753	2,319	1,906	839	883	36	376	1,546	5,970	25,132
1978-9	5,362	3,407	7,973	2,245	5,008	851	451	81	541	1,055	5,570	32,544

Note: Ext. Conv. Factor is 3.5-1 except 4.0-1 for 1978-79.

SOURCE: FAS, USDA

	1973-74	1974-75	1975-76	1976-77	1977-78	1978-79
			$1,000			
Value of Exports	26,546	25,920	26,625	29,591	27,008	
Value of Imports	17,192	17,718	16,616	15,522	12,754	
Net Fav. Trade Bal.	9,354	8,202	10,009	14,069	14,254	

U. S. HOP ADMINISTRATIVE COMMITTEE

Table 11

U. S. EXPORTS BY COUNTRIES AND REGIONS OF DESTINATION (1000 lbs.)

	1977-78			Top	1978-79			Top
	Hops	Extract	1/Total	Ten	Hops	Extract	1/Total	Ten
Canada	2,292	8	2,319	(4)	2,193	13	2,245	(5)
Mexico	435	627	2,632	(3)	999	602	3,407	(4)
N.Am. Sub-total	2,727	635	4,951		3,192	615	5,652	
Belize	—	2	5		—	2	8	
Costa Rica	—	9	31		—	4	16	
El Salvador	—	18	63		—	—	—	
Guatemala	18	15	69		66	44	242	
Honduras	—	13	44		—	15	60	
Nicaragua	74	2	81		62	—	62	
Panama	—	4	15		—	5	20	
Cent. Am. Sub-total	92	63	308		128	70	408	
Bermuda	—	1	1		—	—	—	
French West Indies	1	—	1		—	—	—	
Barbados	5	—	5		—	—	—	
Dom. Repub.	87	9	118		60	13	112	
Haiti	1	—	3		1	—	1	
Jamaica	76	18	137		82	10	122	
Trinidad	39	5	57		15	3	27	
Carrib. Sub-total	208	34	322		158	26	262	
Argentina	28	29	130		8	9	44	
Bolivia	146	21	220		160	20	240	
Brazil	4,122	214	4,872	(1)	4,270	273	5,362	(2)
Chile	65	—	65		210	34	346	
Colombia	212	484	1,906	(5)	—	1,252	5,008	(3)
Ecuador	—	229	801		175	49	371	
Guyana	22	4	36		—	17	68	
Paraguay	—	29	100		—	18	72	
Peru	—	243	851	(9)	95	78	407	
Uruguay	40	20	109		32	23	124	
Venezuela	83	318	1,198	(6)	137	205	957	(6)
S.Am. Sub-total	4,718	1,591	10,286		5,087	1,978	12,999	
Belgium-Lux.	—	1	5		2	2	10	
Denmark	—	1	1		—	—	—	
Ireland	883	—	883	(8)	451	—	451	(9)
Netherlands	—	40	139		—	47	188	
U.K.-N. Ireland	232	—	232		343	—	343	
W. Germany	36	—	36		77	1	81	
EC-9 Sub-total	1,150	42	1,295		873	50	1,073	
Austria	—	17	61		—	—	—	
Cyprus	—	—	—		6	—	6	
Greece	—	—	—		—	2	8	
Portugal	—	—	—		—	32	128	
Spain	—	—	—		—	42	168	
Sweden	—	—	—		70	—	70	
Switzerland	—	9	31		—	—	—	
Other Eur. Sub-total	—	26	92		76	76	380	
Czechoslovakia	—	—	—		291	—	291	
USSR	3,058	199	3,753	(2)	5,745	557	7,973	(1)
E. Eur. Sub-total	3,058	199	3,753		6,036	557	8,264	

U. S. HOP ADMINISTRATIVE COMMITTEE Table 11 - Cont.

U. S. EXPORTS BY COUNTRIES AND REGIONS OF DESTINATION (1,000 lbs.)

(Continued) -

	1977-78			Top	1978-79			Top
	Hops	Extract	1/Total	Ten	Hops	Extract	1/Total	Ten
Angola	—	22	78		—	—	—	
Brazzaville	—	—	—		—	17	68	
Burundi	—	10	35		—	11	44	
Cameroon	98	4	114		179	15	239	
Ghana	—	—	—		—	6	24	
Liberia	—	4	15		—	12	48	
Mauritius	9	—	9		11	—	11	
Nigeria	366	155	910	(7)	61	63	313	
Rep. S. Africa	131	38	264		135	11	179	
Rwanda	—	—	—		—	22	88	
Sierra Leone	32	3	43		25	4	41	
Zaire	—	22	78		—	—	—	
Africa Sub-total	636	258	1,546		411	161	1,055	
Australia	1	—	1		—	—	—	
Bangladesh	17	—	17		1	—	1	
Hong Kong	—	19	66		—	—	—	
India	1	—	1		6		6	
Indonesia	44	5	61		24	8	56	
Japan	839	—	839	(11)	851	—	851	(7)
Korea, Rep. of	—	27	95		9	43	181	
Malaysia	—	69	240		—	52	208	
New Zealand	—	—	—		—	—	—	
Pakistan	15	—	15		7	—	7	
Philippines	234	177	854	(10)	—	108	432	(10)
Singapore	—	62	216		—	60	240	
Sri Lanka	11	—	11		—	—	—	
Taiwan	154	—	154		470	—	470	(8)
Thailand	—	2	8		—	—	—	
Asia-Oceania Sub-Tot.	1,314	361	2,577		1,368	271	2,452	
GRAND TOTAL	13,903	3,208	25,132		17,336	3,802	32,544	

1/ Natural Hop Equivalent with extract converted at 3.5-1.

Note: Totals may not agree with addition of individual items because of rounding.

SOURCE: Hop Market News, Grain Division, AMS, USDA.

U. S. HOP ADMINISTRATIVE COMMITTEE

Table 12

HOPS

ANALYSIS OF PRECEDING FOUR CROPS

	1976	1977	1978	1979	1980
			1,000 lbs.		
BASE	59,270	59,270	59,270	59,270	59,270
Allotment Percentage	100%	100%	100%	105%	115%
Reg. Allotment	59,270	59,270	59,270	62,234	68,160
Spec. Fuggle Allot.	1,000	1,000	1,000	1,000	1,000
TOT. ALLOTS. POTENT. AVAIL.	60,270	60,270	60,270	63,234	69,160
Reg. Allots. Not Produced	-3,002(5%)	-4,844(8%)	-4,651(8%)	-7,803(12%)	
Spec. Fug. Allot. Not Used	- 279(28%)	- 597(60%)	- 848(85%)	- 893(89%)	
Allots. Lost by Fire	- 912	- 149	- 215	-0-	
Net Allots. Available	56,077	54,680	54,556	54,538	
Res. Used to Fill Defic.	-0-	-0-	-0-	-0-	
Res. Sold Normal Outlets	686	10	197	219	
ALLOTS. & RES. ACTUALLY AVAIL. & % SUCH IS OF AMOUNT POTENTIALLY AVAIL.	56,763(94%)	54,690(90%)	54,753(91%)	54,757(87%)	
RECONCILIATION WITH USDA					
Reserves not sold in normal outlets	256	-0-	-0-	-0-	
Fire Loss	912	149	215	-0-	
Unacc. Difference	(157)	(62)	103	172	
Sub-Total	1,011	87	318	172	
TOTAL CROP (USDA)	57,774	54,777	55,071	54,929	
PROD. IN EXCESS OF ALLOT. (RESERVES)	942(2%)	10(*%)	197(*%)	219(*%)	
Used to Fill Deficiencies	-0-	-0-	-0-	-0-	
RESERVE POOL HOPS	942	10	197	219	
Sold	686	10	197	219	
Balance for Sale	256	-0-	-0-	-0-	

* Less than 1/2 of 1%.

SOURCE: Hop Administrative Committee records.

/1 For information only. To qualify grower must return application for annual allotment prior to May 1, 1979.

/2 This column refers to retransfers effective April 1, 1979. Further transfers for 1980 crop authorized through 3/31/80.

NOTE: N.C. - No change from 1979 base in Column 1.

U. S. HOP ADMINISTRATIVE COMMITTEE April 1, 1979

GROWER ALLOTMENT BASES AND ANNUAL ALLOTMENTS

EFFECTIVE FOR 1979 CROP YEAR AND 1980 CROP YEAR AS OF 4/2/79

WASHINGTON

GROWER	1979 BASE	1979 ALLOT. AT 105% /1	1980 BASE AS OF 4/2/79 /2
	lbs.		
ALEXANDER, DAN	-0-	-0-	753,658
ALLWAROT, MONA M. OR CARL D. (c/o MONA)	214,729	225,465	N.C.
ANDERSON, RAY	33,238	34,891	N.C.
B3 ENTERPRISE, INC.(c/o MAX BENITZ, JR)	165,870	174,164	89,680
BATALI RANCH, INC. (c/o JOSEPH & GENE J.)	67,231	70,594	N.C.
BATES, K. P.	80,334	84,352	N.C.
BB - BC HOPS, INC. (c/o BENNETT G. BRULOTTE)	333,333	350,000	N.C.
BELAIRE, VICTOR W.	231,885	243,479	N.C.
BOISSELLE RANCHES, INC. (c/o RICHARD A.)	757,155	795,013	N.C.
BRULOTTE, ALTA BELLE	-0-	-0-	72,000
BRULOTTE,(ALVIN) ESTATE	228,572	240,001	-0-
BRULOTTE, ARNOLD O.	476,190	500,000	162,211
BRULOTTE, DORIS	-0-	-0-	313,979
BRULOTTE FARMS (RON. L. & RICH. D.d/b/a)	14,286	15,000	15,000
BRULOTTE FARMS, INC. (c/o RON. L. & RICH. D.)	1,174,052	1,232,755	942,625
BRULOTTE, HERVY	162,630	170,762	N.C.
BRULOTTE (LAWRENCE) RANCH, INC.	20,000	21,000	-0-
BRULOTTE, LLOYD J.	414,257	434,970	371,429
BRULOTTE, LYLE J.	569,080	597,534	325,895
BRULOTTE, RICHARD D.	14,286	15,000	15,000
BRULOTTE, ROLAND E. ESTATE	6,786	7,126	7,500
BRULOTTE, RONALD L.	14,286	15,000	15,000
BRULOTTE, ROSALIE M.	7,500	7,876	N.C.
BRULOTTE, STANLEY H.	200,000	210,000	195,313
BRULOTTE (STAN) FARMS, INC. (c/o STANLEY H.)	300,782	315,821	163,469
BURKHOLDER & SYBOUTS (H. BURKHOLDER & G. SYBOUTS d/b/a)	137,150	144,008	N.C.
CARIBOU RANCHES, INC. (c/o WM. L. SCHILPEROORT)	170,495	179,020	122,876
CARPENTER & CARPENTER (THOM. D. & THOMAS JR. d/b/a)	81,381	85,451	N.C.
CARPENTER, THOM. D.	240,111	252,117	N.C.
CARP-LAND COMPANY (THOM. D. CARPENTER d/b/a)	45,618	47,899	N.C.
CHAMPOUX BROS. (MARVIN E. & JOSEPH T. d/b/a)	344,022	361,223	294,022
CHARRON COMPANY, INC. (c/o SEBASTIAN CHARRON)	160,511	168,537	170,511
CHARRON, EDGAR	130,465	136,988	N.C.
CHARRON, JOSEPH E.	403,124	423,280	N.C.
CHARRON, ROBERT	36,500	38,325	61,500
CHARRON, SEBASTIAN	590,719	620,255	455,719
CHARVET, BEN L.	414,830	435,572	397,343
CHARVET BROS.(MATT & TERRY d/b/a)	34,127	35,834	N.C.

WASHINGTON (CONT'D)

GROWER	1979 BASE	1979 ALLOT. AT 105% /1	1980 BASE AS OF 4/2/79 /2
		lbs.	
CHARVET (EMILE) ESTATE (c/o VIOLET CHARVET)	133,386	140,055	N.C.
CHARVET, ERNEST W.	233,292	244,957	140,396
CHARVET, EUGENE P., JR.	136,395	143,215	N.C.
CHARVET, EVELYN L.	77,683	81,567	N.C.
CHARVET, FRANCES V.	-0-	-0-	100,000
CHARVET, GERALD	75,499	79,274	N.C.
CHARVET, HENRY	30,000	31,500	N.C.
CHARVET, JOSEPH P.	275,337	289,104	N.C.
CHARVET, KEITH	61,030	64,082	N.C.
CHARVET, MARCEL	25,752	27,040	N.C.
CHARVET, MAURICE J.	25,455	26,728	N.C.
CHARVET, MICHAEL A.	124,117	130,323	24,117
CLOVER MEADOWS RANCH (HARLAN SHINN d/b/a)	534,991	561,741	N.C.
CHIEFTAIN ACRES (HENRY J. TOBIN & O. DESSERAULT d/b/a)	337,687	354,571	N.C.
DELL, JOHN	50,000	52,500	N.C.
DESMARAIS, G. LEE	257,885	270,779	N.C.
DESMARAIS, MARC	94,341	99,058	78,341
DESMARAIS, RAYMOND F.	143,810	151,000	N.C.
DESMARAIS, STEVE G.	140,779	147,818	N.C.
DESMARAIS (STEVE) RANCH, INC. (c/o STEVE G.)	571,576	600,155	N.C.
DESSERAULT RANCH, INC. (c/o ALB. & KEN J. DESSERAULT)	462,653	485,786	453,129
DION, GERALD	28,223	29,634	N.C.
DOUBLE O HOP RANCH, INC. (c/o DARRELL DESSERAULT)	524,286	550,500	454,454
DOUBLE R RANCH (LEONARD W. & JEROME O. RIEL d/b/a)	299,939	314,936	N.C.
DUFAULT, LEON A.	339,459	356,432	N.C.
FAUCHER, DON	60,000	63,000	N.C.
GAMACHE (AMBROSE) FARMS, INC. (c/o AMBROSE J.)	672,453	706,076	N.C.
GAMACHE (AMOS) FARMS, INC. (c/o AMOS T.)	705,758	741,045	N.C.
GAMACHE, DENIS R.	2,004	2,104	N.C.
GAMACHE, DONALD J.	341,885	358,979	N.C.
GAMACHE (JEFF) FARMS, INC. (c/o JEFFERY)	337,393	354,263	289,774
GAMACHE, KENNETH	40,000	42,000	N.C.
GAMACHE, LEE J.	95,161	99,919	N.C.
GAMACHE, LESLIE	110,320	115,836	N.C.
GAMACHE, RONALD F.	160,000	168,000	N.C.
GAMACHE (VIRGIL) FARMS, INC. (c/o VIRGIL W.)	813,691	854,376	N.C.
GANNON (L.O.) & SON, INC. (c/o WM. L. GANNON)	364,047	382,249	N.C.
GASSELING (LEO) & SONS, INC. (c/o LEO GASSELING)	477,832	501,724	281,384
GASSELING (WM.) RANCHES, INC. (c/o WILLIAM)	792,750	832,387	622,750

WASHINGTON (CONT'D)

GROWER	1979 BASE	1979 ALLOT. AT 105% /1	1980 BASE AS OF 4/2/79 /2
		lbs.	
GREEN ACRE FARMS, INC. (c/o WES MORFORD, JR.)	1,321,042	1,387,094	1,346,042
HARRAH FARMS, INC. (c/o JOSEPH E. FAVILLA)	127,443	133,815	N.C.
HEARRON (E.T.) CO., INC. (c/o THOM. O. CARPENTER)	382,668	401,801	254,097
HEFFLINGER RANCHES, INC. (c/o LEE HEFFLINGER)	333,000	349,650	N.C.
HERKE & SON (CARL J. & JOSEPH d/b/a)	81,469	85,542	N.C.
HOGUE RANCHES, INC. (c/o WAYNE & MICHAEL HOGUE)	732,410	769,031	692,410
HOLLINGBERY, O.E., JR.	25,085	26,339	95,085
HUBERDEAU, ALBERT	43,825	46,016	N.C.
IMPERIAL HOP FARM (c/o GARTH ORKNEY)	147,309	154,674	N.C.
K & R FARMS (MICH. J. KORESKI & DONALD P. RIEL d/b/a)	54,312	57,028	6,312
KORESKI, MICHAEL J.	320,011	336,012	324,011
L & R FARMS, INC. (c/o RONALD MC DONALD)	289,755	304,243	N.C.
LAURENT, RICHARD W.	-0-	-0-	31,506
LENSEIGNE, ALCIDE R.	91,037	95,589	N.C.
LENSEIGNE, ALCIDE R. & ALFRED F.	248,409	260,829	188,409
LENSEIGNE, ALFRED F.	178,922	187,868	N.C.
LENSEIGNE, LAWRENCE	193,934	203,631	N.C.
LENSEIGNE, PAUL	250,924	263,470	N.C.
LENSEIGNE, WALLACE	200,634	210,666	180,634
LOFTUS (B.T.) RANCHES, INC. (c/o LEOTA MAY LOFTUS)	474,377	498,095	225,786
LOFTUS, LEOTA MAY	-0-	-0-	60,797
MC DONALD, DAN A., JR.	-0-	-0-	145,860
MC DONALD, DAN, SR.	-0-	-0-	179,556
MC DONALD & WEIGE (RON. G. MC DONALD & LES. WEIGE d/b/a)	120,000	126,000	N.C.
MIERAS, VERN M.	45,718	48,004	N.C.
MINICK, CLAUDE P.	15,238	16,000	-0-
MORRIER, ALBERT	38,021	39,922	N.C.
MORRIER RANCH, INC. (c/o JOSEPH R. MORRIER)	303,519	318,695	283,519
NEWHOUSE, ALBERT	23,000	24,150	N.C.
NEWHOUSE, ALFRED R.	65,809	69,099	N.C.
NEWHOUSE FARMS (c/o MELVIN, ALFRED, ALBERT & JOHN)	977,488	1,026,362	877,488
NEWHOUSE, MELVIN	80,213	84,224	N.C.
NEWHOUSE, WAYNE	50,000	52,500	N.C.
NIGHTHAWK RANCH, INC. (c/o STEVE G. DESMARAIS)	238,628	250,559	N.C.
OASIS FARMS, INC. (c/o WILLIAM A. ROY)	391,023	410,574	411,603
ORKNEY FARMS, INC. (c/o GARTH ORKNEY)	139,130	146,087	280,740
ORKNEY, GARTH	60,000	63,000	N.C.
ORKNEY, JAMES W.	260,740	273,777	N.C.

WASHINGTON (CONT'D)

GROWER	1979 BASE	1979 ALLOT. AT 105% /1	1980 BASE AS OF 4/2/79 /2
		lbs.	
PATNODE HOPS, INC. (c/o FRANCIS PATNODE)	376,982	395,831	396,982
PERRAULT FARMS, INC. (c/o BERNARD PERRAULT)	492,919	517,565	N.C.
PERRAULT, FRANK	-0-	-0-	178,466
PERRAULT (FRANK & WAYNE) HOP FARM (c/o FRANK)	220,466	231,489	-0-
PERRAULT, STEVEN M.	68,571	72,000	-0-
PERRAULT, WAYNE	80,000	84,000	42,000
PUTERBAUGH, R. MARTIN	359,851	377,844	242,851
REGIMBAL & REGIMBAL (ALAN F. & LAURENT d/b/a/)	525,398	551,667	445,398
RIEL, DONALD P.	214,153	224,861	114,656
RIEL, DONALD P. & SONS (c/o DONALD)	-0-	-0-	123,497
RIEL, JEROME O.	98,353	103,271	N.C.
RIEL, LEONARD F.	241,118	253,174	N.C.
RIEL, LEONARD W.	66,813	70,154	N.C.
RIEL RANCHES, INC. (c/o RONALD J. RIEL)	534,211	560,922	N.C.
ROBILLARD, LEO	-0-	-0-	36,896
ROONEY HOP RANCH(WM. L., DON. A., FRANK J.& MRS.T.L. d/b/a)	171,731	180,318	N.C.
ROY, ALCID	485,311	509,576	N.C.
ROY FARMS, INC. (c/o LESTER W. ROY)	1,339,683	1,406,666	1,244,516
ROY, LESLIE A.	-0-	-0-	36,500
ROY, STANLEY A.	120,580	126,609	100,000
ST. MARY, CHARLES A.	130,000	136,500	-0-
ST. MARY, CHARLES P.(JIM)	244,391	256,611	N.C.
SALI, KASPER	-0-	-0-	159,372
SAUVE & SON FARMS, INC. (c/o LOUIS & MICHAEL L. SAUVE)	424,520	445,746	N.C.
SAUVE, WILMA S.	313,190	328,850	328,190
SCYMANSKI, PETER	85,795	90,085	-0-
SEGAL, JOHN B.	382,857	402,000	282,857
SHAMROCK RANCH (GEORGE H. GANNON, JR. d/b/a)	621,469	652,541	653,469
SHINN & SON (HARLAN L. & EDWARD d/b/a/)	527,221	553,582	N.C.
SIMCOE HOP RANCHES, INC. (c/o WM. GASSELING)	60,135	63,142	N.C.
SMITH, MICHAEL M.	-0-	-0-	94,000
STEGEMAN, MICHAEL E.	-0-	-0-	17,487
STRAUSZ, DAVID A.	420,107	441,112	N.C.
SYBOUTS, GERALD F.	304,553	319,781	284,553
TOBIN (L.&H.) BROS., INC. (c/o LAWRENCE K.)	207,344	217,711	N.C.
TOBIN (L.&H.)BROS. FARMS, INC. (LAWRENCE K. TOBIN d/b/a)	240,585	252,614	N.C.
TOBIN, LAWRENCE K.	90,891	95,436	110,891
TOBIN, LEONARD	74,034	77,736	N.C.
WYCKOFF, CLIFFORD D.	-0-	-0-	758,830
WYCKOFF FARMS, INC. (c/o CLIFFORD D. WYCKOFF)	758,830	796,772	-0-
[illegible] RANCHES (DON ALEXANDER d/b/a)	1,307,134	1,372,490	573,476

OREGON

GROWER	1979 BASE	1979 ALLOT. AT 105% /1	1980 BASE AS OF 4/2/79 /2
		lbs.	
ANNEN BROS., INC. (c/o JOSEPH H.)	377,419	396,290	353,419
B.C. FARMS (BRUCE & CHAS. DAVIDSON d/b/a)	-0-	-0-	34,000
BERNING, LOUIS G.	300,270	315,284	N.C.
BUDREAU, LUCILLE	-0-	-0-	37,868
CAPITOL FARMS, INC. (c/o ROGER A. KERR)	283,770	297,959	N.C.
CENTENNIAL FARMS (JEFF A. WEATHERS & SIBLING d/b/a)	35,000	36,750	N.C.
CNR FARMS, INC.(c/o CHARLES STAUFFER)	-0-	-0-	100,000
COLEMAN FARMS, INC. (c/o JOHN F. COLEMAN)	260,685	273,719	114,022
COLEMAN, JOHN F.	-0-	-0-	118,092
COLEMAN RANCH, INC. (c/o ROBERT T. COLEMAN)	338,008	354,909	325,627
COLEMAN, WM., A.	-0-	-0-	118,091
COLEMAN, STEPHEN D.	85,000	89,250	N.C.
CROSBY HOP FARMS, INC. (c/o E. W. CROSBY, JR.)	346,155	363,463	351,155
DAVIDSON, JAMES E.	270,607	284,137	151,940
FAIRFIELD FARMS, INC. (c/o WILLIAM A. COLEMAN)	259,879	272,873	113,217
FINNEY LAKE FARM (DONALD C. & CARL W. WEATHERS d/b/a)	105,781	111,070	N.C.
FOBERT, FRANK & BILL	226,725	238,061	168,857
GESCHWILL, FRED, HENRY J., & WM. J.	241,552	253,630	N.C.
GOSCHIE FARMS, INC.	383,211	402,372	364,163
GOULET FARMS, INC. (c/o HOMER L. & PHILLIP H.)	454,816	477,557	30,000
GOULET, HOMER L.	-0-	-0-	262,632
GOULET, PHILIP H.	-0-	-0-	162,184
GREENLEAF HOP FARM, INC. (c/o DONALD F. COLEMAN)	119,789	125,778	N.C.
HORSESHOE LAKE FARMS (JAMES N., SAM,DAVE & JACK SMITH d/b/a)	385,487	404,761	N.C.
KERR HOP RANCH (ROGER A. KERR d/b/a)	137,012	143,863	N.C.
KING,MELVIN A.	-0-	-0-	135,029
KIRK HOP FARMS, INC. (c/o RICHARD C. KIRK)	388,781	408,220	N.C.

OREGON (CONT'D) GROWER	1979 BASE	1979 ALLOT. AT 105% /1	1980 BASE AS OF 4/2/79 /2
		lbs.	
LEAVY FARMS (c/o PATRICK LEAVY)	81,967	86,065	38,225
MISSION BOTTOM FARMS, INC. (c/o DONALD C. WEATHERS)	247,117	259,473	N.C.
P-M RANCH, INC. (c/o PHILIP E. WOLF, JR.)	162,745	170,882	N.C.
R D FARMS, INC. (c/o RAY DAVIDSON)	39,107	41,062	N.C.
SAN SALVADOR FARMS, INC. (c/o CARL EUGENE SMITH)	122,116	128,222	N.C.
SCHWABAUER FARMS (KENNETH AND L. J. SCHWABAUER d/b/a)	73,305	76,970	N.C.
SERRES, ADELA & JOSEPH SERRES ESTATE (c/o ADELA)	456,506	479,331	456,051
SERRES, JOHN	-0-	-0-	25,455
SERRES, PAUL J.	-0-	-0-	50,000
SMITH, DAVID C.	142,512	149,638	N.C.
STAUFFER BROS. (NORMAN & ROBERT d/b/a)	568,126	596,532	518,126
SUNNYBROOK HOP YARDS, INC. (c/o CHARLES LATHROP)	621,342	652,409	526,313
VALLEY HOP FARMS, INC. (c/o ROBERT T. COLEMAN)	291,367	305,935	N.C.
WEATHERS, CARL W.	214,737	225,474	179,737
WILMES, PATRICIA	-0-	-0-	12,742
WILMES, WILFRIED	50,358	52,876	N.C.

GROWER	1979 BASE	1979 ALLOT. AT 105% /1	1980 BASE AS OF 4/2/79 /2
		lbs.	
IDAHO			
ENROSE FARMS, INC. (c/o VERNON M. BATT)	354,989	372,738	514,989
GEM HOP COMPANY (HAROLD J. & DOUGLAS G. BATT d/b/a)	441,808	463,898	N.C.
GOODING FARMS, INC. (c/o FRED GOODING)	448,082	470,486	408,082
GREENLEAF FARMS, INC. (c/o ROBERT M. BATT)	354,975	372,724	384,975
NOTUS HOP CO., INC. (c/o VERNON M. BATT)	65,176	68,435	N.C.
OBENDORF, BERNARD	181,120	190,176	N.C.
OBENDORF, ORVILLE	110,000	115,500	90,000
RIM RANCHES & R & D, INC. (c/o RAY OBENDORF)	845,571	887,850	875,571
SALI, RONALD J.	35,000	36,750	-0-
SUTER FARMS, INC. (c/o LAURA SUTER KNIE)	382,816	401,957	202,816
WILDER FARMS, INC. (c/o DONALD R., & REED BATT)	421,840	442,932	441,840
WILDER HOP COMPANY (c/o FRED BATT)	421,824	442,915	441,824
CALIFORNIA			
ROONEY BROS., INC. (c/o PETER M. & EDWARD T.)	388,978	408,427	N.C.
ROONEY, F. L., INC. (c/o BERNARD J. ROONEY)	210,071	220,575	160,071
SIGNOROTTI, GEORGE W.	260,704	273,739	N.C.
WESTERBERG FARMS (P. F. ESTATE & MIKE d/b/a)	332,038	348,640	212,990
CALIFORNIA - WASHINGTON - IDAHO			
GOLDEN GATE HOP RANCHES, INC.(c/o A. C. ZUCCHI)	2,538,749	2,665,686	3,634,923
CALIFORNIA - WASHINGTON - OREGON - IDAHO			
JOHN I. HAAS, INC. (c/o FREDERICK J. HAAS)	4,906,739	5,152,076	6,156,427
TOTAL ALL STATES	59,269,877	62,233,371	

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ANHEUSER-BUSCH AND MILLER SLICE

The way it splits up as we start this year of 1980, the top six U.S. brewers share a whopping 82 percent slice of the beer market pie, leaving the crumbs (only 17.9%) to all their smaller competitors.

Anheuser-Busch retains its first place position with a 27.5 percent chunk, with Miller a close second enjoying a 21.3 percent morsel, trailed by Schlitz (10%), Pabst (9%), Coors (7.7%) and Heileman (6.6%).

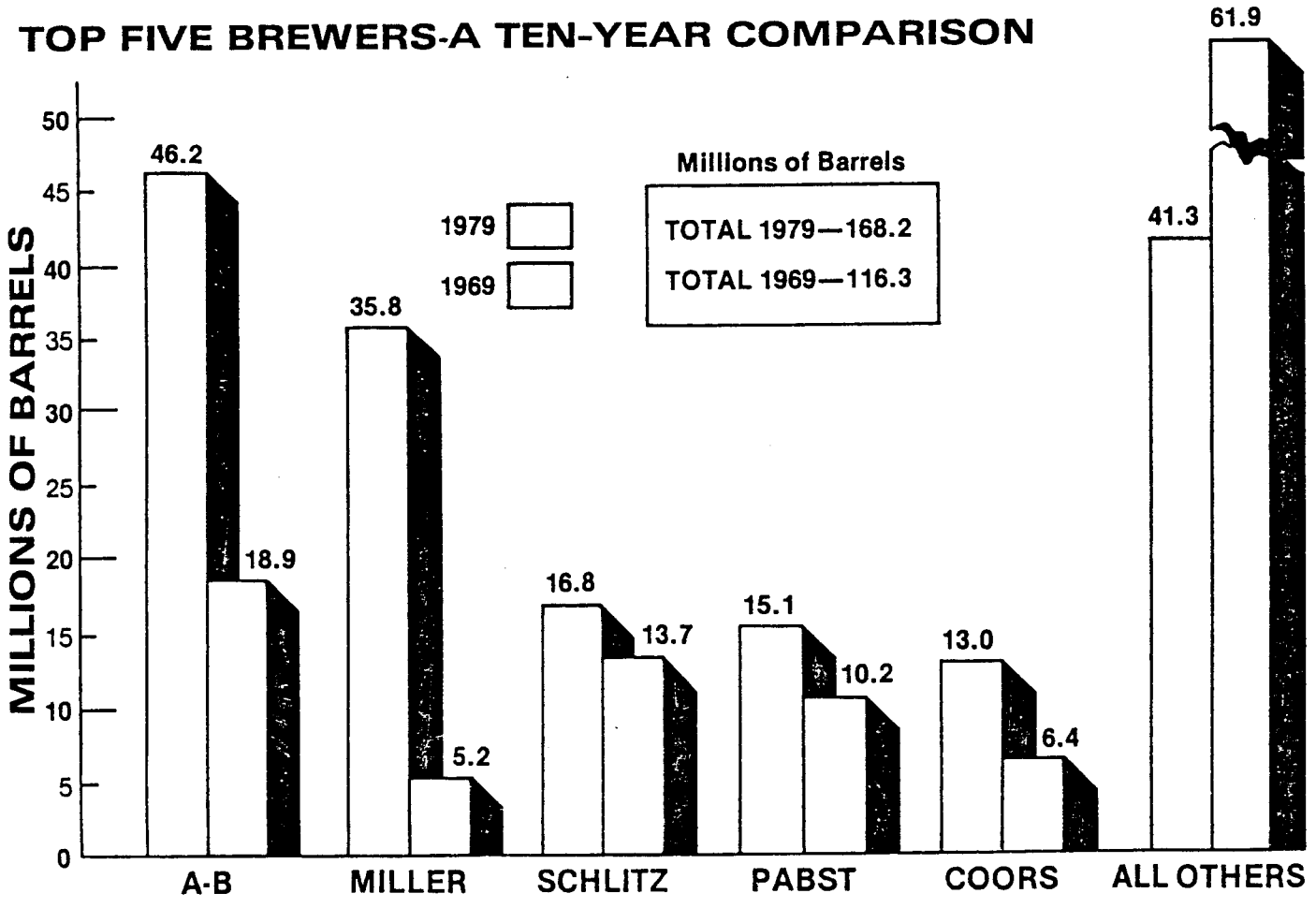
And there's another way to carve up the pie. Splitting it just about in half, the U.S. market divides between one bloc shared by two growing national marketers and another formed by the rest of the nation's brewers—all adapting with varying degrees of success to the tremendous upheaval which has characterized the beer business in recent years. The diversified bloc of all but the top two brewers still claims, by just two percent, a majority of the sales of United States beers. Anheuser-Busch and Miller share 49 percent of the market.

To carry this pie-cutting game perhaps too far, especially for those gallant smaller brewers who have survived up until now, there's still another way to carve up the U.S. beer business. That is between the 12 leaders and all the others. When the dozen at the top walked away from the table last year with their 97.8 percent piece, there was only a sliver of 2.2 percent for the other 32 brewing companies left in this country.

The competition between A-B and Miller was well publicized in virtually all media over the last two years. Even non-beer drinkers recognize the companys' products through their artful television campaigns. Last year, a public relations blitz supplemented the advertising campaigns. The great beer war, with its battles of images and skirmishes of words, helped create the consumer recognition necessary for beer distributors to gain new accounts. However fierce the "war," the net effect was to give the competitors a bigger ring to share. Together, Anheuser-Busch and Miller grew almost four percent over 1978.

Nine brewing companies sold 90 percent of the U.S. beer last year. Changes in each of these companies in 1979 varied from a volume loss of 14.3 percent by Schlitz to a gain of 23 percent by Heileman (see table 1). With its acquisitions, Heileman boosted its growth rate even more—56.8 percent over 1978 volume.

Continued consolidation is reflected in the market share changes



OFF 49% OF U.S. BEER MARKET PIE

(see table 2). Of the top nine, all gains were by Anheuser-Busch, Miller, and Heileman. Coors, right in the middle of the group, maintained equilibrium, but despite opening new markets and initiating new advertising campaigns, no growth in market share. Volume increase, however, edged up 2.8 percent. While new products by Coors are expected to hit test markets soon, the brewery does not yet have the demand necessary to justify the second brewery which it has talked about building.

Schlitz, the biggest loser in the restructured market, sold one of its breweries, a new one, to Anheuser-Busch. With a dwindling volume base, its loss ratio spirals downward. New management, new advertising, new brewing processes and new products—notably Erlanger—have not so far been able to bring about a turnaround. In 1979, Schlitz lost more volume than it did in 1978. Its market share fell 2.1 points to ten percent.

Pabst, in a dramatic move, brought in a former Anheuser-Busch advertising executive as president of the company at the beginning of the last quarter, after buying Blitz-Weinhard early in the year and closing its Los Angeles brewery. The consolidation marked the merging of the oldest Milwaukee brewery with the oldest western brewery. The company completed its repricing from popular to premium levels and brought strong beer back to Oklahoma, where restrictive state law had pushed out other major brewers.

(continued)

U.S. MALT BEVERAGE IMPORTS 1979/1978

	1979 In Gallons	1978 In Gallons	Percent Change
Netherlands	61,660,303	47,511,321	29.8
Canada	40,343,293	30,876,128	30.7
Germany	14,208,999	11,989,071	18.5
Mexico	9,094,305	6,344,816	43.3
U.K./Ireland	4,767,790	4,162,321	14.5
Australia	2,223,678	1,595,820	39.3
Japan	1,171,921	924,330	26.8
Philippines	877,875	878,105	0.0
Denmark	621,001	713,709	−13.0
Norway	599,536	658,985	−9.0
Others	2,160,939	1,621,227	33.3
Total all nations	**137,729,640 (4,442,892 bbl)**	**107,275,833 (3,460,511 bbl)**	**28.4**

Tabulated by Modern Brewery Age—copyright 1980.

TEN-YEAR COMPARISON OF LEADING U.S. BREWERS

	1979 Sales Position	1979 Sales 31-Gal. Barrels	1969 Sales 31-Gal. Barrels	1969 Sales Position	Gain or Loss Percentage
A-B	1	46,200,000	18,860,000	1	145.0
Miller	2	35,794,225	5,189,000	8	589.8
Schlitz	3	16,800,000	13,709,359	2	22.5
Pabst	4	15,115,000	10,250,000	3	47.4
Coors	5	12,912,000	6,350,000	4	103.3
Heileman	6	11,520,000*	2,215,500**	17	420.0
Olympia	7	6,029,000	3,375,000	12	78.6
Stroh	8	6,015,000	2,939,000	15	104.7
Schmidt	9	3,850,000	2,950,000	13	30.5
Schaefer	10	3,537,000	5,450,000	6	−35.1
Falstaff	11	3,489,426	6,191,500	5	−43.64
Total Industry		***168,200,000***	***116,271,320***	***44.66***	

**Includes Carling Sales.*

***In 1969, Carling sold 5,440,000 Bbl. and was No.7.*

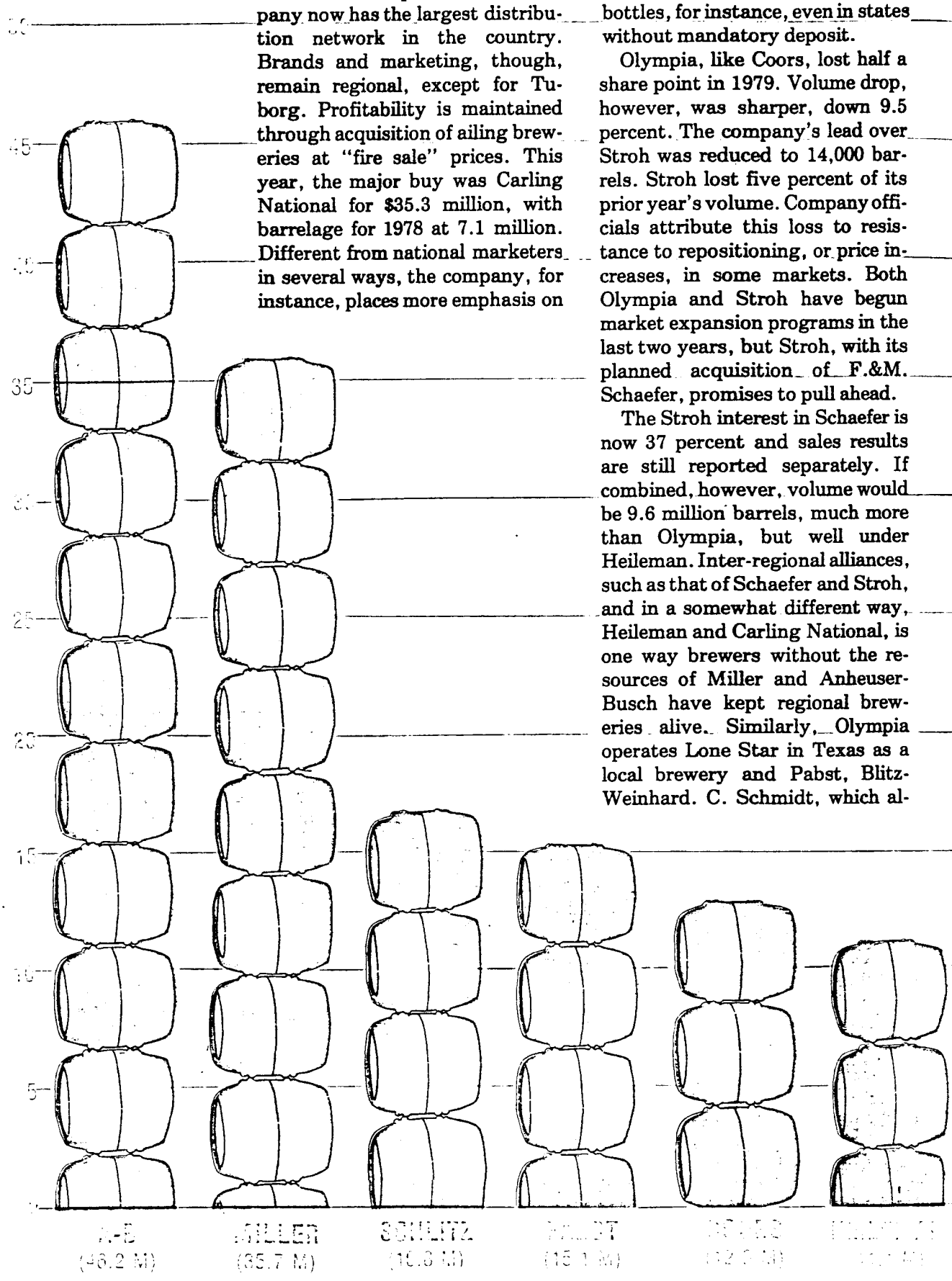
Tabulated by Modern Brewery Age—copyright 1980.

Volume losses were stemmed—from 4.0 percent in 1978 to 1.6 in 1979. Pabst's market share fell half a point to nine percent.

Topping all brewers in growth rate, Heileman upped its market share, with acquisition of Carling National, to 6.6 percent. The company now has the largest distribution network in the country. Brands and marketing, though, remain regional, except for Tuborg. Profitability is maintained through acquisition of ailing breweries at "fire sale" prices. This year, the major buy was Carling National for $35.3 million, with barrelage for 1978 at 7.1 million. Different from national marketers in several ways, the company, for instance, places more emphasis on price alternatives for the consumer. Heileman President Russell Cleary advocates the use of less expensive packaging to keep product prices down. He notes the growing popularity of refillable bottles, for instance, even in states without mandatory deposit.

Olympia, like Coors, lost half a share point in 1979. Volume drop, however, was sharper, down 9.5 percent. The company's lead over Stroh was reduced to 14,000 barrels. Stroh lost five percent of its prior year's volume. Company officials attribute this loss to resistance to repositioning, or price increases, in some markets. Both Olympia and Stroh have begun market expansion programs in the last two years, but Stroh, with its planned acquisition of F.&M. Schaefer, promises to pull ahead.

The Stroh interest in Schaefer is now 37 percent and sales results are still reported separately. If combined, however, volume would be 9.6 million barrels, much more than Olympia, but well under Heileman. Inter-regional alliances, such as that of Schaefer and Stroh, and in a somewhat different way, Heileman and Carling National, is one way brewers without the resources of Miller and Anheuser-Busch have kept regional breweries alive. Similarly, Olympia operates Lone Star in Texas as a local brewery and Pabst, Blitz-Weinhard. C. Schmidt, which al-



ready acquired numerous regional brands in previous years, was unable to obtain the Schaefer notes that Stroh later picked up, because of Schaefer's resistance and a judicial anti-trust judgment.

Among the Falstaff-General Brewing family owned by Paul Kalmanovitz, Pearl Brewing has been the notable success story. Now supplying eastern U.S. and California markets, Pearl's growth rate was 16.3 percent in 1979. However, the overall Falstaff/General barrelage last year was only 3,489,426 as compared to the previous year's figure of 4,600,000 —a drop of 24.1 percent. One reason for the plunge: the 1978 barrelage included shipments from Falstaff's San Francisco brewery through April, when it shut down.

It should be noted that General's Vancouver brewery increased barrelage 15 percent in 1979 to a total of 565,000, partly because it picked up business with the closing of the San Francisco plant.

A flaw in the Falstaff/General was the sales performance of the Narragansett (R.I.) brewery, which fell off 28.1 percent, with total barrelage sales of 607,874 last year.

Small breweries attesting to the survival of the local brewery are Pittsburgh and Genesee. Under a new president, William Smith, Pittsburgh turned around a seven-year decline by targeting both the light beer market and private label market as potential solutions to the company's decline.

Competition and market share, of course, is the biggest of the forces that influence the distribution of beer. As a controlled product, however, the influence of state and federal government is an ever-present factor. At all levels, actual and increased taxes affect prices, already pressured by skyrocketing increases in raw materials. Virtually every state is intimately involved in determing the extent and the rules of beer distribution. The involvement of the states is supplemented by that of the federal government — through the Treasury departments' Bureau of Alcohol, Tobacco, and Firearms. However, federal and state regulation of the market is under scrutiny by legislators across the country. Interest groups want more or less regulation, depending on the issues involved, and government affairs is a significant part of brewer and wholesaler planning.

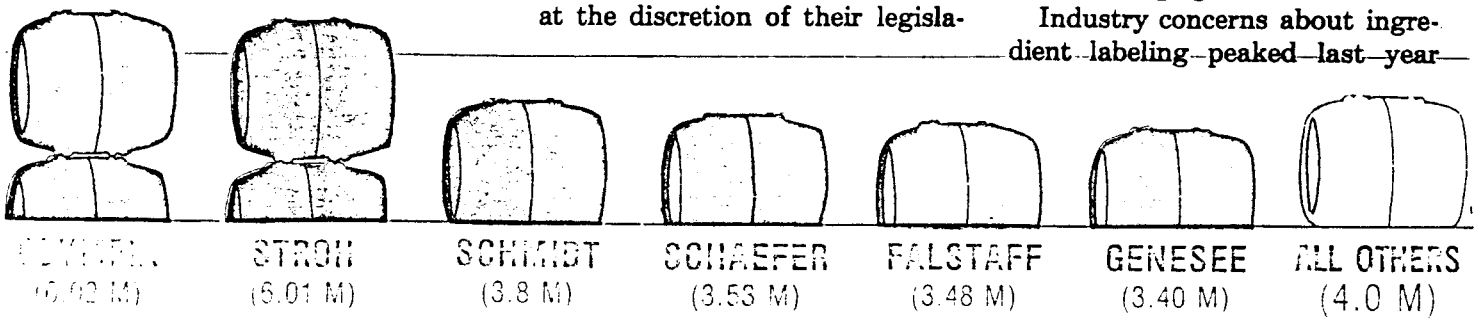
A gradual erosion of federal regulation of beer marketing along with greater state discretion appears to be an inevitable consequence of the current political push for deregulation. In June of last year, a U.S. Circuit Court ruled that the state of Florida, not the BATF, has final control over regulating alcoholic beverages within its boundaries. The judgment pointed out that the 21st amendment presumes state power over the alcoholic beverage trade, the historical conflict between federal and state governments in this area notwithstanding.

A pending Supreme Court decision will determine whether state price posting laws in California can be struck down as anti-competitive. More broadly, the decision may affect the balance of power in the federal / state jurisdictional conflict. If the Supreme Court follows the same reasoning as the lower court did in the Florida decision, then states may be able to regulate or deregulate the industry at the discretion of their legislatures, administrators, and attorney generals. The anti-trust provisions of the Commerce Clause of the Constitution, used by opponents of state regulation, would then be secondary to the 21st amendment.

State control over pricing is a related issue which can affect the beer market. Price affirmation, required by some control states for liquor, insures that suppliers sell in a state at prices as low as anywhere else in the country. In the past, brewers effectively argued against application to beer of such legislation in the states on the basis of perishability and the regional nature of the business. Argument against price affirmation for beer in New Mexico, where such legislation did slip by the industry last year, depend in part on interference with interstate trade. If federal influence is diminished, however, by the Supreme Court, wholesalers in states where prices are high may begin to push for such legislation. Potentially, the issue is a divisive one in the trade, just as franchise legislation, no longer sought at the national level, but now in the domain of the individual state groups, has been in the past.

Product considerations, like distribution questions, have a potentially heavy impact on the market. The most pressing of these involves the growing national and international concerns about alcoholism. More states have been reversing the trend, which followed the Viet Nam War, to grant young people between 18 and 21 drinking privileges. Now, of course, any national registration or draft move might again slow down the push for a more restrictive drinking age.

Industry concerns about ingredient labeling peaked last year



TOP TWELVE GRAB OFF MORE THAN 97 PERCENT OF THE BEER BUSINESS

MARKET SHARES–TOP 12 BREWERS

	1979	1978
Anheuser-Busch	27.5%	25.6%
Miller	21.3	19.3
Schlitz	10.0	12.1
Pabst	9.0	9.5
Coors	7.7	7.7
Heileman*	6.6*	4.4
Olympia	3.6	4.1
Stroh	3.6	3.9
C. Schmidt	2.3	2.3
Falstaff/General	2.1	2.8
Schaefer	2.1	2.4
Genesee	2.0	1.8

*Includes three quarters of Carling National sales.

Tabulated by Modern Brewery Age—copyright 1980.

TABLE 2.

STATISTICAL STUDY
(continued)

when the BATF issued proposed regulations under pressure from the Food and Drug Administration. By the end of the year, however, the more immediate concern was health warning labels, which came up repeatedly in the U.S. Congress. Both general warnings on the dangers of drinking, as well as specific ones on fetal alcohol syndrome, have been proposed. An important administrative recommendation on the controversial issue, requested by Congress, is due in June.

Last year, the ingredient labeling issue became a point of bitter contention between Anheuser-Busch and Miller, both of whom publicized their positions before federal agencies. With the Federal Trade Commission and the Bureau of Alcohol, Tobacco and Firearms both under attack, however, the use of either agency to settle questions about beer advertising or labeling becomes a less likely alternative. Whether or not BATF will ever promulgate the partial ingredient labeling requirement supported by the brewers' trade group and criticized by Miller Brewing may depend on the influence of other beverage trade groups actively opposing it, the strength of the Food and Drug Administration, and the analysis of its impact on prices.

Advertising regulations, if proposed this year as planned by the Bureau of Alcohol, Tobacco and Firearms, may provide yet another forum for those urging stricter control of beverage alcohol products. And deposit legislation, held at bay in 1979 by concerted efforts in Nebraska, Washington and Ohio, still simmers in many states.

With the end of the decade, the U.S. beer industry splits in two. Anheuser-Busch and Miller make one half of it. All other brewers comprise the other half. But common to all were problems other than competition: beer is regulated as both a food and as an alcoholic beverage. It is taxed as soon as it is brewed and again as it is sold in each state. Its local marketing must meet local mores, its handling must comply with quality control standards. Historically a beverage of moderation, it is still targeted in current efforts to combat alcoholism. Its packaging is highly controversial, but the basis for an entire system of efficient distribution. Beer marketing and distribution in the 1980's will continue to be a competitive and a complex challenge to all who engage in its production, distribution and ultimate sale. ■

U.S. Beer Sales-Domestic and Imported

	Barrels in Millions		% of Total		% Gain Over Last Year	
	1979	1978	1979	1978	1979	1978
Domestic beer	168.2	162.3	97.5	97.9	3.6	3.4
Imported beer	4.4	3.5	2.5	2.1	28.4	36.0
Total Sales	**172.6**	**165.8**	**100**	**100**	**4.1**	**3.9**

Tabulated by Modern Brewery Age—copyright 1980.

TOTAL BARRELAGE OF LEADING U.S. BREWERS — 1979/1978

	1979 Sales 31-Gal. Barrels	1978 Sales 31-Gal. Barrels	Gain or Loss Barrels	Gain or Loss Percent
1. Anheuser-Busch, Inc.	46,200,000	41,609,891	4,590,109	11.0
2. Miller Brewing Co.	35,794,225	31,274,174	4,520,051	14.5
3. Jos. Schlitz Brewing Co.	16,800,000	19,600,000	– 2,800,000	– 14.3
4. Pabst Brewing Co.	15,115,000	15,367,000	– 252,000	– 1.6
5. Adolph Coors Co.	12,912,000	12,566,000	346,000	2.8
6. G. Heileman Brewing Co.*	11,152,000*	7,112,000	4,040,000	56.8*
7. Olympia Brewing Co.	6,029,000	6,662,000	– 633,000	– 9.5
8. The Stroh Brewery Co.	6,015,246	6,328,519	– 313,273	– 5.0
9. C. Schmidt & Sons, Inc.	3,850,000	3,792,000	58,000	1.5
10. F. & M. Schaefer Brewing**	3,537,000	3,929,000	– 392,000	– 10.0
11. Falstaff/General Breweries***	3,489,426	4,600,000	– 1,110,574	– 24.14
12. Genesee	3,400,000	3,000,000	400,000	13.3
Total Industry	***†168,200,000***	***162,284,469***	***5,915,531***	***3.6***

*Includes Carling Sales for 3 quarters. Without Carling, barrelage was 8,747,760, up 23%.

**Company estimate.

***Includes Pearl (1,481,112 bbls., up 16.3%); Narragansett (607,874 bbls., down 28.1%); General Vancouver (565,000 bbls., up 15%), and all three Falstaff breweries.

***Note also that the 1978 figure for Falstaff/General included Falstaff San Francisco, which stopped shipping in April of that year.

†Includes all U.S. brewers, including those in this table.

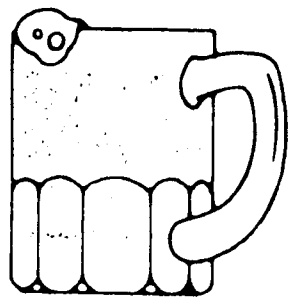


TABLE 1.

U.S. BEER EXPORTS DECLINE 24%

The spectacular increase in U.S. exports of beer to Taiwan in 1979 helped offset the marked decline in exports to Canada. Unusual situations contributed to the great changes in our beer exports to these markets in the last two years. U.S. beer exports to tourist centers in the Caribbean continued to rise. Hong Kong surpassed Canada to become our second largest export market for beer in 1979.

The strike by brewery workers in Canada during the summer of 1978 contributed to unusually large exports of 13.5 million gallons of U.S. beer valued at $17.4 million to Canada during 1978. The value in 1977 had been only $1.7 million. Our beer exports to Canada in 1979 fell back to 2.2 million gallons valued at $3.3 million.

Total U.S. exports of beer to all countries increased from 11.3 million gallons in 1977 to 25.8 million gallons in 1978 valued at $35.4 million, or double the $16.6 million of the previous year. The decline of 11.3 million gallons in shipments to Canada during 1979 would have caused a shattering reduction in our total beer exports if the large increase in recorded exports to Taiwan had not occurred. U.S. beer exports declined 24 percent in quantity to 19.6 million gallons in 1979, and the value declined by 17 percent to $29.3 million.

Exports to Taiwan soar

U.S. exports of beer to Taiwan soared from a token 9,000 gallons in 1978 to seven million gallons in 1979 and the value rose to $10 million.

Stores catering to Americans living and working in Taiwan are well stocked with an assortment of American brands of beer. Imports for some of the stores operated by a special foundation are free of import duties. Taiwan had a trade surplus of over $2 billion with the United States in the last two years. This led to the relaxation of import regulations for commodities classified as "semi-luxuries." U.S. exports of beer to Taiwan are likely to increase again in 1980.

Duty-free imports into Hong Kong are also rising. U.S. exports of beer to Hong Kong increased from 2.7 million gallons in 1978 to 3.4 million gallons in 1979 and the value rose from $3.5 million to $4.5 million. Hong Kong's imports of beer from China and Singapore have not increased in recent years at the rate imports from the United States have. Many of the leading hotels on Hong Kong Island and in Kowloon now have American brands of beer available and this should push the value of U.S. beer exports to Hong Kong up to $6 million in 1980.

The move by Asian countries to allow more imports of consumer goods because of changes in trade policy should open the way to larger exports of U.S. beer to that continent.

Mexico may use some of its extra billions of petroleum income to allow larger beer imports, possibly including some American brands for foreign technicians working in its petroleum industry.

U.S. beer exports to various markets in the Caribbean continued to rise in 1979.

Sales of U.S. beer in the Mideast increased in 1979, despite rising competition from Singapore and European suppliers.

However, shipments to Bahrain and the United Arab Emirates declined last year. Egypt has many new international hotels which recently opened for the influx of foreign tourists. Some of these hotels are even serving beer from Israel.

■

U.S. EXPORTS TO MAJOR MARKETS

Destination	1978 (1,000 Gallons)	1979 (1,000 Gallons)	1978 (1,000 Dollars)	1979 (1,000 Dollars)
Taiwan	9	7,039	18	10,023
Hong Kong	2,720	3,403	3,539	4,536
Canada	13,490	2,167	17,392	3,326
Netherland Antilles	229	635	424	1,247
Columbia	299	675	469	1,075
Bermuda	460	535	652	761
Cayman Islands	135	191	223	370
Panama	140	89	252	132
Leeward & Windward Islands	75	108	152	225
Mexico	66	211	175	242
United Kingdom	205	165	255	250
Japan	60	135	518	452
Lebanon	121	199	173	289
UAE	45	39	91	74
Bahrain	77	45	121	76
South Korea	8	18	18	44
Nicaragua	17	24	31	58
Guatemala	7	19	14	61
Total	**25,815**	**19,631**	**35,401**	**29,330**

Source: Bureau of the Census runs for January-December of 1978 and 1979.

Welt-Biererzeugung 1979

WORLD BEER PRODUCTION, 1979, in hectoliters. 1 hl = 26.39 gal or 0.8547 bb

Die nachstehende Aufstellung basiert auf den Berichten der Firma Joh. Barth & Sohn, Nürnberg, deren neuester Jahresbericht „Hopfen 1979/1980" soeben erschienen ist. Die Welt-Biererzeugung erreichte 1979 rd. 889 Mio hl. Sie liegt damit um 35,7 Mio hl (= 4,2 %) über der Statistik von 1978. (Zuwachs von 1977 auf 1978 = 2,5 %). Viele europäische Länder konnten ein Plus verzeichnen, so daß der kontinentale Ausstoß einen Zuwachs von 3 % hatte. In Amerika betrug die Zunahme 3,5 %, in Afrika 9,5 % und in Asien 10 %. In Australien/Ozeanien trat ein leichter Rückgang ein (=1,5 %).

Land	1000 hl 1979	1978	1977
BR Deutschland	91 623	91 656	94 300
UdSSR*)	70 000	65 000	65 000
Großbritannien	67 416	65 880	66 085
Tschechoslowakei	23 610	22 058	22 500
DDR	23 000	23 000	22 000
Frankreich	22 793	22 781	22 772
Spanien	19 712	18 653	18 600
Niederlande	15 388	14 651	13 970
Belgien	13 681	13 830	14 035
Jugoslawien	11 254	10 005	9 588
Polen	11 127	11 378	12 069
Italien	8 899	7 963	7 338
Dänemark	8 307	8 057	8 453
Rumänien*)	8 300	8 150	7 910
Österreich	7 660	7 480	7 611
Ungarn*)	7 500	7 244	7 003
Irland	6 039	5 824	5 659
Bulgarien*)	5 500	5 160	5 200
Schweden	4 033	4 111	4 515
Schweiz	4 022	4 000	4 033
Portugal	3 300	2 852	2 274
Finnland	2 698	2 606	2 613
Griechenland	2 200	2 100	1 720
Norwegen	1 917	1 915	1 984
Luxemburg	732	682	703
Malta	117	100	100
Island	33	32	37
Europa	**440 861**	**427 168**	**428 072**
USA[1])	195 858	189 745	183 629
Brasilien*)	28 000	26 530	23 000
Mexiko	24 649	21 994	21 045
Kanada	20 540	20 386	20 389
Kolumbien	11 354	10 964	10 123
Venezuela	10 000	9 300	7 500
Peru	4 616	4 200	5 200
Kuba	2 307	3 000	3 500
Ekuador	2 263	1 980	1 600
Argentinien	2 100	2 043	2 543
Chile	1 698	1 499	1 383
Bolivien	1 063	1 063	969
Guatemala	800	795	675
Dominikan. Republik	763	623	605
Costa Rica	750	670	470
Puerto Rico	735	631	436
Uruguay	650	650	600
Panama	582	490	400
Jamaika	580	580	576
Nicaragua	550	550	550
Paraguay	520	500	430
Honduras	485	416	364
El Salvador	439	600	600
Trinidad u. Tobago	350	300	290
Martinique	53	100	96
Guadeloupe	35		
Amerika	**311 740**	**299 609**	**286 973**

Land	1000 hl 1979	1978	1977
Südafrika	6 800	6 000	6 000
Nigeria	6 710	4 890	3 315
Kamerun	3 000	2 100	2 000
Kenia	2 800	2 250	2 500
Zaire	2 619	3 905	4 196
Elfenbeinküste	1 300	1 250	1 050
Sambia	1 000	1 000	967
Ruanda/Burundi	935	980	892
Tansania	900	850	780
Simbabwe	900	730	900
Angola*)	800	1 000	1 030
Gabun	650	529	450
Algerien*)	600	600	600
Äthiopien	574	435	410
Mosambik	573	693	850
VR Kongo	491	464	377
Obervolta	490	200	190
Ägypten	430	415	350
Marokko	389	346	330
Ghana	383	500	705
Togo	350	290	185
Benin	350	225	185
Tunesien	349	354	320
Senegal	300	238	250
Zentralafrika	240	239	202
Madagaskar	234	253	248
Mauritius u. Reunion	225	200	165
Namibia	221	150	130
Liberia	180	160	120
Tschad	136	185	160
Uganda	102	295	180
Sudan	82	104	90
Afrika	**35 113**	**32 070**	**30 431**
Japan	44 758	44 300	41 242
Philippinen	7 177	6 225	6 000
Südkorea	6 425	4 654	2 541
VR China*)	5 000	1 800	1 750
Türkei	2 630	2 460	2 040
Taiwan	2 450	2 142	1 620
Malaysia u. Singapur	1 565	1 270	1 190
Thailand	1 558	1 300	970
Vietnam*)	1 500	1 500	1 500
Indien*)	1 200	1 344	850
Hongkong	700	624	600
Indonesien	560	544	531
Israel	492	456	424
Irak	430	300	305
Libanon*)	190	100	115
Zypern	174	152	135
Sri Lanka*)	95	75	71
Syrien	80	130	80
Jordanien	80	47	49
Asien	**77 064**	**69 868**	**62 610**
Australien	19 678	19 511	19 511
Neuseeland	3 753	4 371	4 180
Ozeanien	150	92	96
Australien/Ozeanien	**23 581**	**23 974**	**23 787**
Welt	**888 359**	**852 689**	**831 873**

*) Schätzung — [1]) USA: Die Angaben betreffen den versteuerten Bierabsatz. Produktionsmengen (inkl. nicht versteuerter und exportierter Mengen) lt. Barth-Bericht 1979: 215,809 Mio hl, 1978: 210,135 Mio hl., 1977: 200,125 Mio hl.

1979: WEATHER SUMMARY: Corvallis, OR. Hyslop Agronomy Farm.

Daily maximum-minimum temperatures, crop year 1978-79. Recorded at the Hyslop Agronomy Farm

Date	September	October	November	December	January	February	March	April	May	June	July	August	September
1	73-53	69-44	60-30	52-43	21-12	31-18	49-33	53-41	66-48	84-51	66-51	93-52	79-58
2	78-56	68-44	60-31	52-39	23-13	29-13	46-34	54-40	60-46	89-54	67-45	82-53	68-57
3	80-59	75-42	60-36	51-39	28-20	37-15	52-35	58-38	65-43	91-51	72-44	82-48	65-55
4	67-54	71-43	63-43	52-40	32-25	41-23	57-48	53-38	67-43	86-48	76-43	76-46	73-53
5	62-53	75-46	56-34	53-31	32-24	47-39	59-51	64-37	57-42	78-54	72-54	81-45	75-52
6	64-52	81-42	53-30	45-28	33-19	49-41	62-50	68-48	58-42	69-42	79-57	80-44	69-47
7	70-44	69-42	57-30	34-26	35-19	51-44	69-42	57-40	58-41	67-36	75-45	82-48	78-51
8	68-47	64-45	63-40	36-25	32-23	48-43	58-35	63-44	56-40	71-42	77-52	84-45	81-53
9	64-51	76-45	55-32	41-29	33-25	51-43	57-40	53-40	57-39	79-48	83-54	84-45	73-50
10	66-53	66-52	49-32	48-35	35-28	53-43	67-35	51-40	62-35	84-48	79-51	88-47	72-52
11	69-51	72-46	43-25	52-37	39-32	51-45	69-40	49-41	64-39	83-45	71-52	87-45	76-51
12	68-48	68-41	42-23	47-28	41-33	52-43	53-39	54-44	68-41	75-40	71-46	85-48	81-54
13	72-47	67-47	41-18	40-27	49-29	56-44	60-34	56-42	71-43	71-40	73-46	84-50	88-49
14	63-54	76-40	43-18	43-27	35-30	51-32	70-37	57-36	73-44	71-40	82-47	65-55	92-48
15	72-55	77-40	46-19	48-28	38-31	46-31	56-44	53-35	77-43	67-38	84-57	69-50	91-47
16	70-43	67-45	48-25	39-27	44-30	48-32	54-35	56-43	75-42	66-48	97-56	82-51	76-50
17	67-42	67-50	52-45	42-28	39-29	47-36	52-37	58-40	69-45	61-47	102-54	76-56	75-50
18	58-44	70-42	53-32	43-29	40-23	53-40	53-38	53-37	73-48	61-53	100-55	79-49	85-53
19	65-40	79-41	49-37	37-27	39-24	47-36	54-40	53-33	71-43	68-52	96-54	72-56	75-52
20	68-44	70-45	45-28	32-27	47-36	50-33	64-42	57-35	75-46	65-48	95-54	69-52	76-49
21	69-47	60-38	36-29	41-30	53-39	40-36	66-33	64-42	80-51	69-44	90-53	72-51	78-52
22	68-51	59-31	41-25	48-37	50-26	46-35	62-32	66-42	83-48	73-41	80-49	78-47	74-48
23	66-47	63-34	42-27	51-41	44-27	47-37	65-33	57-41	65-47	74-48	81-52	79-55	72-45
24	80-51	68-36	42-27	52-45	37-27	46-38	69-33	57-41	71-55	80-53	84-51	77-51	73-49
25	78-53	62-32	35-28	53-30	41-30	52-41	69-35	64-40	73-49	87-48	85-49	81-54	84-51
26	79-53	64-28	40-31	41-25	42-23	55-44	54-41	70-45	85-43	87-48	85-50	80-52	66-55
27	76-51	65-28	35-31	33-25	37-27	50-40	52-43	77-54	66-38	85-43	89-49	82-53	73-42
28	71-48	56-37	47-31	43-20	41-31	46-35	52-43	62-50	63-37	84-46	83-49	76-58	76-44
29	75-49	57-41	56-45	27-17	39-22		53-38	69-49	58-33	75-45	76-48	74-57	72-39
30	72-47	51-35	56-45	29-14	31-22		51-38	70-44	66-36	72-51	83-55	75-58	78-43
31		49-31		27-14	34-17		54-38		77-47		90-57	69-55	
Avg	70-50	67-40	49-31	43-30	38-26	47-36	58-39	59-41	68-43	76-46	82-51	79-51	77-50

Daily Precipitation Record, Crop Year 1978-79. Recorded at the Hyslop Agronomy Farm, Corvallis, Oregon

Date	September	October	November	December	January	February	March	April	May	June	July	August	September
1		T		1.11			.14	.04			.12		.02
2				.08			.02	.04			.06		.95
3			.06	T		.07	.52	.01					.86
4	.60		.38	.12		T	.14	T	.15				.03
5	.31			.65	.05	.42	.64		.64	T			.02
6	.19					.50	.03	.36	.55	T			.07
7						1.80	.04	T	.29	T			
8	.39		.10		.06	.18		T	.23				.15
9	.49		.08	.25	.05	.09		.10	.13				.05
10	.65			.05	1.06	.23		.30	.01		.23		T
11	.07			1.01	.50	1.20		.26			.02		
12	.19			.05	.06	.41	T	.14					
13	.13				.02	.44		.35					
14	.17			.01	.21	.01		.05				.18	
15	.01			.10	T	.03	.35	.07		T		T	
16			.02			.22	.06	.24		.13		.88	T
17	.06		.13	.01		.82	.17	.35		.25		T	
18	.13		.01	.01		.30	.08	.02		T		T	
19	.01		.70		.07	.18	.01	.05				.23	
20		.03	.95	.01	.05	T		T				.08	
21	T	.03	T	.60	T	.31						.02	
22	T			.01		.05						1.24	
23				.07		.23		.16				T	
24		T		.04	.09	.20		.03					
25					.08	.06							
26						.07	T						T
27					.15	.19	.29	.35					
28		.01	.12		.20	.37	.25	.01	.01				
29		.44	.43				.01		.10			T	
30		.47	.16				.10					.02	
31							.04					.02	
Total	3.40	.98	3.14	4.18	2.71	8.35	2.89	2.93	2.11	.38	.43	2.67	2.15

Daily maximum-minimum soil temperatures at the 4-inch depth, crop year 1978-79
Recorded at the Hyslop Agronomy Farm, Corvallis, Oregon

Date	September	October	November	December	January	February	March	April	May	June	July	August	September
1	71-59	64-57	49-43	47-46	34-33	34-33	45-41	50-45	61-56	77-61	67-63	87-72	78-64
2	75-64	64-55	49-44	48-46	34-33	33-33	45-41	51-46	59-55	81-64	71-62	83-71	69-66
3	76-68	66-55	50-43	47-45	34-33	33-33	47-41	53-46	64-54	84-67	79-61	83-70	66-62
4	68-62	67-56	51-49	47-45	33-32	34-33	48-45	51-46	63-54	84-67	80-63	82-69	68-62
5	65-61	68-58	53-44	47-40	32-29	34-33	50-48	59-46	57-55	82-67	74-68	83-69	69-61
6	65-61	69-58	49-43	43-40	33-30	38-34	52-49	58-48	58-54	74-64	82-67	82-68	66-60
7	68-59	66-58	48-43	41-38	30-30	42-38	57-51	54-50	57-53	73-61	78-67	83-69	71-58
8	64-58	62-58	50-45	38-37	30-30	43-41	55-46	60-49	57-53	75-60	79-67	83-68	74-62
9	61-58	68-57	52-44	37-37	31-30	44-42	51-45	52-48	56-51	79-60	79-67	81-68	70-61
10	63-59	62-58	47-42	40-37	32-31	46-44	52-45	52-47	59-51	80-64	75-65	84-68	71-58
11	64-59	66-60	42-38	45-40	32-31	45-45	49-44	49-47	62-50	80-68	68-64	84-70	72-60
12	65-58	66-57	38-36	45-39	32-31	46-45	49-46	51-46	66-52	81-67	68-62	83-69	73-61
13	67-57	63-56	37-35	40-37	32-32	46-45	52-44	51-48	67-54	79-66	71-61	85-70	76-63
14	62-60	64-56	36-35	38-37	32-32	46-42	53-43	53-47	68-56	80-65	81-61	71-67	78-65
15	68-60	65-55	35-35	40-37	32-32	43-40	51-47	51-47	71-57	73-63	81-64	70-64	80-65
16	67-57	61-56	38-35	38-37	35-32	41-40	52-46	54-48	72-59	72-62	85-68	80-63	79-65
17	64-56	61-58	44-38	39-37	35-33	41-40	50-46	53-49	71-60	65-59	90-73	73-67	74-64
18	58-55	62-57	47-43	39-37	35-34	42-40	49-45	53-47	73-58	62-59	89-73	80-68	76-63
19	63-55	64-57	45-43	38-36	34-34	44-42	52-46	53-46	74-60	64-59	90-75	70-67	75-63
20	63-54	63-56	45-38	36-36	37-34	45-41	54-46	54-46	74-59	65-60	88-74	69-64	76-65
21	61-56	59-53	39-37	36-35	41-37	41-40	54-46	59-47	76-61	71-58	88-74	71-63	75-64
22	64-58	56-49	38-37	39-35	43-38	43-40	55-45	60-50	78-63	74-60	85-71	77-65	76-64
23	59-57	56-49	38-37	41-38	38-37	42-40	56-44	55-52	66-63	78-61	84-71	75-65	68-62
24	68-56	51-48	39-37	45-41	37-36	43-41	55-46	55-51	72-62	79-63	85-70	75-66	73-61
25	69-60	58-50	38-37	41-41	38-36	43-42	56-46	59-50	77-64	83-66	85-70	81-65	73-62
26	69-61	56-47	40-37	41-38	39-36	46-42	50-45	61-49	80-63	84-67	85-69	78-66	65-63
27	70-62	54-47	40-38	38-37	36-35	47-44	49-47	63-50	73-51	85-68	86-71	81-67	71-60
28	68-60	52-50	42-38	38-36	36-34	45-43	48-46	59-56	68-59	82-67	86-72	75-68	69-59
29	68-58	51-49	46-41	36-35	37-34		51-47	64-55	64-55	82-69	79-69	74-68	71-60
30	69-58	50-47	48-47	36-34	35-34		49-46	66-57	71-54	75-67	83-68	73-68	72-59
31		48-44		34-33	35-34		51-44		75-58		86-71	68-65	

CORVALLIS, OREGON
MEANS AND EXTREMES

Month	TEMPERATURE							PRECIPITATION					Average Sky Cover	Mean Number of Days				
	Mean			Record					Greatest		Snowfall			Precipitation .01 or more	Temperature			
															Max		Min	
	Max	Min	Monthly	High	Year	Low	Year	Mean	Daily	Year	Mean Total	Maximum Monthly			90° and above	32° and below	32° and below	0° and below
(a)	30e	30e	30b	89		89		30b	68		34	89	15	34	34	34	34	34
Jan	44.4	32.1	38.8	64	1940+	-1	1950	7.06	4.28	1965	4.8	51.9	.8	19	0	1	13	#
Feb	49.5	34.7	43.1	69	1916+	-5	1899	4.63	2.76	1961	0.8	9.5	.7	17	0	#	7	#
Mar	54.0	36.8	45.5	78	1947+	12	1971	4.20	1.90	1963	0.6	6.5	.7	19	0	0	7	0
Apr	61.0	40.5	50.1	91	1926	24	1968+	2.05	2.06	1937	T	1.5	.7	13	0	0	9	0
May	67.7	45.5	55.7	99	1922	28	1915+	1.77	2.23	1941	0	0	.6	11	#	0	#	0
Jun	72.9	49.2	61.0	102	1925	32	1929+	1.15	2.14	1952	0	0	.5	8	1	0	0	0
Jul	81.2	51.6	65.9	107	1946	36	1921+	.33	1.75	1947	0	0	.3	2	4	0	0	0
Aug	81.1	51.2	65.8	105	1972	35	1910	.55	1.35	1968	0	0	.3	3	3	0	0	0
Sep	75.8	48.3	62.0	103	1944	26	1919	1.31	2.18	1969	0	0	.4	6	2	0	#	0
Oct	64.2	43.0	53.2	90	1936+	13	1919	3.78	2.26	1924	0.2	0.5	.6	13	0	0	1	0
Nov	52.2	37.2	45.3	73	1890	10	1896	6.04	3.16	1921	0.3	9.5	.7	17	0	#	6	0
Dec	46.8	35.1	41.0	66	1950+	-14	1919	6.83	3.58	1941	0.8	20.5	.8	20	0	#	9	#
					Jul		Dec			Jan								
Year	62.6	42.1	52.3	107	1946	-14	1919	39.70	4.28	1965	7.5	51.9		148	10	1	52	#

(a) Length of record
e Means for period 1931-1960 (adjusted to present location)
b 1941-1970, 30 year normal
\+ Also earlier dates, months or years
\# Less than one

HOP BREEDING

Exchange of Germplasm

Germplasm distributed in 1979.

Table 1 lists in alphabetical order recipients of hop germplasm distributed from our project in 1979. In addition to hop growers and scientists at various universities, hop germplasm was distributed to researchers in West Germany, Australia, Yugoslavia and Czechoslovakia. A large amount of breeding material was sent to C. E. Zimmermann, USDA-SEA, Prosser, WA for evaluation under semi-arid conditions in the Yakima Valley.

Germplasm received at Corvallis.

Attempts continue to upgrade the U.S. World Hop Collection. Old established hop varieties, new breeding material and new varieties were received from England, Yugoslavia as well as from Parma, ID and Prosser, WA (Table 2). The two new hop varieties from England, Wye Saxon and Wye Viking are the most recent releases from the Hop Research Institute at Wye College, England. Both are tolerant to downy mildew, have high alpha acid potential and some verticillium wilt tolerance. The Yugoslavian material represents 10 wild female genotypes collected in Yugoslavia by Dr. Wagner, as well as two recent Czechoslovakian aroma hops (probably selected from Saazer), and three Belgian varieties which apparently are not grown commercially any more.

Accession numbers assigned or eliminated in 1979.

The new accession numbers assigned in 1979 are listed in Table 3. Bullion 6A, a virus-free selection from Prosser received accession number 21196. USDA accession numbers were also assigned to virus-free Tettnanger (also called Swiss-Tettnanger) which is now grown commercially in the Willamette Valley. Four breeding lines from the 1969 and 1970 crossing program with high yield potential and good quality traits received selection numbers as did the foreign introductions from Yugoslavia. A heat-treated USDA 65009 which presumably is free of viruses received USDA accession number 21219.

No accession numbers were eliminated in 1979.

Crosses made in 1979.

The 1979 crosses were designed to study the feasibility of liquid nitrogen pollen storage. Four males, 19036M, 19039M, 19172M, and 64103M were crossed to Cascade in the seedless Smith Yard. Pollen from these four males was sent to Fort Collins, Colorado, for short-term storage in liquid nitrogen (-196°C) and also at two other temperature regimes (-18C, 5C). Table 4 shows the results of these crosses and also gives seed weight and number of seeds per cone. Seeds were germinated in late winter 1979 and seedlings will be transplanted to a field nursery in 1980.

No crosses for breeding purposes were made in 1979.

Table 1: Hop Germplasm distributed in 1979.

Recipient	Date sent	Variety	Amount (propagules)	Reason
Annis, Claudia Dept. Botany, Ore. State Univ.	March 22	21041	10	Willamette, hobby gardening
Berning, Louis Mount Angel, OR 97362	March 21	21056	250	Bullion 10A, (v. free), for propagation by Oki Nursery, Aurora, OR.
Brooks, S. N. USDA-Area Director Pullman, WA 99163	Jan. 24	21040 21041	6 6	Columbia Willamette — demonstration plots
Coleman, Robert Gervais, OR 97026	April 27	19009M 21087M 19170M 19036M	45 36 60 25	Fu x FuS Yug. 3/3 XS x (EKGxEG-KGS) Fu x FuS — early flowering diploid ♂ for a Fuggle yard
"	May 30	21049 21185	200 200	Styrian Hersbrucker-G — potted plants, Obs. plots
"	May 30	21091	100	Ea. triploid, (from Schwabauer), Obs. plots
Crandall, Chere Dep. General Biology Univ. Arizona Tucson, AZ 85720	May 10	56013 19005M	5 5	Cascade dipl. male — genetic studies
Gmelch, Franz Hop Res. Institute Wolnzach, W. Germany	April 17	21055	10	High alpha GP line, variety collection
Goschie, Herman Silverton, OR 97381	April 27	64032M 64033M 21017M 21089M 21090M	17 15 65 35 11	med. late med. late med. late late late — dipl. males for B. Gold yard
	June 26	21185	1200 +	Hersbrucker-G, offstation trial, from softwoods
	April 13		2000 +	Styrian, offstation trial, from softwoods
Haas, John I. Inc. Salem, OR 97303 Yakima, WA	April 16	21056 21116 21193	35 55 25	v.f. Bullion 10A v.f. Brewer's Gold — obs. planting + increase, OR. high-alpha line, Obs. plcts, Alluvial Ranch, OR
	March 26	48209 21055 21016	10 10 10	Fuggle H, obs. pl. in Washington high α GP line, " " Fuggle N, " "
	July 16	63015M 64035M	Pollen Pollen	to G. Probasco, delivered by C. E. Zimmermann, Prosser, WA

Table 1: Continued.

Recipient	Date sent	Variety	Amount (propagules)	Reason
Hughes, G. A. Carlton & United Breweries Melbourne, Australia	March 26	21092 64033M 64037M	10 10 10	v.f. Cascade DM res. male " " } via I. D. Geard, Plant Quarantine, Hobart, Australia
Kerr, Roger Salem, OR 97303	March 12	21116	400	v.f. Brewer's Gold, commercial planting & increase
	April 11	21193	20	high α GP line, obs. plots
Kisgeci, Dr. Jan Inst. Hop Research Novi Sad, Yugoslavia	April 13	21055	10	high α GP line, genotype collection
Kralj, Mag. D. Inst. Hop Research Zalec, Yugoslavia	April 13	60037 58016 65101	5 5 5	Wyoming 2-1, Wild Amer. Utah 526-5, " " Talisman } germplasm collection
Lehman, M. P. Bethany, Oklahoma 73008	June 7	56013	10	Cascade, hobby gardening, source of B-vitamins
Oki Nursery, Aurora, OR	April 13 May 15	21056 "	200 500	virus free bullion for commercial propagation aerial shoots for softwood cuttings
Romanko, Dr. R. R. Parma, ID 83660	March 28	48209 21040 21041	50 50 50	Fuggle H Columbia Willamette } Verticillium wilt test
		21190M 21191M	10 10	ea. flowering triploid male " " "
		21189M 21102M	10 10	med. flowering triploid male, for M. Obendorf " " "
		21105M 21106M	10 10	late flowering triploid male, " " " "
	March 12	21185	2	Hersbrucker-G, potted plants, "
Schmütz, Dr. W. Univ. Hohenheim, 7000 W. Germany	March 26	21055	5	genetic studies on hop quality
Schwabauer, Ken Hubbard, OR 97032	March 20	21196	3000 +	Bullion 6A, stock from C. B. Skotland, Prosser, WA, via root propagator Fred Netter, Aurora, OR
Signorotti, George W. Sloughhouse, CA 95683	April 18	21187 21188 21167	2 2 20	Southern Brewer, aroma hop NP2/55, high α hop } potted plants, obs. plots Hybrid-2, observation plots
Skotland, Dr. C. B. Prosser, WA	Jan. 24	21193 21194 21195	3 3 3	Sel. 7005-194 7006-311 7006-408 } high α lines, virus testing
	March 19	21185	2	Hersbrucker-G, virus testing & propagation

Table 1: concluded.

Recipient	Date sent	Variety	Amount (propagules)	Reason
	Sept. 28	21102M	2	Tripl. males, virus testing: Converse tests: PNRSV + Mos. +
		21104M	2	(potted plants) + +
		21105M	2	- -
		21106M	2	- -
		21175M	2	- -
		21176M	2	- -
		21177M	2	- -
		21178M	2	- -
	March 13	64100	2	Bullion — 2 potted plants each
		21056	2	Bullion 10A (virus free) — also sent 4 rhizomes of each virus indexing by ELISA
		19001	2	Brewer's Gold
		21116	2	v.f. Brewer's Gold
		48209	2	Fuggle H
		21016	2	Fuggle N (v.free)
		64107	2	Northern Brewer
		21093	2	v.f. Northern Brewer
		56013	2	Cascade
		21092	2	v.f. Cascade
	Nov. 7	21185	144	Hersbrucker-G, potted softwood cuttings, virus free for offstation tests
White, George A. USDA-SEA, Beltsville MD 20705	April 6	21040	5	Columbia — for Ivo Bares, Inst. Genetics 16106 Prague, CSR via FAS, USDA
		21041	5	Willamette
		65101	5	Talisman
		62013	5	Comet
		65103	5	E-2(Ea.Cluster Sel.)
Zimmermann, C. E. USDA-SEA, Prosser, WA 99350	March 13	21049	72	Styrian, potted plants, low trellis + offsta. plots
	March 19	21185	2	Hersbrucker-G, observation plot
	April 5	21081	5	Dunav — observation plots
		21082	5	Neoplanta
		21083	5	Vojvodina
	July 16	21102M	III Pollen	for pollinating Yak. Valley, Bullion yard with pollen from triploid males for cone size stimulation
		21175M	"	
		21177M	"	
		21178M	"	
		21190M	"	
	Nov. 7	21056	12	Bullion 10A, potted plants — winter survival test
		65102	12	Yakima Cluster
		21187	12	Southern Brewer
		21188	12	NP2/55
	April 16	21175M	4	Triploid males for testing as pollinators
		21176M	4	
		21177M	4	
		21178M	4	
		21189M	4	
		21190M	4	
		21191M	4	
		21187	2	Southern Brewer , potted plants
		21188	2	NP 2/55) , potted plants

Table 2: Germplasm received at Corvallis in 1979.

Supplier	Date received	Variety	Amount (propagules)	Remarks
R. A. Neve Wye College, England	Dec. 6	Early Prolific	6	all planted E. Greenhouse, Jan. 22, 1980
		Early Promise	6	
		Keyworth's Early	6	old English varieties
		Keyworth's Midseason	6	
		Pride of Kent	4	
		Sunshine	6	
		Wye Saxon	6	released 1974, α 9%, early, DM tolerant, wilt tolerant
		Wye Viking	6	released 1974, α 10%, DM tolerant, wilt susceptible
R. R. Romanko Parma, ID	March 12	21049	1000	Styrian, off-station testing at Goschie Farms, Silverton, OR
Dr. Tone Wagner Hop Res. Institute Zalec, Yugoslavia	April 17	20P14	3	all planted: greenhouse, April 17, 1979.
		21P01	3	
		24P07	3	native Wild Yugoslavian ♀ hops
		26P03	3	
		27P04	3	
		32P02	3	
		33P13	3	
		33P34	2	
		40P19	3	
		41P36	3	
		Aromat	4	new Czechoslovakian aroma hops
		Sířem	4	
		Nordgard	3	Belgian hop varieties
		Groene Bel	3	
		Star	3	
Robert Stauffer, Hubbard, OR	March 9	21197	50	vf Swiss-Tettnanger, 10 diff. hills, 5 pc. each, clonal selection
C. E. Zimmermann, Prosser, WA	May 18	21196	40	Bullion 6A, heat treated, virus free (vf)
		I35-29A	5	Brewer's Gold x OP, aroma, originally from Idaho
		W203-99	5	21093(vfNB) x vf 63015M aroma to Smith Yard
		W401-16	5	65009 x 63012M; aroma; "
		-35	1	" aroma; "
		-65	4	" " "
		-75	4	" " "
		-82	5	" " "
		-192	3	" " "
		-231	5	" " "
		-270	3	" " "
		-274	5	" " "
		W402-30	5	65009 x vf 63012M; " "
		-47	4	" " "
		W403-89	5	vf 65009 x vf 63012M; aroma; "
		W406-57	5	65009 x vf 63015M; aroma; " Anheuser Busch Brew.Co.
		W412-31	5	6619-04 x 63015M; aroma; "

Table 2: Concluded.

Supplier	Date received	Variety	Amount (propagules)	Remarks
C.E.Zimmermann, cont'd.	May 18	W417-12	5	6619-04 x vf 64028M; aroma; to Smith Yard
		W421-01	3	68052 x vf 63012M; aroma; "
		-18	3	" " "
		-20	3	" " "
		-23	2	" " "
		-35	5	" " "
		-38	5	" " " Schlitz Brewing Co.
		-43*	4	" " "
		-44	4	" " "
		-50*	5	" " "
		-52*	5	" " "
	May 18	W401-01	5	65009 x 63012M; alpha, Willamette Yard
		-26	1	" " "
		-30	2	" " "
		W402-15	1	65009 x vf 63012M; " "
		-50	5	" " "
		-105	1	" " "
		-123	4	" " "
		W403-09	5	vf 65009 x vf 63012M; alpha; "
		W404-06	1	65009 x 63015M; " "
		-49	5	" " "
		W405-22	1	65009 x vf 63015M; " "
		-71	2	" " "
		W406-65	5	vf 65009 x 63015M; " "
		-74	5	" " "
		-108	5	" " "
		W407-36	5	vf 65009 x vf 63015M; " "
		-54	4	" " "
		W408-10	2	65009 x 64028M; " "
		W410-179	5	vf 65009 x 64028M; " "
		W412-18	5	6619-04 x 63015M; " " Miller Brew. Co.
		-92	3	" " "
		W413-10	4	6619-04 x vf 63015M; " "
		W416-02	2	6619-04 x 64028M; " " alpha, Miller Brewing Co.
		-17	5	" " "
		W421-48	5	68052 x vf 63012M; " "

* Considered for WA-offstation tests and Brewer Inspection samples.
As of Feb. 1980 the following Washington Selections are under consideration for off-station plots in 1980:
large plots (10 acres): W412-18 (high alpha), W421-38 (high alpha), both for Miller Brewing Co.
small plots (2 acres) : W402-179 (alpha, aroma), W407-33 (aroma), W412-152 (alpha, aroma), W416-02 (alpha)
Final decision will be made by C.E. Zimmermann in March 1980.

Table 3: New Accession Numbers Assigned in 1979.

Accession Number	Location	Source	Name or Pedigree	Remarks
21196	207:1-10	Prosser, WA	Bullion 6A	virus-free, heat-treated, meristem tip culture
21197	232:28-32	Stauffer Farms Hubbard, OR	Swiss-Tettnanger	virus-free, via Prosser, WA, M. Puterbaugh WA, 10 clonal selections planted in the Smith Yard, St-1 to St-10
21198	227:12-16	Sel. 7003-38	65009 x 19046M	2000 lbs /A, α 8-9 β 7-8, late, DM res., tight cone
21199	212:17-21	Sel. 7004-03	65009 x 19182M	2200 lbs /A, α 9-11, β 5, late
21200	221:17-21	Sel. 7004-75	"	1800-2000 lbs/A, α 9-11, β 4-5,tight cone (TC)
21201	238:17-21	Sel. 7005-70	65009 x 63015M	2000 lbs/A, α 6-10, β 5-9, TC, ME (med.early)
21202	314:11-15	Sel. 6903-107	65102 x 64037M	2000 lbs/A, α 3-5, β 4-6, high H/C, late
21203	Greenhouse	20P14, Yugoslavia	Native Yugoslavian	high yield, late, α 3.6, β 4.2, H/C = 3.11, aroma
21204	"	21P01, "	"	med. yield, late, α 4.1, β 7.9, H/C = 8.19, aroma
21205	"	24P07, "	"	med. yield, late, α 3.7, β 5.0, H/C = 0.60, intensive aroma
21206	"	26P03, "	"	high yield, v. late, α 3.9, β 6.1, H/C = 2.75, undefined aroma
21207	"	27P04, "	"	high yield, med. late, DM res., α 3.6, β 5.3, H/C = 2.46, aroma
21208	"	32P02, "	"	med. yield, late, α 4.2, β 5.2, H/C = 3.88, non-hop aroma
21209	"	33P13, "	"	high yield, late, DM res., α 3.8, β 5.3, H/C = 2.27, unusual aroma
21210	"	33P34, "	"	high yield, late, DM tol., α 2.9, β 4.2, H/C = 2.85, unpleasant aroma
21211	"	40P19, "	"	high yield, DM tol., v. late, α 4.4, β 5.4, H/C = 2.67, non-hop aroma
21212	"	41P36, "	"	v. high yield, late, DM tol., α 2.2, β 4.2, H/C = 0, unusual aroma
21213	"	Yugoslavia	Aromat	Czechoslovakian aroma hop, early
21214	"	"	Sirem	Czechoslovakian aroma hop, early
21215	Greenhouse	Yugoslavia	Nordgard 1478	prob. Belgian hop, early, α 8.5, β 8.8
21216	"	"	Groene Bel	Belgian variety, late, α 5.5, β 8.4
21217	"	"	Star	Belgian variety, local selection, med. early, α 3.6, β 5.1
21218	311:16-20 47: 7-8	7005-149	65009 x 63015M	(BG x EG - XS)x(BG^2 x EKG-BavS); vigorous, high yield, alpha 10-11, beta 3-4, late
21219	308:11-15	Prosser, WA	(BG x EG-XS) v.f.	heat treated USDA 65009, virus free high alpha, high beta, comact cone, late downy mildew susc., poor storage

TABLE 4: Crosses Made in 1979

Feasibility study of liquid Nitrogen Pollen Storage

Cross Number	Location of female	Pedigree	Treatment	Number of cones	Total Seeds		No. of seeds per cone	Weight of one seed mg
					Number	Weight g		
7901	211:6	Cascade X 19036M	5C	152	504	1.7765	3.3	3.5
7902	211:7	"	-18C	61	267	1.1690	4.4	4.4
7903	211:6	"	LN_2	231	1057	4.5772	4.6	4.3
7904	211:6	"	Corvallis Control	119	675	3.0439	5.7	4.5
7905	211:6	Cascade X 19039M	5C	69	481	1.8006	7.0	3.7
7906	211:7	"	-18C	91	311	1.5331	3.4	4.9
7907	211:6	"	LN_2	127	715	2.9951	5.6	4.2
7908	211:6	"	Corvallis Control	228	1417	6.7642	6.2	4.8
7909	211:7	Cascade X 19172M	5C	92	645	2.4903	7.0	3.9
7910	211:7	"	-18C	93	361	1.4217	3.9	3.9
7911	211:6	"	LN_2	156	647	2.5437	4.1	3.9
7912	211:6	"	Corvallis Control	256	1727	7.3374	6.7	4.2
7913	211:7	Cascade X 64103M	5C	87	656	3.0957	7.5	4.7
7914	211:6	"	LN_2	120	544	2.1038	4.5	3.9
7915	211:6	"	Corvallis Control	217	1280	5.6384	5.9	4.4
7916	211:6	Cascade ,control	Bagged Non-pollinated	24	11	0.0548	0.5	5.0
7917	211:6	Cascade ,control	Not-bagged Non-pollinated	193	227	1.2693	1.2	5.6

Intermediate Evaluation.

Advanced 10-hill Observation Nursery (Smith Yard).

Over 40 hop varieties and advanced selections that were grown in 10-hill plots in this seedless yard in 1979 were harvested. The data are presented in Table 5. Yield levels ranged from over 3000 pounds/acre for the Yugoslavian variety Vojvodina to a low of slightly over 100 pounds per acre for the Czechoslovakian cultivar Saazer, an aroma hop that is very difficult to grow in the United States. The English variety Wye Target, (USDA 21112), had excellent alpha acid content but disappointing yields. Other outstanding alpha acid levels were produced by the Yugoslavian varieties Ahil , Aurora, by Northern Brewer and by the advanced USDA breeding lines 21193, 21194, and by the new Idaho variety Galena (USDA 21182). The aroma variety Styrian (from Yugoslavia) which is closely related to Fuggle had slightly higher cone production but similar alpha acid content as Fuggle. Bullion 10A (21056), a virus-free (heat-treated) strain of Bullion again produced higher yields and higher alpha acid content than regular Bullion (USDA 64100). Similar results were observed during the past 8 years. Bullion 10A has now been increased and made available for commercial production. Approximately 50 acres of this line were planted in the Willamette Valley in 1979.

Columbia and Willamette, the two Fuggle-like triploids continued to produce satisfactory yields and alpha acid content in this test, as does Cascade which has been growing now for nearly 20 years at the same location (211: 1-10) in the Willamette Yard. The German Hersbrucker-G (USDA 21185) was a baby plant in 1979 and only cone samples were available for analysis. This was also the case with the two South African varieties Southern Brewer and NP2/55.

Advanced 5-hill Seedless Observation Nursery (Smith Yard).

Nearly 40 selections representing a range of breeding material from various crosses were harvested in 5-hill plots in 1979. Yield data as well as agronomic data and chemical data are presented in Table 6.

Yield, alpha acid content and storage stability showed tremendous variation among genotypes. Selections with a hop storage index below .4 after 6 months at room temperature are considered to have excellent storage stability. Unfortunately, many of the highest yielding selections in this nursery had moderate to poor storage stability and, therefore, such selections will not be advanced in the future.

The triploid USDA 21091 which is also in the third year of off-station testing had satisfactory yield levels in 1979 but disappointing alpha acid content, a trend that was observed already during the last few years. The hop storage index of 21091 also is substantially above the acceptable level, indicating that this genotype has poor storage stability. Similar information was obtained from the cooperating brewer who evaluated this hop in bale quantities. Alpha acid content - even in cold storage - had dropped to about half of the original value after approximately 8 months of cold storage.

USDA 21195, had excellent alpha acid content, (13.7%). However, the yield level of this selection was rather low, slightly over 7 bales per acre. This hop also had a higher than average oil content (3.18 ml/100 g). USDA 21180 and 21181, two breeding lines that were obtained from the 1970 crossing program, continued to exhibit excellent yield levels and attractive alpha acid content. The storage index of 21180 and 21181 however was higher than desirable which may have a bearing on the commercial acceptance of these hops in the future.

Seedless 2-hill Hop Variety World Collection (Smith Yard).

This is the last year that various aroma hops and less important hops from foreign countries will be grown at this location. Many of these hops have been discontinued in foreign countries from commercial production such as the English varieties Janus, Density, Defender, and Alliance, or the New Zealand varieties Calicross, First Choice and Smooth Cone. Others are now included in the seedless 10-hill variety observation nursery. The space vacated by this nursery will be used to expand the 10-hill testing phase in 1980 at this location.

Seedless 5-hill Variety Observation Nursery (Willamette Yard).

This second seedless location on the banks of the Willamette River north of the seeded hop yard is designed to give backup information to the advanced testing phase of established hop varieties and experimental lines prior to planting advanced selections in off-station plots. Standard varieties such as Brewer's Gold, Fuggle, Cascade, Bullion and a number of aroma hops including low yielding European noble-aroma hop varieties are included in this test (Variety Evaluation Nursery Table 8). Yield levels are lower in the Willamette Yard than in the seedless Smith Yard. Alpha acid content at this location generally is also lower, while seed content is significantly higher due to lack of sufficient windbreaks. Prevailing winds from the southwest which bring some pollen to this location from the seeded yard nearby.

Heat-treated Bullion 10A (USDA 21056) had significantly higher alpha acid content than regular Bullion but only approximately half the yield. Plants in this plot, however, were only in the second mature year and had not reached their full production potential. Heat-treated (presumably virus-free) Brewer's Gold had substantially higher production and somewhat higher alpha acid content as compared to USDA 19001, the original Brewer's Gold. Other hop varieties in this test were primarily grown to provide information on yield levels and alpha acid content. Some of these and particularly the lower yielding hop cultivars or those with poor storage stability, will be removed from this test next year.

Table 9 lists advanced hop selections that are grown adjacent to the Variety Evaluation Nursery in the Willamette Yard. A number of selections in this test had attractive yield levels coupled with outstanding alpha acid content. Several selections from the 1973 crossing program for high alpha acid content, listed in Table 10, (a follow-up of Table 9) had outstanding resin content. A number of selections also had an excellent hop storage index (below 0.4) which is particularly important for those having high alpha acid content. As was mentioned earlier, yield levels at this location are generally below those of the Smith Yard and should be compared with the standard controls Bullion, Fuggle, Cascade and Brewer's Gold listed in Table 8.

Among the promising high-alpha selections in Table 10 are 7311-108 (yield + alpha), 7311-105 (yield + alpha), 7312-09 (over 17% alpha and good storage), 7312-41 (over 15% alpha), 7313-83 (over 15% alpha), 7313-110 (good yield and alpha), and some selections from crosses involving USDA 21055 as the female parent. A number of these selections, however, appear to exhibit the typical Wild American phenotype which is also reflected and the aroma characteristics as evaluated by hand rubbing and sniffing.

Table 11 presents a summary of potentially valuable male high-alpha selections evaluated in 1978 and 1979. A number of these selections exhibited excellent quality

traits both in 1978 and 1979 with alpha acid levels in excess of 50% (lupulin basis) and an alpha ratio over 70. Among the most promising genotypes from this material are 7610-112M, 7613-25M, -42M, -104M (1978 analysis was low and can be adjusted upward due to the failure of alpha plus beta approximating 70%), selection 7614-47M and others. Little is known about the storage stability of resins from these male plants but, based on information of females from the same genetic background and the female parents listed in Tables 9 and 10, some genotypes should have above average storage stability. Some of these males will be used in future crosses to develop high-yielding germplasm lines for future breeding.

Female high-alpha selections from crosses with a pedigree similar or identical to the male selections of Table 11 are listed in Table 12. These selections (as well as those in Table 11) represent the third cycle of high-alpha acid intercrosses. Again, alpha ratios were extremely high but cone yield generally was lower than expected. Many of these female selections had outstanding storage stability as indicated by the Hop Storage Index (HSI) after 6 months at room temperature. Many had exceptionally high alpha ratios which in some cases approached or even exceeded 80. Certain crosses averaged substantially higher alpha ratio than others, for example crosses 7610, 7611, 7612, 13 and 15. Male selections were planted in 2-hill observation plots in the Main Yard adjacent to the germplasm nursery, while the female selections were planted in the Willamette Yard. Additional data will be collected on a plot basis when these plants are mature in another year.

Table 5: Hop Varieties and Selections Grown in the 10-hill Advanced Seedless Observation Nursery (Smith Yard), Corvallis, 1979. Pruned March 22; trained May 2.

Accession or Sel. No.	Location Row:Hill	Name or Pedigree	Cross Wire First	Cross Wire Most	Flowering First	Flowering Most	Harvest Date	Yield[1/]	Quality α	Quality β	Quality α-ratio	Oil	HSI_6	Remarks
			June		June	July	Aug.	lbs/A	%	%		ml/100g		
21092	202:1-10	Cascade (heat treated)	4	11	21	2	9/12	1802	5.8	6.3	47	1.35	.91	
48209	203: "	Fuggle H	1	8	12	6/22	23	843	4.9	3.2	60	1.49	.63	
21016	204: "	Fuggle N (heat treated)	4	10	12	2	10	960	6.3	3.4	64	1.33	.50	
64100	205: "	Bullion	5/28	2	12	6/24	28	1781	11.6	7.3	61	2.26	.62	Cohumulone 41
21056	206: "	Bullion 10A (heat treated)	5/28	2	12	6/22	28	2359	12.8	6.7	65	2.42	.66	
	206: "	" late pick					9/12	1500	11.0	6.7	62	2.50	.76	
56013	208: "	Cascade	7	11	15	4	28	2491	5.9	6.1	48	1.22	.75	
19001	209: "	Brewer's Gold	1	11	12	2	9/12	1775	9.6	5.6	63	2.93	.89	
21054	210: "	Co x (BG x Fu-Colo 2-1)	4	10	10	6/24	23	1392	10.1	4.6	69	1.92	.76	
56013	211: "	Cascade (nuclear stock)	8	14	14	6	28	1898	6.3	6.0	51	1.35	.89	
21055	212: "	Co x (BG x Fu-Colo 2-1)	4	15	10	6	20	657	13.9	5.3	72	2.01	.44	good storage
21116	213: "	Brewer's Gold (heat treated)	5/31	7	15	6/28	9/12	2287	10.2	6.3	61	3.04	.96	
21049	214: "	Styrian	5/26	2	8	6/18	10	1002	6.0	3.6	62	1.50	.51	
21043	215: "	Wye Challenger	4	15	28	8	23	1525	7.8	5.8	57	0.91	.50	red stem
		" late pick					9/12	1416	7.8	5.5	58	1.57	.56	
21044	216: "	Wye Northdown	3	15	10	6/24	23	462	9.5	6.5	59	2.79	.53	
21112	217: "	Wye Target	5/30	8	10	6/24	20	1394	13.0	5.3	70	1.50	.54	slipdown, uneven
	217: "	" late pick					9/12	1536	9.1	4.3	67	0.82	.98	
21050	218: "	Ahil	4	18	20	2	28	1339	11.8	5.6	67	2.29	.76	
	218: "	" late pick					9/12	1979	10.5	5.3	66	2.82	.84	
21053	219: "	Aurora	3	11	20	6	20	1424	12.5	5.3	70	1.46	.34	Cohumulone 22
	219: "	late pick					28	1840	12.3	5.2	70	1.71	.60	
21080	220: "	Backa	3	18	7/10	20	9/12	879	4.1	7.3	36	0.89	.54	top crop
21081	221: "	Dunav	5/26	4	22	2	20	2538	6.5	4.1	61	1.50	.44	red stem
	221: "	" late pick					28	1988	7.6	4.0	65	1.42	.47	
21082	222: "	Neoplanta	4	11	30	6	28	1975	8.3	4.2	66	1.29	.38	
	222: "	" late pick					9/12	1621	9.2	4.6	66	2.18	.63	late

Table 5: concluded:

Accession or Sel. No.	Location Row:Hill	Name or Pedigree	Cross Wire First	Cross Wire Most	Flowering First	Flowering Most	Harvest Date	Yield[1/]	Quality α	Quality β	Quality α-ratio	Oil	HSI_6	Remarks
			June		June	July	Aug.	lbs/A	%	%		ml/100g		
21083	223: "	Vojvodina	5/31	8	7/2	8	28	3387	9.4	4.0	70	1.04	.40	late
	223: "	" late pick					9/12	1792	9.0	4.7	68	1.35	.43	
21078	224: "	Record	2	11	28	6	23	1525	7.1	8.0	47	1.85	.56	
	224: "	" late pick					9/12	1557	9.4	7.0	57	3.20	.75	
64107	225: "	Northern Brewer	10	20	18	8	23	697	10.9	4.9	68	1.72	.43	good storage
	224: "	" late pick					9/12	768	10.9	5.2	67	2.56	.50	
21040	226: "	Columbia	5/30	11	7/2	15	9/13	2670	8.6	4.6	65	1.60	.47	
21041	227: "	Willamette	1	10	7/4	15	9/13	2052	5.3	4.0	57	1.49	.56	
21077	228: "	Saazer	11	22	18	2	10	128	4.9	4.6	51			split leaf blotch
21167	229: "	Hybrid-2	6	14	7/4	25	9/17	2432	8.9	6.4	58	1.15	.49	very late
21179	230: "	Hersbrucker-E	20	7/4	7/16	28	9/13	768	5.9	7.4	44	1.17	.56	
66050	231: "	Alliance	8	22	7/4	12	20	1152	6.0	2.3	72	0.92	.40	good storage
62052	232: "	Density	1	14	14	6/26	9/13	1058	5.6	3.7	60	0.51	.43	very late
62053	233: "	Defender			7/10	15	9/13	160	4.4	2.5	63	0.98	,62	
66051	234: "	Progress	6	16	7/4	10	18	469	6.6	3.1	67	1.17	,30	good storage
21094	235: "	YC x 7K491-OP	5/31	14	22	16	9/13	1305	8.7	7.3	54	0.94	.48	top crop
21095	236: "	"	5/31	10	24	10	9/13	1659	6.5	6.9	48	0.76	.35	top crop
21193	237: "	65009 x 63015M	1	10	24	8	28	2058	13.4	5.2	72	1.15	.44	white hops
	237: "	" late pick					9/13	2031	13.8	5.3	72	2.39	,48	
21194	238:1-10	65009 x 64035M	6	18	30	12	28	1757	12.2	6.9	63	1.85	1.05	
21182	239: "	Galena	5	11	8	6/18	10	533	10.3	8.2	55	0.96	.40	white hops
	239: "	" late pick					20	981	9.6	6.8	58	1.00	.37	good storage
21185	240: "	Hersbrucker-G							5.3	8.8	37			baby, cone analysis
21187	242: "	Southern Brewer							8.9	4.9	64	2.87		" , " "
21188	243:	NP2/55							5.3	3.9	57	1.53		" , " "

[1/] Yield calculations: $\frac{\text{green wt/plot} \times 774}{\#\text{pl./plot} \times 453.6 \times 4}$; multiplication factors: 1 pl./plot: 0.4265873 corrected for 4 vines/plant
2 pl./plot: 0.2132927
5 pl./plot: 0.0853175
HSI_6 below .40 = excellent storage stability

Table 6: Hop Selections Grown in the 5-hill Advanced Seedless Observation Nursery (Smith Yard), Corvallis, 1979.
Pruned March 22; trained May 2.

Accession or Sel. No.	Location Row:Hill	Pedigree	Spring[1] DM	Cross Wire First	Cross Wire Most	Flowering First	Flowering Most	Harvest Date	Yield[2]	Quality α	Quality β	Quality α-ratio	Quality Oil	Quality HSI_6	Remarks[3]
			May 23	June		July		Sept.	lbs/A	%	%		ml/100g		
7003-03	212:12-16	65009 x 19046M	4	6	12	10	20	17	1621	6.2	7.6	44	1.82	.91	YF2, late
-15	213: "	"	1	8	14	6/15	10	17	1382	9.4	4.8	66	1.14	.44	red stem, shatter, TC
-32	222: "	"	4	8	12	2	15	17	1397	7.4	4.0	64	1.07	.58	shatter
21198	227: "	"	3	8	12	6/30	16	18	2662	9.2	8.7	51	2.28	.67	late, tight cone
7003-66	229: "	"	3	10	14	10	20	17	2000	7.2	7.4	49		.58	late
-75	230: "	"	2	8	14	2	18	18	1740	6.9	6.0	53	1.42	.67	late
-81	233: "	"	4	6	10	6/30	15	18	2952	5.9	6.2	48	1.85	.92	late
6771-21	236:12-16	FuT x RV - FuS	0	5/31	8	6/26	6	18	2772	5.2	4.1	56	2.50	.90	triploid, late, shatter
21180	242: "	65009 x 19046M	0	4	8	10	20	13	2751	9.7	8.3	53	2.39	.67	
7003-176	202:17-21	"	4	6	10	15	25	13	1570	8.0	7.5	51	1.81	.72	late
21181	204: "	"	0	6	12	6/14	2	13	2133	7.3	7.7	48	1.64	.85	large cones
7003-250	205: "	"	2	6	10	6/18	6/30	13	1732	7.8	6.8	53	2.57	1.13	red stem, lg. cones
21199	212:17-21	65009 x 19182M	2	5/31	8	6/22	6	13	3114	9.3	5.2	64	2.87	.75	late
21200	221: "	"	4	5/31	8	6/20	2	17	1783	11.8	4.7	71	2.67	.80	
21201	238: "	65009 x 63015M	3	5/31	10	6/28	17	8/28	2261	10.1	8.9	53	2.04	.67	
6761-16	205:23-27	FuT x FuS	0	2	12	8	18	17	2256	6.3	3.2	66	1.39	.64	triploid, late
7005-182	207: "	65009 x 63015M	2	8	12	6/30	12	17	1049	12.3	6.0	67	3.20	.61	
-201	209: "	"	4	4	10	6/24	10	17	1401	9.8	6.3	60	2.59	.93	tight cone
-205	210: "	"	3	5/30	12	6/22	18	17	998	12.5	5.9	68	2.15	.86	YF2, late, TC
-232	211: "	"	1	1	10	6/22	10	17	1860	11.2	5.2	68	2.70	.69	large TC, white hops
21042	226:23-27	FuT x FuS	1	5/29	6	4	10	17	2525	4.7	4.2	52	1.34	.85	
65009	228: "	BG x EG - XS	0	2	10	8	18	17	1694	11.1	8.5	56	3.00	1.31	tight cones
7006-296	230: "	65009 x 64035M	4	5/30	6	6/10	6/26	—	800e	11.4	5.9	65	0.29	--	YF2, ♀, to germplasm
21098	232: "	19001 x 21153M	0	5/28	2	6/14	6/30	14	1672	7.5	5.2	59	2.70	1.00	triploid, med. early
7006-302	233: "	65009 x 64035M	1	10	17	4	15	—	1000e	9.8	6.1	61	0.29	--	TC, to germplasm
7006-318	236:23-27	65009 x 64035M	4	8	15	2	15	—	1000e	11.3	4.7	70	0.27	--	red stem, DM, TC
21091	237: "	FuT x RV - FuS	0	2	12	6/24	8	8/28	1728	3.8	5.9	38	1.73	.83	early triploid
"	237:28-32	" second pick						7	1433	3.9	6.0	39	—	.84	second pick, late pick
21099	240:23-27	65104 x 6751-98M	0	2	8	8	6/15	8/23	922	9.3	7.4	55	2.67	.67	early, triploid
7006-370	242: "	65009 x 64035M	3	5/29	6	6/28	4	14	1706	9.9	9.1	51	2.73	1.07	red stem
-398	206:28-32	"	0	2	8	2	15	17	1212	—	—	—	—		red stem, late, TC
-406	209: "	"	0	5/31	6	6/30	10	14	700	10.6	5.2	67	2.06	.67	red stem
21195	210: "	"	4	5/28	6	6/28	10	14	1408	13.7	6.2	68	3.18	.56	
7006-450	215: "	"	0	4	12	2	15	17	1092	12.5	5.4	69	2.54	.81	red stem, mildew
-456	216: "	"	0	2	11	2	15	14	1578	8.7	4.4	66	1.93	.50	tight cone
7007-175	223:28-32	64100 x 64035M	0	5/26	2	6/12	6/28	14	1758	9.6	5.7	62	2.68	.54	red stem
-206	230: "	"	0	5/26	2	6/9	6/24	14	1045	11.9	7.2	62	2.34	.62	
-339	241: "	"	4	5/28	2	6/10	6/22	—	1200	12.5	7.6	62		--	1% ♂, to germplasm, E
															1% ♂, early

1/ downy mildew bottom spikes: 0 = best to 4

2/ see yield calculation factors in table 5; e = visual estimate

3/ YF = yellow fleck; TC = tight compact cone; E = early maturity

HSI_6 below .40 = excellent storage stability

Table 7: Hop Varieties Grown in the Seedless Variety World Collection (Smith Yard), Corvallis, 1979.
Pruned March 22; trained May 3.

Accession or Sel. No.	Location Row:Hill	Name	Cross Wire First	Cross Wire Most	Flowering First	Flowering Most	Harvest Date	Yield[1/]	Quality α	Quality β	Quality α-ratio	Quality Oil	Quality HSI_6	Remarks
			June		June		Aug.	lbs/A	%	%		ml/100g		
21014	247:1-2	Hallertauer m.f.	4	11	8	20	10	363	5.7	5.4	50		.88	early
21015	248: "	Tettnanger	10	20	30	7/4	20	160	5.5	5.0	52	1.07	.62	CoH 22, early
61019	246:3-4	Yugoslavia Golding	4	8	18	30	10	942	5.6	3.1	64	1.22	.49	early
61020	247: "	Savinja Golding	6	10	18	28	10	827	5.5	3.1	63	1.17	.47	
61021	248: "	Swiss - Tettnanger	11	20	18	28	20	192	5.9	5.6	51		.66	
62051	244:5-6	Janus	—	—	8	18	7/30	64	5.2	3.1	62		--	very early
62052	245: "	Density	8	11	11	24	9/12	888	6.6	4.7	58	0.49	.48	
62053	246: "	Defender	20	26	20	7/2	20	85	—	—	—	—	--	
64107	247: "	Northern Brewer	16	22	26	7/10	20	555	11.6	5.3	68	2.35	.41	
66050	244:7-8	Alliance	8	14	26	7/6	20	1066	5.9	2.3	72	1.21	.42	early
66051	245:7-8	Progress	4	8	30	7/8	20	1088	6.1	2.6	70	0.94	.47	
66052	246: "	Pride of Ringwood	12	21	7/16	7/28	9/18	1813	6.9	8.1	46	1.40	.73	red stem, late
66054	248: "	Calicross	6	14	7/10	7/20	9/18	1262	7.9	7.0	53	1.39	--	late
66055	249: "	First Choice	26	30	7/14	7/20	—	—	—	—	—	—	--	
66056	244:9-10	Smooth Cone	4	26	7/2	7/12	9/17	704	7.9	4.4	64	1.53	.49	
68052	246:9-10	Petham Golding Seedling	20	26	20	7/6	9/12	938	7.8	2.4	76	1.35	.57	very late
21043	247: "	Wye Challenger	10	20	24	7/8	28	871	7.6	5.6	57	1.85	.52	red stem
21044	248: "	Wye Northdown	12	24	18	26	20	768	10.1	6.5	60	2.79	.59	
21050	249: "	Ahil	24	30	7/2	7/10	9/12	917	10.7	5.1	67	2.85	.46	
21053	246:11-13	Aurora	11	18	7/2	7/12	9/12	995	12.0	4.0	71	2.14	.56	
21049	247: "	Styrian	8	14	18	26	28	702	4.8	3.0	61	1.45	.64	

[1/] Yield calculations: green wt/plot x 0.2132927 for a 2 hill plot (4 vines/plant)

Table 8: Seedless 5-hill Variety Observation Nursery (Willamette Yard), Corvallis, 1979. Pruned March 23; trained May 3.

Accession or Sel. No.	Location Row:Hill	Name	Cross Wire First	Cross Wire Most	Flowering First	Flowering Most	Harvest Date	Yield[1/]	Quality α	Quality β	Quality α-ratio	Quality Oil	Quality HSI_6	Remarks
			June		July		Aug.	lbs/A	%	%		ml/100g		
19001	302:1-5	Brewer's Gold	8	12	6/24	4	9/17	1822	9.2	5.9	60	3.42	--	CoH 41, shatter
48209	303: "	Fuggle H	10	22	6/20	2	15	533	4.1	2.3	64	1.11	.49	
		" , late pick					22	640	4.5	2.6	63	1.10	.57	
21016	304: "	Fuggle N, heat treated	10	24	6/11	2	15	320	6.2	3.4	64	1.28	.43	
		" , late pick					22	444	5.0	2.7	64	1.09	.54	
56013	305: "	Cascade	8	12	6/20	6/28	29	1979	5.5	6.6	45	1.78	.81	shatter
21092	306: "	Cascade, heat treated	8	14	6/20	6/26	29	1613	6.1	6.7	47	1.79	.76	
64100	307: "	Bullion	6	10	6/11	6/20	29	2000*	9.5	6.3	60	2.37	.64	picker broke,estim.yld.
21056	308: "	Bullion 10A, heat treated	5/31	8	6/11	6/30	29	1190	12.7	6.6	65	2.17	.57	
21040	309: "	Columbia	12	22	4	10	9/7	1382	7.4	4.1	64	—	.43	
21041	310: "	Willamette	10	24	2	12	9/13	1266	5.3	3.6	59	1.10	.57	
64107	312: "	Northern Brewer	20	26	6/20	6/30	15	764	10.3	4.4	70	2.01	.43	CoH 22
21093	313: "	No. Brewer, heat treated	14	28	6/18	4	15	938	11.9	5.2	69	1.92	.40	
21170	316: "	Elsässer	26	—	4	16		300e	3.0	5.1	36	—	--	split leaf blotch
21078	317: "	Record	14	7/2	6/30	12	29	614	10.1	5.4	65	1.82	.39	
62013	318: "	Comet	6	10	6/28	10	9/7	1339	10.1	4.8	67	2.15	.92	shatter
21179	319: "	Hersbrucker-E	5/30	12	2	10	9/7	613	4.4	5.4	45	0.75	.57	late, split leaf blotch
21167	321: "	Hybrid-2	8	12	4	20	9/14	1729	10.2	6.6	60	0.87	.46	red stem, late
66052	324: "	Pride of Ringwood	12	20	13	25	9/13	1630	8.1	6.4	56	1.21	.53	late
66054	325: "	Calicross	5/28	6	2	20	9/13	2122	6.7	5.8	53	1.00	.37	shatter, large cones
21014	326: "	Hallertauer m.f.	8	12	6/10	6/20	15	299	5.4	5.5	49	0.78	.74	early
21015	327: "	Tettnanger	8	—	6/12	6/26	15	149	5.6	5.3	51	0.85	.58	early
21043	328: "	Wye Challenger	14	25	2	16	30	928	7.5	5.3	58	1.67	.46	red stem
21049	329: "	Styrian	4	18	6/16	6/28	15	789	5.0	2.7	65	1.04	.52	early, shatter
"	"	" , second pick					22	626	4.5	2.6	63	1.09	.55	
21053	330: "	Aurora	8	14	14	25	30	889	10.6	4.3	71	1.47	.43	
21116	301:6-10	Brewer's Gold, heat treated	5/30	6	6/22	2	9/7	2423	10.6	5.1	67	3.01	.86	shatter
21112	303: "	Wye Target	10	—	6/12	6/26	9/7	1315	11.2	4.1	73	1.81	.80	
21081	305: "	Dunav	6	10	6/18	6/30	9/7	811	6.0	3.9	60	1.32	.48	red stem
21082	306: "	Neoplanta	11	24	2	18	29	1681	9.3	4.5	67	1.53	.44	med. early
21171	307: "	Hersbrucker-P	7/12	—	10	—		400e					--	
21083	327: "	Vojvodina	8	28	2	18	9/7	2048	8.6	3.8	69	0.96	.43	red stem, late
21113	328: "	Lubelska (Pulawy)	6	12	6/16	6/24	15	166	5.5	6.0	47	0.87	.68	early
21114	329: "	Nadwislanska	12	24	6/16	6/24	15	128	5.0	5.3	48	0.89	.68	early
21003	302:11-15	tetraploid Fuggle, FuT	10	28	6/24	6/30	22	498	3.7	2.1	63	1.07	.61	

[1/] for calculations see Table 5; e = visual estimate

HSI_6 below .40 = excellent storage stability

Table 9: Hop Selections Grown in the Seedless 5-hill Observation Nursery (Willamette Yard) in 1979. Pruned March 23; trained May 3.

Accession or Sel. No.	Location Row:Hill	Pedigree	Spring DM[1]	Cross Wire First	Cross Wire Most	Flowering First	Flowering Most	Harvest Date	Yield[2]	Quality α	Quality β	Quality α-ratio	Quality Oil	Quality HSI_6	Remarks[3]
			May 24	June		July		Sept.	lbs/A	%	%		ml/100g		
7102-26	314:6-10	21003 x 19170M	0	10	14	2	15	7	1723	4.7	4.5	51	1.03	.95	triploid, late
21055	316: "	Co x (BG x Fu-Colo2-1)	0	16	24	2	10	8/29	853	14.7	4.8	75	1.93	.41	CoH 45
21054	317: "	"	1	10	14	6/20	6/28	8/29	1176	9.0	4.2	68	1.70	.65	
7013-130	321: "	21153, selfed	3	12	22	6/16	6/28	7	1544	7.9	5.9	57	2.09	.98	lg. cones, triploid
7312-36	323: "	21055 x 21109M	3	8	20	6/12	6/30	7	619	10.8	5.9	64	1.56	.37	red stem
-83	325: "	"	4	8	16	2	16	7	1271	13.5	3.9	77	1.74	.40	
-134	326: "	"	4	6	14	2	18	14	1530	10.8	5.0	68	1.38	.33	TC, late
65009	303:11-15	BG x EG - XS	0	4	26	2	20	10	1877	9.7	7.2	57	3.03	1.13	
21042	304: "	FuT x FuS	0	2	8	2	10	10	2252	3.6	4.1	46	1.53	.78	triploid
21091	305: "	FuT x RV - FuS	0	8	12	6/10	6/24	8/29	1135	3.7	5.7	42	1.89	.81	triploid, early
21094	306: "	YC x 7K491-OP	0	6	10	2	15	10	811	7.0	6.6	51	0.69	.41	poor pick
21095	307: "	"	2	1	10	6/2	8	10	700	5.9	5.1	53	0.71	.35	poor pick
21098	309: "	19001 x 21153M	0	1	8	6/20	6/30	10	2269	7.0	5.3	56	1.15	1.07	triploid, early
21099	310: "	65104 x 6751-98M	0	10	8	6/12	6/15	8/15	1200	8.5	7.2	54	2.18	.63	triploid, early
6771-21	313: "	FuT x RV - FuS	0	5/30	6	6/22	6/30		2000e	3.1	2.9	51		.60	triploid, exc. pick
21202	314: "	YC x ZS (Sel. 6903-107)	1	5/29	8	6/24	4	10	2039	4.8	5.9	45	0.80	.45	high H/C, late
7003-03	318: "	65009 x 19046M	4	8	24	10	20	10	1717	6.1	7.7	43	1.47	.63	late
-15	319: "	"	2	2	8	6/12	4	10	1868	10.7	4.7	69	1.14	.38	red stem
21198	322: "	"	4	22	—	12	—	—	600e	—	—	—	—	--	TC, med. early
7003-66	323: "	"	4	10	26	4	20	—	1600e	5.5	5.6	49	—	.41	TC, white hops, late
-75	324: "	"	4	10	18	6/20	15	—	1800e	8.2	6.1	57	—	.59	lg. TC, slipdown, late
-81	326: "	"	4	12	20	6/22	18	10	1555	5.5	6.0	48	1.21	.73	late
21180	329: "	"	0	10	14	2	28	10	2466	8.4	7.7	52	2.25	.66	late
7003-176	330: "	"	4	2	24	2	25	—	1600e	8.1	6.2	56		.68	exc. pick, late, TC
21181	302:16-20	65009 x 19046M	0	6	12	6/18	6/28	10	2413	6.1	7.2	45	1.35	.84	
7003-250	303: "	"	0	4	14	6/12	2	10	1574	8.9	7.1	55	2.46	.96	red stem
-284	304: "	"	4	10	14	2	16	10	1689	4.0	8.6	31	2.26	1.02	wrong α/β, discard
21199	305: "	"	1	—	—	10	16		400e	—	—	—	—	--	
21200	307: "	65009 x 19182M	3	12	16	6/20	4	8/31	1271	11.2	4.5	71	2.20	.63	med. early
7005-22	309: "	65009 x 63015M	2	12	20	6/24	15	8/31	1348	10.7	3.9	73	2.90	.70	med. early
-40	310: "	"	1	1	8	2	18	14	1708	7.8	4.6	63	1.89	.70	white hops, late
-149	311: "	"	1	4	14	2	16	10	2414	9.2	3.2	74	1.86	.75	shatter
21201	312: "	"	4	4	12	6/24	2	8/31	1120	9.8	9.2	51	2.25	.55	early
21193	315: "	"	4	2	14	6/22	4	8/31	1589	13.3	4.9	73	1.53	.44	no crown infection by DM
7005-168	317: "	"	✓	5/31						8.7	3.3	72		--	exc. set, TC
-201	319: "	"	2	4	10	6/24	20	10	1851	8.6	5.2	62	1.88	.86	
-205	320: "	"	2	16	26	2	20	10	832	11.9	5.1	70	2.51	.77	waterfleck
7006-95	322: "	65009 x 64035M	3	4	8	6/24	4		1200e	10.3	5.2	66		--	large TC
-61	323: "	"	4	10	20	6/25	12	8/31	1075	9.4	2.6	78	1.09	.42	red stem
-382	326: "	"	3	8	12	6/22	2		1200e	11.7	4.5	72	0.30	--	tight cone
-296	330: "	"	4	8	28	6/22	10	8/30	1273	14.0	7.2	66	2.81	--	med. early

Table 9: concluded.

Accession or Sel. No.	Location Row:Hill	Pedigree	Spring DM[1]	Cross Wire First	Cross Wire Most	Flowering First	Flowering Most	Harvest Date	Yield[2]	Quality α	Quality β	Quality α-ratio	Quality Oil	Quality HSI_6	Remarks[3]
			May 24	June		July		Sept.	lbs/A	%	%		ml/100g		
21182	301:21-25	Galena	0	2	20	6/8	6/26	8/22	816	11.0	7.4	59	0.73	.41	early
7006-398	306: "	65009 x 64035M	0	10	14	6/30	20		1200e	14.1	7.5	65		.45	red stem, TC
21195	309: "	"	0	1	14	6/12	4	14	1485	11.8	5.6	67	2.56	.53	red stem, TC
7006-445	311: "	"	2	6	12	6/30	10	8/31	2252	9.2	5.7	61	2.59	.59	
-450	312: "	"	4	8	12	2	14	8/31	1045	11.9	5.4	68	2.31	.70	
-456	313: "	"	3	12	18	2	16		1600e	6.0	3.0	66		--	red stem, TC, ♀, YF1
7007-175	317: "	64100 x 64035M	1	5/29	6	6/12	6/30	8/22	793	7.7	4.8	61	1.99	.59	early
-206	318: "	"	4	6	10	6/20	6/30		1000e	10.1	7.1	58		.57	lg. TC, ♀
-339	321: "	"	4	5/30	6	6/20	6		1000e	11.0	7.0	61		--	
I31-11A	323: "	Brewer's Gold x OP	0	10	14	8	20	14	1507	12.6	7.3	63	1.97	.56	YF2, red stem, TC
I33-6	324: "	"	0	14	22	6	25	14	1397	7.6	4.9	61	2.20	.77	large cones
21183	325: "	Eroica	0	16	30	6	16	13	1525	11.7	4.7	71		.75	bad crown DM, late
7101-96	309:26-30	21003-64035M	1	4	14	2	15	14	1672	4.2	3.3	56	1.07	.64	late, discard
-98	310: "	"	0	1	6	6/25	8	8/22	1350	4.3	4.2	50	1.15	.72	TC, DM resistant
		" , late pick						8/31	1529	4.7	4.0	53	1.71	.85	
-99	311: "	"	1	5/31	6	6/25	2	8/22	1216	4.5	2.6	63	0.89	.53	med. early
		, late pick						8/31	1244	5.1	2.9	63	1.47	.65	
-175	315: "	"	1	8	12	6/30	15	8/22	1692	3.4	3.4	49	1.44	.62	
		" , late pick						8/31	1386	3.4	3.0	53	0.89	.84	

1/ Downy mildew; 0 = best to 4

HSI_6 below .40 = excellent storage stability

2/ For calculation factors see Table 5; e = visual estimate

3/ CoH = cohumulone; H/C = humulene/caryophyllene ratio; TC = tight, compact cone; YF = yellow fleck virus

Table 10: High Alpha Selections Grown in the Seedless 5-hill Observation Nursery (Willamette Yard) in 1979. Pruned March 23; trained May 3.

Accession or Sel. No.	Location Row:Hill	Pedigree	Spring[1] DM	Cross Wire First	Cross Wire Most	Flowering First	Flowering Most	Harvest Date	Yield[2]	Quality α	Quality β	Quality α-ratio	Quality Oil	Quality HSI_6	Remarks[3]
				June		July		Sept.	lbs/A	%	%		ml/100g		
7301-01	322:26-30	62013 x 21108M	0	8	14	2	18	6	1118	5.4	2.7	66	0.76	.43	
-03	323: "	"	0	1	8	6/30	16	6	1497	6.4	3.6	63	1.77	1.12	DM spikes, shatter
-34	324: "	"	0	1	8	6/30	12	6	1570	11.4	3.2	78	0.98	.63	shatter
-183	325: "	"	1	5/24	1	6/28	16	6	1258	7.5	2.3	76	1.18	.83	DM/cone, weak arms
7302-29	326: "	62013 x 21109M	0	5/28	8	6/12	6	6	1171	11.7	3.0	79	1.50	.45	
-146	327: "	"	0	2	8	6	15	6	1443	9.6	3.4	73	1.03	1.15	yellow leaves
7303-07	328: "	62013 x 21110M	0	4	14	6/24	10		1000e	10.6	3.6	74		--	large cones, poor pick
-19	329: "	"	0	4	12	6/20	6/30		1000e	12.6	3.8	76		.43	large cones, poor pick
7306-05	330:26-30	64107 x 21108M	0	4	10	6/20	2	8/31	1092	9.1	6.1	59	1.89	.63	early, red stem
-40	301:31-35	"	0	14	28	10	20		800e	10.4	3.4	75		--	tight cone
-42	302: "	"	0	8	-	2	25		800e	11.1	3.8	74		--	tight cone
-43	303: "	"	0	5/28	2	6/20	14	5	1254	10.4	3.7	73	1.93	.36	red stem, leaf bronzing
-91	305: "	"	0	5/28	8	6/22	12	5	802	9.2	2.9	76	1.67	.43	red stem
-139	306: "	"	0	8	14	6/20	12	5	926	10.7	4.6	69	1.96	.44	red stem
-148	307: "	"	0	5/31	12	6/22	12	5	1209	9.0	6.2	59	2.26	.55	red stem
-182	308: "	"	0	10	16	6/22	15	5	1126	11.3	6.4	63	2.51	.68	
7307-23	309: "	64107 x 21109M	0	12	26	4	18	5	1267	10.1	4.1	71	0.67	.48	
-51	310: "	"	0	10	16	6/24	4	8/22	640	9.7	3.1	75	1.25	.41	early
7308-34	311: "	64107 x 21110M	0	16	22	6/30			800e	9.3	4.8	66		--	large cones
7311-31	314: "	21055 x 21108M	0	2	14	6/20	4		800e	12.5	3.9	76		.79	poor set
-32	315: "	"	0	5/29	6	6/24	15	5	2159	13.0	4.0	76	1.50	.39	
-66	316: "	"	0	2	14	15	25	14	1152	11.1	7.9	58	3.25	.74	tight cones, late
-68	317: "	"	0	5/26	6	6/22	16	6	2167	10.3	6.9	59	1.99	.46	
-78	318: "	"	0	5/31	6	6/28	4	6	1113	11.0	3.3	77	0.25	.39	shatter
-95	319: "	"	0	4	10	8	20		1800e	12.0	2.8	80		--	high α /β, small cones
-108	320: "	"	0	5/28	6	6/20	4	6	1634	13.4	4.4	75	1.67	.55	
-152	321: "	"	0	1	8	2	12	6	1519	14.0	4.9	74	2.01	.47	shatter
-177	322: "	"	0	5/26	6	6/28	10		800e	9.5	5.0	64		--	poor set
7312-09	324: "	21055 x 21109M	0	8	24	10	20	6	1275	17.3	6.3	72	2.87	.48	highest α in '78, CoH 38
-15	325: "	"	0	16	25	8	25	6	640	12.0	4.7	71	1.24	.46	CoH 34
-23	326: "	"	0	5/28	14	6/10	4		1200e	7.7	3.4	69		--	large TC, red stem
-27	327: "	"	0	5/28	6	10	18	6	1041	13.8	4.2	76	1.92	.46	
-41	328: "	"	0	12	22	2	12		1000e	15.5	6.6	72		.47	high α in '78, good pick
-78	329: "	"	0	12	26	10	20	6	636	11.0	6.2	64	2.01	.45	
-129	344:1-5	21055 x 21109M	0	8	12	6/18	6/30		600e	10.1	4.7	68		--	
7313-29	332:1-5	21055 x 21110M	0	4	10	6/12	6/28	8/22	1141	11.3	4.9	69	1.85	.45	large cones, early
-32	333: "	"	0	14	12	2	10	14	2240	11.8	5.6	67	2.87	.54	
-43	334: "	"	0	5/29	10	6/24	6	8/30	1937	8.5	5.1	62	1.47	.37	aphids
-53	335: "	"	0	5/26	2	12	6/30	8/30	1160	10.9	5.0	68	2.12	.41	♂, 3% male flowers
-83	336: "	"	0	1	8	6/12	6/24	8/30	1424	15.4	6.5	70	2.78	.46	early
-92	337: "	"	0	4	10	6/25	2		600e	8.6	7.4	53		.48	poor set
-110	338: "	"	0	1	10	6/20	6	8/30	1540	12.3	5.1	70	2.43	.61	
7314-11	339: "	21055 x 21111M	0	8	28	6/22	6		600e	12.2	4.2	74		.41	TC, short arms
-12	340: "	"	0	16	26	6/10	6/28		400e	11.0	5.5	66		--	TC, poor
-44	341: "	"	0	12	26	6/10	4		600e	13.3	3.7	78		.45	large cones
-58	342: "	"	0	10	14	6/20	6/30	8/30	757	9.2	7.3	56	1.53	.61	slipdown
7315-63	343: "	21055 x 21070M	0	5/31	10	6/22	6/30	8/30	1280	13.8	4.4	75	2.14	.76	lg. cones, exc. pick

[1] Downy mildew; 0 = best to 4

[2] For calculation factors see Table 5; e = visual estimate

[3] CoH = cohumulone; TC = tight, compact cone

Pedigree: 62013 = Comet
64107 = Northern Brewer
21055 = Co x (BG x Fu-Colo 2-1)

HSI_6 below .40 = excellent storage

21108M = (BG x EG-XS) x ZS
21109M = "
21110M = Bullion x ZS
21111M = "
21070M = BG^3 x EKG-BavS

Table 11 : Male High-Alpha Selections, grown in the 1977 Nursery, Corvallis in 1978 and 1979. Pruned April 3; trained May 10-11, 1979.

Accession or Sel. No.	Location Row:Hill	Pedigree	1978 α	1978 β	1978 ratio	1979 α	1979 β	1979 ratio	Remarks
7605-44M	145:16	7312-36 x 7308-23M	47.5	17.8	72	55.4	21.8	71	
7610-24M	151:18	7312-83 x 7303-165M	–	–	–	43.4	12.6	77	
-112M	:53	"	54.1	18.1	74	52.0	20.4	71	
7611-102M	156:03	7312-83 x 7308-23M	45.8	20.5	69	53.6	21.3	71	
7612-04M	157:41	7312-83 x 7311-141M	49.2	18.3	72	56.6	22.1	71	good storage
7613-03M	158:44	7312-134 x 7303-165M	34.3	14.4	70	46.6	20.7	69	
-04M	:45	"	24.6	11.8	67	49.2	26.1	65	
-25M	159:13	"	46.6	13.7	77	56.8	13.7	80	high alpha, low β
-42M	:30	"	–	–	–	59.0	17.0	77	v.high alpha
-58M	:46	"	–	–	–	48.0	20.8	69	early
-77M	160:12	"	32.0	14.6	68	47.6	20.2	70	
-89M	:24	"	41.0	18.5	68	50.7	18.3	73	
-104M	:39	"	39.9	13.6	74	57.7	17.9	76	v. high alpha
-105M	:40	"	25.1	16.7	60	55.7	19.4	74	
-128M	161:10	"	36.3	13.1	73	55.3	21.1	72	
7614-26M	161:51	7312-134 x 7308-23M	33.9	14.4	70	54.9	23.5	70	
-47M	162:19	"	53.3	14.2	78	52.1	16.8	75	
-52M	:24	"	47.0	18.1	72	53.8	22.3	70	
-60M	:32	"	32.5	10.9	74	54.8	21.4	71	
-108M	163:27	"	14.7	3.7	79	59.6	17.2	77	v. high alpha
-121M	:40	"	20.1	8.9	69	50.0	19.9	71	
7615-82M	165:44	7312-134 x 7311-141M	42.5	16.4	72	55.5	17.4	76	
-146M	167:02	"	5.4	4.1	56	53.7	17.9	74	
-154M	:10	"	32.6	11.4	74	53.7	20.7	72	

Table 12 : Female High Alpha Selections grown in the 1977 Nursery, Corvallis, in 1978 and 1979. Pruned; April 3, trained; May 10-11, 1979.

Accession or Sel. No.	Location Row:Hill	Pedigree	1978 α	1978 β	1978 ratio	1979 α	1979 β	1979 ratio	HSI_6	Remarks
7601-06	139:12	7303-07 x 7303-165M	9.9	1.8	84	13.2	2.9	82	.40	hard pick , low beta
-22	:28	"	10.9	2.3	82	9.6	1.8	84	.40	very low beta
-33	:39	"	7.2	2.1	77	12.6	3.0	80	.60	v. late
7602-	140:25	7303-07 x 7308-23M	7.6	2.4	76	10.4	3.2	76	.35	
-67	141:38	"				11.0	3.9	73	.37	
7603-41	142:30	7303-07 x 7311-141M	7.6	2.5	75	12.0	3.0	79	.39	
-47	:36	"	9.2	2.9	76	12.0	3.7	76	.86	VG, tight cone
7604-03	143:10	7312-36 x 7303-165M	9.6	2.9	77	9.5	2.8	77	.82	tight cone, low beta
7605-09	144:34	7312-36 x 7308-23M	10.7	6.7	61	14.7	6.8	68		
-13	:38	"	10.2	3.9	72	13.1	4.7	73		some DM/crown
-40	145:12	"	8.8	2.6	77	10.9	2.8	79	.38	G, tight cone,low beta
-47	:19	"	9.8	2.5	79	12.3	3.5	77		
-108	146:27	"	7.7	2.3	76	11.5	3.5	76	.43	
7606-02	147:52	7312-36 x 7311-141M	8.6	2.9	75	8.4	2.7	76	.46	low beta
-32	148:29	"	7.3	1.7	81	9.1	2.2	80	.42	very low beta
-35	:32	"	11.0	3.1	78	11.7	3.5	77	.54	large tight cone
-39	:36	"	8.4	2.2	79	10.5	2.7	79	.38	VG, tight cone,low beta
-48	:45	"	11.5	3.0	79	13.3	4.6	76	.35	hard pick, tight cone,
-50	:47	"	7.9	2.6	75	12.4	3.4	78	.42	tight cone
-57	149:01	"				12.6	4.1	75	.47	tight cone
-86	:30	"	13.2	5.5	70	14.3	5.7	71	.38	large cones
-108	:52	"				9.6	2.6	78		tight cone, low beta
7610-28	151:22	7312-83 x 7303-165M	8.2	2.7	75	11.1	4.0	73	.60	
-50	:44	"	6.9	1.8	78	14.2	3.0	82	.35	G, tight cone
-53	:47	"	8.7	2.5	77	9.9	2.4	80	.72	low beta
-96	152:37	"				10.5	2.5	80	.42	low beta
-97	:38	"	12.1	3.7	76	13.7	4.2	76	.39	tight cone
-104	:45	"	9.2	2.6	78	13.7	3.7	78	.37	
-109	:50	"	9.2	3.2	74	11.3	4.1	73	.60	G
-124	153:12	"	10.8	3.2	77	11.6	4.6	71	.88	
-127	:15	"				9.7	1.8	84	.39	very low beta
-138	:26	"	6.2	1.7	78	8.3	2.2	78		low beta
-143	:31	"				10.5	2.4	81	.49	low beta
7611-05	154:12	7312-83 x 7308-23M	12.2	2.9	80	13.8	3.8	78	.38	G, large cones
-25	:32	"	7.3	1.1	87	7.9	1.8	81	.36	VG, very low beta
-26	:33	"	9.3	4.0	70	11.1	3.7	75	.41	
-69	155:23	"	11.7	2.6	81	14.0	3.0	82	.50	
-84	:38	"	9.0	2.9	75	13.2	4.3	75	.42	VG, tight cone
-88	:42	"				10.9	3.3	76	.42	
-91	:45	"				10.1	2.7	78	.43	low beta
-108	156:09	"	13.6	3.6	79	15.4	3.5	81	.36	large tight cone
-117	:18	"	7.9	2.4	77	11.7	3.0	79		
-123	:24	"	12.5	4.1	75	7.9	2.5	75	.42	low beta

Table 12 : concluded:

Accesion or Sel. No.	Location Row:Hill	Pedigree	1978 α	1978 β	1978 ratio	1979 α	1979 β	1979 ratio	HSI_6	Remarks
7611-124	156:25	7312-83 x 7308-23M				11.4	3.0	79	.43	
-143	:44	"	9.8	3.3	74	14.6	3.3	81	.37	tight cone
-158	157:6	"	13.2	3.6	78	10.7	3.4	76	.34	G
-169	:17	"				14.7	6.1	70	.38	
-183	:31	"	6.6	3.0	68	10.8	4.1	72	.36	VG
7612-02	157:39	7312-83 x 7311-141M	7.8	2.4	76	11.5	4.4	72	.62	
-08	:45	"	11.3	4.2	73	12.4	3.7	77	.38	
-20	158:04	"	4.6	1.4	76	11.0	2.4	81	.45	
-35	:19	"	9.1	2.3	79	14.6	3.1	82	.39	
-44	:28	"	11.7	4.0	74	13.2	4.1	76	.48	tight cone
7613-37	159:25	7312-134 x 7303-165M	10.0	2.3	81	12.8	3.0	81	.39	tight cone
-61	:49	"	9.3	3.6	71	11.0	4.1	72	.50	
-72	160:07	"	10.8	2.5	81	12.0	2.5	82	.30	
-124	161:06	"				10.8	2.3	82	.34	
7614-16	161:41	7312-134 x 7308-23M	12.8	3.7	77	14.2	4.2	77	.45	
-17	:42	"	11.1	3.9	74	12.3	3.6	77	.32	
-27	:52	"	8.5	2.7	76	11.7	3.5	76	.34	
-55	162:27	"	8.9	2.0	81	8.5	2.1	80	.51	DM/cones
-83	163:02	"	9.3	2.6	77					vg set
-102	:21	"				10.1	2.7	79	.38	
-115	:34	"				15.4	5.0	75	.33	g. storage
7615-07	164:22	7312-134 x 7311-141M	6.6	2.4	73	11.4	3.1	78	.45	
-12	:27	"	5.3	1.5	78	7.5	2.0	78	.47	tight cone
-38	:53	"	9.8	3.7	72	11.8	3.7	76	.49	
-59	165:21	"	11.1	3.4	76	11.7	3.2	78	.40	
-75	:37	"	6.5	2.4	73	9.0	2.5	78	.43	
-79	:41	"				8.9	2.7	76	.47	
-83	:45	"	6.1	1.7	79	10.1	2.0	83	.37	
-99	166:08	"				14.7	4.3	77	.38	g. storage
7616-02	167:28	7314-12 x 7303-165M	9.9	2.6	79	9.2	2.6	77	.72	large cones
-15	:41	"	7.1	2.1	77	10.8	3.5	75	.56	
-75	168:48	"	11.5	3.6	76	10.5	3.4	75	.78	
7617-07	169:32	7314-12 x 7308-23M	12.4	4.6	73	16.3	5.9	73	.42	lg. tight cone
-65	170:37	"	11.5	3.5	76	11.3	3.5	76	.42	
-107	171:26	"				13.8	5.5	71	.58	tight cone, g. pick
7618-11	171:42	7314-12 x 7311-141M	10.7	5.1	67	12.2	5.7	68	.53	lg. tight cone
-16	:47	"				9.0	2.8	76	.43	small tight cone
-48	172:26	"	13.0	4.5	74	15.7	5.5	74	.41	good set, tight cone
-53	:31	"				11.9	4.2	74	.36	g. set, tight cone
-111	173:36	"				13.8	6.1	69		
19001	4 hills, avg.	Brewer's Gold, control	8.1	4.0	66	10.8	4.9	68	.70	
48209	3 hills, avg.	Fuggle H, control	3.6	1.9	65					
7303-07	4 hills, avg.	62013 x 21110M, parents	7.7	3.4	70	12.3	4.1	75	.45	
7312-36	3 hills, avg.	21055 x 21109M, parents	13.0	3.7	77	14.9	4.0	79	.35	
-42	3 hills, avg.	" "	6.5	2.1	76	10.0	3.2	75	.45	
-83	5 hills, avg.	" "	10.2	2.7	78	13.9	3.7	78	.47	
-134	4 hills, avg.	" "	7.4	2.0	78	9.7	2.7	78	.39	
7314-12	4 hills, avg.	21055 x 21111M	13.7	5.6	70	14.0	5.6	71	.44	

Male parents: 7308-23M= NB x Bu-ZS; 7311-141M= 21055 x 21110M; 7303-165M= Co x Bu-ZS

Alfred H aunold, USDA. REs. geneticist, Hop Research

July 24, 1979 REPORT BY JERRY HULL, FOREST RESEARCH LABORATORY, OSU

COMPARISON BETWEEN SINGLE STRAND AND MULTI-STRANDED HOP TWINE MADE OF PAPER

A multi-stranded paper twine with reportedly superior properties was used in OR this year.

Tests were performed this past week to compare comparable pieces of paper twine used for stringing hops. About a 10 cm piece of each string was clamped on both sides and run at a moderately fast extension to test tensile strength. The comparisons are as follows:

Regular string (average of 10 tests)-- tensile strength 128.9 pounds
standard deviation 7.3 pounds

Multi-strength (average of 8 tests) -- tensile strength 128.4 pounds
standard deviation 10.41 pounds

At the slower extension, 6 to 7% stretch was noticed in either string type which probably had no effect on the breaking strength at all.

If the single stranded string starts to break, it continued to break clear through. When the multi-stranded string was extended, usually 2 or 3 strings would break, but the remaining strands (string is composed of approximately 10 single strands) maintained the approximately 40 to 50 pounds of strength which was still enough to carry a significant load. Thus, although the tensile strength is comparable, it is felt that the multi-stranded string has the potential to carry a given load for a longer period of time.

Most breaks occurred at or near the jaw where the strings were clamped, but some breakage occurred in the middle. There did not seem to be any significant difference in tensile strength regardless of where the break occurred.

Comparison of weight per unit length.

Single stranded string weighed 2.32 grams per foot or 195.5 feet per pound of paper. Multi-stranded string weighed 2.07 grams per foot or 219.1 feet per one pound. This is a significant difference which indicates that the multi-stranded string has comparable or slightly better carrying capacity at significantly reduced paper usage.

Additional tests should be performed to see what the difference is between the individual strands making up the multi-stranded cable or paper strength. At the present time no additional samples of the multi-stranded string were available to conduct these tests. The identity of the manufacturer of the multi-stranded paper string is being kept secret at the present time.

JOHN I. HAAS, INC.
HOPS
P. O. BOX 1441
YAKIMA, WASHINGTON 98907
TELEPHONE AREA CODE 509 457-5133

GROWER
DEALER

MAIN OFFICE
815 CONNECTICUT AVENUE
WASHINGTON, D. C. 200(

REGISTERED TRADE MARK

HOP FARMS IN CALIFORNIA, OREGON, WASHINGTON AND IDAHO

September 19, 1979

Alfred Haunold
Dept. of Crop Science
Agricultural Hall 37
Oregon State University
Corvallis, Oregon 97331

Dear Al:

I'm sending you small samples of the experimental varieties grown at Mabton. Those grown at Toppenish had alpha-acids similar to those at Mabton; however, yields were less at Toppenish.

I hand-picked these varieties at three intervals for alpha. The following are the alpha results at 7% moisture:

DATE PICK	VARIETY	ALPHA	BETA	HSI
8-30	21193 = 7005-194	13.8	4.6	.254
8-30	21194 = 7005-311	10.5	5.1	.256
8-30	21195 = 7006-408	9.4	5.6	.282
8-30	Brewers Gold	7.8	4.2	
9-7	21193	14.0	5.1	.244
9-7	21194	14.0	5.0	.244
9-7	21195	12.0	6.0	.270
9-7	Brewers Gold	9.0	5.0	.263
9-12	21193	14.0	4.9	.263
9-12	21194	13.7	4.6	.257
9-12	21195	11.3	5.7	.285

The entire yard was picked on 9-12 and 9-13, and at this time the average alpha of these baby Brewers Golds was about 8.0.

The yields are a little more difficult to determine. 21193 was the most vigorous and most of the 21 hills at Mabton reached the wire. Side-arm development of this variety was similar to that of Brewers Gold. 21194 was the least vigorous and only a couple reached the wire. 21195 was in between the other two in vigor.

I compared the three experimentals with the Brewers Gold in terms of cone numbers. My judgment was made on 3 or 4 of the best looking hills of each variety. 21193 had about 50%, 21194 had about 20%, and 21195 had about 40% of the cones of the adjacent Brewers Gold.

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WASHINGTON, D. C. 200

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Also: there was only 1 pc/hill planted as compared to several for BG

HOP FARMS IN CALIFORNIA, OREGON, WASHINGTON AND IDAHO

The yield of 21193 looked like it might be comparable to that of Brewers Gold, considering the weight of the cone, which averaged 3.4 times the weight of the Brewers Gold cone. At 7% H_2O, 20 cone samples of the baby Brewers Gold cones averaged 170 mg/cone, 21193 cones averaged 580 mg/cone, 21194 averaged 560 mg/cone, and 21195 averaged 290 mg/cone.

As mentioned before, the alphas at the Toppenish location were very similar to those of the Mabton location. I did not estimate yields at Toppenish, because the vigor was not as in Mabton. I think this is due partly to the plants at Toppenish being put into a mature yard and treated as such, and partly to soil differences. I believe next year they will do quite well at Toppenish and I will then evaluate them for yield.

I do have a few more notes taken during the growing season, if you want these, but the preceding information largely covers this years testing.

Sincerely,

Gene Probasco

GP:mb

cc: D. C. Office
Dr. F. L. Rigby
Mr. Herbert Lundberg

GOLDING FARM J·I·H INC. YAKIMA WASH.
REGISTERED TRADE MARK

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YAKIMA, WASHINGTON 98907

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GROWER
DEALER

MAIN OFFICE
815 CONNECTICUT AVENUE, N. W.
WASHINGTON, D. C. 20006

HOP FARMS IN CALIFORNIA, OREGON, WASHINGTON AND IDAHO

October 2, 1979

Alfred Haunold
Department of Crop Science
Agriculture Hall 37
Oregon State University
Corvallis, Oregon 97331

Dear Al:

I received your letter today. I believe the number and quality of roots of 21193 were comparable to that of the Brewers Golds. We planted four or five good roots of all of these varieties.

I notice your data indicates 21193 yields very similar to Brewers Gold. As I mentioned in the earlier letter, I believe 21193 would have yielded very close to what the Brewers Gold yielded in that yard (those baby Brewers Golds yielded 10½ bales per acre).

I believe what is misleading is that the cone numbers of 21193 were only perhaps 50% of Brewers Gold, but the cone weight of 21193 was 3.4 times that of Brewers Gold. Cone weight of 21193 would only have to be 2 times as great to have a yield equal to Brewers Gold. I think the yield of 21193 is there and I would be willing to expand testing of 21193 to 1 or 2 acre plots next year. I could produce the rootstock here next spring.

Sincerely,

Gene Probasco

GP:mb

A. S. "Bill" Nash: Pine Street, Godwin's Beach, M/S Caboolture
Queensland, Australia 4510

THE ORIGIN AND DEVELOPMENT OF PRIDE OF RINGWOOD: USDA Acc.No. 66052

from a personal letter dated Jan. 26, 1980, to A. Haunold, USDA, Corvallis: OR

There was a write up on Pride of Ringwood in Brewers Guardian , I sent it to them on 30th March 1975.It gives the background. Actually I never saw the finished product as I was moving around. Details of trials are all on file at Ringwood. Layout for yield trials were first submitted to Division of Mathematical Statistics,C.S.I.R.O. Canberra, who carried out a full analysis of variance over at least two seasons. Plots were 4 by4 and the inside 4 harvested for yield.Comparisons, Cluster, Late Grape, Ringwood Special,Ringwood Early. Ringwood Early crashed after 1 yr with virus. Clusters had a missing hill factor due to root-rot, but this was allowed for in the analysis.

Parentage you know:-OP seed of Pride of Kent harvested at E.M.R.S. Maidstone, Kent,Oct 1948. Grown at Ringwood 1950 as seedling 12/0/1 in nursery. Planted to hop garden 1951. OP seed saved March 1953, males present being a selection from T.A.Francomb of Huon,Tasmania . Seedling 115/3/1 was raised in glasshouse Oct.1953 and planted to hop garden in Dec 53. Cones analysed April 1954 and alpha only about 6%, but it exhibited a very high T.S.R.(Total soft resin) about 14.6. Easily the highest of all tested. Next year it went about 10.5 alpha and again the high T.S.R.

Mist propagation of surplus vine started Spring 1954 and these went into a nursery in 55 and were layered. About 56, I had enough cuttings to plant out ½ ac at Myrtleford. Yield trial also laid down 56, and first release made 1958.

Mr.Labroo of United Breweries of India, flew to England after I left in 1974, and asked Neve for J78. It was referred back to Melbourne and turned down. Any application of yours will receive the same treatment.

In July 1973, I asked to stay on for two years extra, to develop J78 and finish off the radiation genetics work, using gamma rays in conjunction with Brock at Canberra. This was declined, so J78 found its way to a small Island off the coast of New Zealand to be held pending my return from India. Also included was a highly inbred Pride Male. They survived a drought and were grown in the centre of the N.Island in 1954-55 under my eye. Aerial layered cuttings were taken to the Oamaru district in the South Island, where I had a plot in 55-56 and reselected them. Surplus shoots were mist propagated to have them free of eelworm. These were potted and finally planted in the mountains at about 1500 ft where rainfall is good.

The Dept. of Agriculture were breathing down my neck, so everything was dug up and burnt and I came back to Australia. The ones in the hills are probably still there if you want them.

J 78 is perfect on the picking machine, there is an abscission layer just below the lowest bractiole, so there is no stalk. Flavour not quite as good as Pride, but I have had it brewed and it is very nice. HAS YIELDED UP TO 3500 lbs/acre Late Grape is an old English variety, brought here about 1890. Hops very singly, hard to detach, alpha 3.5,dirty stem on cone. No use for breeding, I tried it for several years.

There is nothing marvellous about the breeding of J78. I made a survey of all Victorian gardens for males, and then gathered seed of Pride from one particular farm for several years. Anyone with half an eye for a hop can pick the male parent from about 10 yds away, by the shape of the leaf and the anthocyanins.

WYE, ASHFORD, KENT
TN25 5AH

WYE 812401 (STD 0233)

DEPARTMENT OF HOP RESEARCH

Dr. A. Haunold
Department of Crop Science
Agricultural Hall 37
Oregon State University
Corvallis
Oregon 97331
U.S.A.

10th October 1979

Dear Al,

Thank you for your letter about the Petham Golding. I thought I had written to you about this but it appears that although I intended to I have not done so.

East Malling checked the plants you sent by ELISA and found them to be infected with hop mosaic virus but the plants have remained symptomless. The outstanding feature of all the true Goldings is that they are susceptible to this virus and invariably show symptoms. For this reason alone I would say quite positively that your plants were not Petham Golding. = USDA 68052

So far as I can tell all the various Goldings are merely clonal selections of the same thing the differences being principally in time of maturity. The only clones which we have here are Bramling, Early Bird, Eastwell Golding, Cobbs and Mathon. The first two are available as virus-free meristem clones while all except Bramling are available free from hop mosaic but infected with Prunus Necrotic Ring Spot Virus.

It would probably be possible to obtain Petham Golding from a Grower but because there is no clear distinction between clones I could not guarantee that it is any closer to Cal's original introduction than our Eastwell Golding would be. There would also be problems of unknown disease status compared with our glasshouse material.

From our stocks the closest to the original would probably be our Eastwell Golding clone both for time of maturity and virus status. If you wanted a meristem clone I would suggest the Easly Bird.

We have propagated the other varieties you want and could send the Golding material with them although we can only provide unrooted cuttings of the Goldings whereas the others will be rooted. Let me know what you would like me to do.

Yours sincerely,

Ray

R.A. Neve.

Jan 24, 1979.

Fact sheet of important activities of Crop Science
Hop Research for Oregon Agriculture.

Alfred Haunold, Research Geneticist, and Associate Prof., courtesy.

1) Development of new hop varieties for Oregon growers:
Variet Cascade was released in 1972, has now about 1,000 acres in Oregon. High yield, good aroma, in great demand by brewers using aroma type hops. Cascade prices have risen sharply in recent weeks due to increased demand

Two triploid varieties, Columbia and Willamette, released in 1976. Currently about 75 acres planted of each variety.
Yields are about 25-30% higher than Fuggle. Both varieties are accepted as full replacement of Fuggle by brewers using aroma-type hops.
Both varieties rank with Fuggle as the highest priced hop varieties grown in the US. Both varietes are adapted primarily to the Willamette Valley of Oregon, giving Oregon growers a distinct advantage.

2) Development of male pollinators to stimulate hop yields.

8 triploid males have been tested in Oregon and are in the process of being registered by the Crop Science Society of America. Propagules have been made available to Oregon growers.

Diploid males have been released to growers to serve as pollinators and to increase hop yields.

3) Cooperation with the Oregon Hop Commission to increase rootstock of commercial and experimental varieties.

Propagules for increase are being made available annually to the Oregon Hop Commission.

Planting stock of important foreign hop varieties is being obtained regularly for testing in Oregon. Presently, one variety, Styrian, much in demand by certain brewers who import substantial quantities annually, is being increased for large-scale commercial testing in Oregon.

4) Development of herbicides and pesticides:

Nor-flurazone and paraquat have been tested and registered for use in hops.
Ronstar (Oxadiazone) is being tested cureently for bindweed control as well as for chemical stripping (suckering).

5) Additional activities involve on-site inspection of growers' fields for disease and insect problems, various soil problems, assistance with increase of hop planting stock, Hop field day, hop-school activities for grower education, liason between hop growers and brewers, analysis of hop samples for chemical constituents in order to facilitate sales etc.

Important Hop Research Projects: USDA-SEA. Corvallis, OR. 1979.
(background information for meeting with Miller BRew. Co. officials.Spring 79).

1) Commercial production of heat-treated and virus tested hop varieties.
   (Removal or reduction of certain hop viruses).
   Increased alpha acid content in all hops tested thus far (Table 1)
   Yield increase varies with certain hop varieties (Table 1).

2) Testing of foreign high-alpha hop varieties in the U.S.
   New Yugoslavian varieties Ahil, Atlas, Apolon, Aurora
   Dunav, Neoplanta, Vojvodenia
   New English variety Wye Target
   (Reprint Exhibit No. 1, page 25)

3) Breeding for new high-alpha varieties in the United States:
   Galena, new Idaho variety: Alpha to 14%; should be tested in
   Oregon and in the Yakima Valley
   New high-alpha lines from Prosser, WA, now being tested in Oregon.
   USDA Selection 21193: limited off-station testing in OR, WA, ID
   Line has higher alpha potential than Bullion, low co-fraction,
   good storage stability. (Tables 2 a, 2 b).

4) Development of high-alpha germplasm lines and basic studies on hop quality.
   USDA 21055. (Reprint Exhibit No. 2)
   Relationship of alph-beta-and lupulin. (Reprint Exhibit No. 3)
   Male lines with high alpha/beta ratio, good storage, low co-fraction.
   (Table 3 a).

5) Recurrent selection for alpha-acid content.
   1970 Nursery Selections: increased α and α/β ratio, cow CoF, storage
   1973 Nursery Selections: increased alpha and α/β ratio
   1976 Nursery Selections: increased alpha, lower beta, v.high α/β ratio
   (Tables 3a, 3b, 4)

6) Use of Triploid Males to increase Hop Yields.
   Yield increase of 15 - 20% by weight
   Little effect on alpha acid content (commercial Brewers Gold test)
   Low seed content
   Probably more beneficial to currently seedless hop production areas
   (Reprint Exhibit No. 4)

Table 1 : Heat treated (HT) vs. Non-heat treated (NHT) Hops

Variety		Years	Yield lbs/A	Alpha %	Beta %
Bullion	HT	7	2575	12.2	5.5
	NHT	7	1938	10.5	5.5
Fuggle	HT	7	1143	6.2	3.2
	NHT	7	1193	5.8	3.0
Cascade	HT	4	2523	7.1	5.9
	NHT	4	2003	5.8	5.4
Br. Gold	HT	2	1553	9.8	5.1
	NHT	2	1258	9.2	4.8
No. Brewer	HT	1	725	8.8	4.0
	NHT	1	171	7.0	2.9

Table 2 a.

New USDA Accession Number in 1979: 21193. Resistant to DM in 78 Greenhouse tests (20-can test).
Selection 7005-194; Pedigree: 65009 x 63015M; (BG x EG - XS) x (BG^2 x EKG - Bav S)

Year	Corvallis			Yakima (J.I.H.)			Prosser			Idaho A = best		
	α,	β,	Remarks	α,	β,	Remarks	α,	β,		α,	β,	
1978	11.9	4.6	981 lbs/A	14.9	5.6					11.5	4.2	
	11.0	4.6	1855 lbs/A DM/cones tight cones				10.1	5.2	P/FCP necrosis, terminal cone			
1977	12.3	4.4	bale 1429 lbs/A	10.8	4.6	HSI_0 0.29 HSI_6 0.41	10.8	4.9	12 1/4 #, adv., cont.	11.1	6.3	74% rem. vigor A, arm lgth A, clustering A, cone size A, good storage
	12.1	4.5	cones HSI_6 0.44; 78% rem; v. good storage						fair vig.			
							11.4	4.7	71% rem good stor.			
1976	12.6	4.9	821 lbs/A, good	13.3	5.0	69% rem.	13.3	5.0	16#, GCP loose,			
	12.6	4.5	HSI_6 0.37; 83% rem v. good storage	14.4	5.8	good vigor good yield			good vig. good yield			
1975	11.8	3.7										
1974	—	—										
1973	12.0	3.6	CoF22, good storage aroma									
1972	11.2	4.2										
Avg:	11.9	4.3		13.4	5.3		11.4	5.0		11.3	5.3	

HSI_6 hop storage index after 6 months common storage
CoF co-fraction, indication of co-humulone

Table 2 b.

Bullion control: 64100

Year	Corvallis			Yakima (J.I.H.)			Prosser			Idaho: A = best		
	α,	β,	Remarks	α,	β,	Remarks	α,	β,	Remarks	α,	β,	
1978	9.2	4.8	1312 lbs/A	5.6	5.3		7.3	5.0	FCP, term cone, 10 3/4 #			
	8.7	5.2	2033 "	5.4	4.8							
	10.6	5.4	2201 "	6.5	6.0							
	9.5	4.9	1408 "									
1977	11.5	6.0	2312 lbs/A; HSI_6 0.93	7.0	4.9	HSI_6 0.41	9.0	5.0	50% rem	7.8	5.3	vigor A
	10.5	5.0	1934 " 35% rem	6.4	4.7	HSI_6 0.40				9.6	5.8	arm length A, clustering A, cone size B
	10.0	5.3	1152 " poor storage	8.0	4.8	HSI_6 0.39						
1976	9.1	4.8	1610 lbs/A; HSI_6 0.69	5.7	4.2	very good	7.3	5.7				
	10.1	5.7	2218 " HSI_6 o.70 47% remaining	6.5	5.4							
				6.3	5.1							
1975	9.1	4.3		4.1	3.3	HSI_6 0.52 rel yield 3 (of 10)						
	11.2	5.9	2624 lbs/A									
1974	10.6	5.8	2043 lbs/A									
1973	10.0	5.1	1851 lbs/A									
1972	10.5	5.1	1680 lbs/A CoF 34									
Avg:	10.0	5.2		6.2	4.9		7.9	5.2		8.7	5.6	

HSI_6 hop storage index, 6 mos. common storage

CoF co-fraction, indication of co-humulone content

Table 3 a.

Recombinant recurrent selection for alpha acids:

Cycle I (1970 crosses)

65009 x 64035M
(α11, β9) α 43, β26, CoF 22, storage

7006-30M (21108M): α55, β25 CoF19, stor.
7006-450 α 13 β 5
7006-94M (21109M): α55, β20 CoF18, stor.
7005-194 now USDA 21193: α 11.9, β4.3 CoF 22, stor.

Bullion x 64035M
(α9, β4) α 43, β 26, CoF 22, storage

7007-18M (21110M): α50, β25, early
7007-335M (21111M): α23, β34, v. early
7007-339 α 13 , β6

Cycle II (1973 crosses)

Comet x 21108M
(α10, β5, ratio 67) 21109M
21110M
21111M

7303-07*
7303-165M*

No. Brewer x 21108M
(α8, β3, ratio 72) 21109M
21110M
21111M

7308-23M*

21055 x 21108M
(α14, β5, ratio 72) 21109M
21110M
21111M

7311-152, -141M*
7312-009, -036*, -041, -042*, -083*, -134
7313-083
7314-12*

Cycle III (1976 crosses)

6 females and 3 males (* above) crossed in all combinations.

Quality data of these parental lines are listed in Table 3 b.

Table 3 b.

Quality data of parents used for Cycle III (1976 crosses: 6 females crossed to 3 males).

Genotype	1975 α	1975 β	1975 α/α+β	1976 α	1976 β	1976 α/α+β	Remarks
Females:							
7303-07	15.5	4.7	77	10.6	3.5	75	early, vigorous
7312-36	14.8	3.0	83	13.3	3.6	79	tight cone
-42	18.7	5.6	77	10.6	3.4	76	tight cone, highest α/β
-83	15.6	4.1	79	16.4	4.2	80	no DM/c, high α/β
				15.6	4.4	78	
-134	14.3	3.1	82	13.8	3.3	81	high α/β
7314-12	15.3	6.7	70	14.0	6.1	70	high α/β
Males:							
7303-165M	50.1	14.3	78	51.1	25.3	67	early, vigorous
7308-23M	63.7	19.5	77	55.2	19.0	74	vigorous
7311-141M	61.9	19.2	76	54.2	21.0	72	vigorous

Selected Progeny from above crosses:

7601-006, -022, -059

7604-020

7611-005, -012, -025

7614-056

Table 4 : Recurrent Selection for α-acid content. 1 lb. bale samples, (*cone analysis)

Variety or Selection	1978 alpha	1978 beta	1978 α-ratio	1977 alpha	1977 beta	1977 α-ratio
7601-006	9.9*	1.8	84			
-022	10.9*	2.3	82			
-059	13.1*	3.6	78			
7604-020	10.3*	2.6	80			
7611-005	12.2*	2.9	80			
-012	14.3*	4.0	78			
-025	7.3*	1.1	87			
7614-056	15.8*	5.6	73			
7312-009	17.7	5.2	77	14.4*	5.1	74
-041	16.5	5.9	73	14.9*	4.7	76
7313-083	15.7	6.3	71	15.5*	4.6	77
7311-152	14.5	3.8	79	12.5*	3.1	80
21055	14.4	4.1	77	13.9	4.3	75
7006-398	13.6	7.5	64	12.7	5.7	68
7312-083	13.5	4.4	75	15.6*	4.1	79
7007-339	13.1	6.5	66	12.7	5.9	68
7006-450	13.0	5.0	72	13.1	4.5	74
Galena	12.3	8.4	59	—	—	—
v.f. Bullion	12.1	5.7	67	12.5	5.8	68

CROP SCIENCE RESEARCH ON SPECIALTY CROPS AT OREGON STATE UNIVERSITY.
September 1979:

HOPS

A. Haunold
Hatch Project 36

"Breeding Genetics, Pathology, Chemistry and Culture of Hops"

Commercial hop production in the United States is limited to Washington, Oregon, Idaho, and California. The reasons for this are partly historical, partly economic, and also related to the current Hop Marketing Order which restricts increasing hop acreage without prior approval of the Secretary of Agriculture and the grower organizations in the various states.

The total acreage in the United States in 1978 was as follows:

Washington	21,300
Oregon	5,500
Idaho	2,700
California	1,500

On that acreage a total of approximately 55 million pounds of hops was produced of which nearly 60% was exported in the current marketing year. This export figure is slightly above the average of the last ten years, but in general approximately 50% of the total U.S. hop production has been exported to over 90 different countries around the world. Total farm gate value of hops in the United States is about $50 million at current prices, and about $12 million in Oregon.

The majority of hop cultivars in current production date back over a considerable number of years and some, such as the English variety Fuggle, have been in commercial production for over 100 years. New varieties have appeared recently, partly as a result of the hop breeding and evaluation program at Oregon State University which is a federal-state-industry cooperative effort and also due to the work by hop researchers in other states, notably Idaho.

Among old established hop varieties, the variety Early Cluster makes up 45% of the total hop acreage. Other hop cultivars related to Early Cluster are: Late Cluster; Talisman; and California and Grants Pass seedless Clusters which in 1978 accounted for another 18% of the total hop acreage in the four states. Clusters are considered a kettle-type hop, suitable for a variety of brewing processes. Due to their excellent storage stability, Clusters are also an excellent hop for export.

Extractors who are primarily interested in resin content of hops prefer higher alpha-acid types such as Bullion, Brewer's Gold, and the new cultivar Comet. These three cultivars comprise a total of 15% of the U.S. hop acreage with Bullion and Brewer's Gold being grown primarily in Oregon and Comet grown in the state of Washington.

Aromatic hop cultivars are currently in great demand around the world. Presently insufficient quantities of specific types of aroma hop cultivars in the United States are available and about 10 million pounds are imported annually. Domestic production of aroma cultivars is based on the variety Fuggle (7% of total hop acreage grown primarily in Oregon). The new variety Cascade, released in 1972, is adapted to Washington, Idaho, and Oregon. Two recently released triploid cultivars, Columbia and Willamette, are well adapted to the Willamette Valley.

Hops research in the United States and particularly in Oregon is funded from three basic sources:

A. The U.S. Department of Agriculture which pays the salaries and some operating funds of researchers stationed at Oregon State University, (a plant pathologist, a research chemist, and a research geneticist).

B. Industry sources such as the Oregon Hop Commission and the U.S. Hop Research Council.

C. Oregon State University in the form of office and greenhouse space and experimental land.

Development of new hop cultivars and germplasm lines that possess superior agronomic and quality traits is the prime concern of the U.S. hop research program. Four new hop cultivars and approximately 15 germplasm lines have been released in the past decade.

Present research involves:

1. Developing additional germplasm lines with high alpha acid content, good storage stability of the resins, sufficient resistance to the major hop diseases such as verticillium wilt and downy mildew and a range of maturity from early August to late September.

2. Development of additional aroma-type cultivars and germplasm lines to reduce hop imports to the United States. Several advanced lines are currently being tested in two-acre plots.

3. Evaluation of foreign aroma hop cultivars such as Styrian and Hersbrucker that command a premium price on world markets.

Dr. Howard Brooks
USDA-SEA-NPS
Nation Program Staff Scientist
Fruit and Nut Section
Beltsville Ag. Res. Center
Beltsville, MD 20705

Dear Howard,

I am enclosing two examples of recent progress according to your memo of September 26. The memo is still circulating and I may get more.

Sam

Sam Likens

SL:mk
encl: Progress, Likens and Haunold
xc: Haunold
USDA file (Uhden)

Selected example of recent progress

S. T. Likens

The alpha-acids and beta-acids contained in the lupulin of hops provide beer with a pleasant bitterness. They are, however, subject to oxidation during storage to substances of less bittering power and less desirable flavors. A very simple test was developed to estimate the extent of oxidation of samples taken for chemical analysis for their alpha and beta acids content.

This test, known as the Hop Storage Index, or HSI, was adopted as an official analytical measurement by the American Society of Brewing Chemists in 1979. Its use has led to improved post-harvest handling practices and therefore improved quality...particularly for certain varieties which have poor storage stability. Limits for the HSI values of acceptable hops are now a routine part of contract specifications of certain major brewers.

Selected example of recent progress

A. Haunold

Nearly 5,000 acres of hops in Oregon's Willamette Valley are grown in the presence of male plants and are consequently seeded. This practice increases yields by about 25% but, since seeds are considered undesirable, results in price penalties based on the seed content. Several tripldid male lines have been developed at Corvallis, OR., over a tenyear period and eight were released in 1979. Pollen from these males stimulates growth of the hop cones but nearly eliminates the production of seeds. Using these male lines, Oregon growers realized about a 20% yield increase in 1978 and 1979 but suffered no penalties for seed content.

Hops grown in the Yakima Valley of Washington are traditionally seedless and cooperative trials are now under way to evaluate triploid males for production increases without invoking penalties for seedset.

ANNUAL RESEARCH PROGRESS REPORT (FY 1979)

I. Research Unit: Field Crops Breeding and Production Research Unit

USDA, SEA-AR
416 Weniger Hall
Oregon State University
Corvallis, Oregon 97331

II. Research Progress:

A. Technological Objective:

20010 Breeding and Production - fruits, nuts, and specialty crops.

(1) Develop new and improved varieties of fruits, nuts and specialty crops that combine improved yield potentials; quality characteristics; better resistance to pests; tolerance to environmental stress; and adaptation for mechanical culture, harvesting, and handling.

1. Progress Report - 5809-20010-006: Hop varieties and production.

a. Objective: Evaluate high alpha-acid selections for new varieties.

Progress: The high-alpha acid selections USDA 21193, 21194, and 21195 were planted in two small off-station tests in the Yakima Valley, WA, and in two small off-station tests in Oregon. Cone samples from the Washington and Oregon plots plus those from experimental plots near Corvallis confirmed the high-alpha acid potential of these three genotypes. USDA 21193 appears to have the greatest potential. This line is now being increased in preparation for large-scale commercial field trials in both states scheduled for 1980. (A. Haunold)

b. Objective: Commercial evaluation of the early maturing triploid USDA 21091.

Progress: Commercial yields of this genotype in 1979 averaged about 40% higher than Fuggle-H at the same location. Alpha acid content was lower than expected, partly due to improper handling after harvest. The cooperating brewer wants to continue testing this cultivar on an expanded scale. Two additional commercial locations of 21091 were planted in Oregon in 1979. (A. Haunold)

c. Objective: Commercial testing of early flowering triploid pollinators.

Progress: Five hills each of the following early to medium-early flowering triploid male genotypes were planted in a commercial Oregon Fuggle yard:

21102M, 21175M, 21177M, 21178M
21189M, 21190M, 21192M, 21197M

The four genotypes in the first group have already been registered and released. Their pollen shedding and yield stimulation will be compared with those in the second group. Due to shading from adjacent mature Fuggle plants, pollen shedding in 1979 was below normal. All plants got established well and detailed data will be obtained in 1980. (A. Haunold)

d. Objective: Selection of aroma varieties with low cohumulone and good storage.

Progress: Eighty-six female and twenty male selections were planted in replicated plots. Plants were trained on bamboo stakes and missing hills were filled in during the growing season from greenhouse-grown back-up material. Another group of twenty-seven aroma selections from Prosser, WA was planted in 5-hill plots in a seedless location for evaluation as mature plants in 1980. (A. Haunold)

e. Objective: Evaluation of foreign aroma-type hop cultivars.

Progress: The Yugoslavian aroma cultivar 'Styrian' was increased from soft-wood cuttings and about 8 acres were planted in 1979. The remainder of the 15-acre plot will be planted in 1980. Hersbrucker-G, a virus-free clone originally obtained from Germany, was increased in the greenhouse and about 4 acres were planted at a commercial Oregon location. One commercial Oregon plot of Tettnanger yielded about 1200 lbs/acre in 1979 in its second mature year, indicating that a premium price may be required for this cultivar to compete with Fuggle. Five-hill plots of ten clonal selections of Tettnanger were planted in a seedless test location in the spring of 1979. (A. Haunold)

f. Objective: Improved techniques for long-term pollen storage.

Progress: Freshly collected pollen of the four male genotypes 19036M, 19039M, 19172M, and 64103M was sent to Fort Collins, CO in a thermos jar, packed in dry ice. A control sample was kept at Corvallis. After three days in liquid nitrogen, pollen was shipped back to Corvallis and used for pollinating receptive Cascade plants. Initial seed set data indicate that liquid nitrogen pollen storage is feasible, although seed set is reduced as compared to fresh pollen samples. Additional pollen samples are stored in liquid N at Fort Collins for pollination in 1980. (A. Haunold)

g. Objective: Introduction of foreign hop germplasm.

Progress: Eight commercial hop cultivars from England, 5 cultivars and 10 indigenous hop genotypes from Yugoslavia were obtained in 1979. After completion of the mandatory quarantine period these genotypes will be included in the USDA World Hop Germplasm Collection at Oregon State University. (A. Haunold)

h. Objective: Identify sources of both high and low cohumulone in the alpha-acids of both male and female.

Progress: Samples have been collected from germplasm, commercial varieties and from experimental lines for cohumulone analysis. The method previously used for this analysis was not sufficiently precise and has been replaced by a liquid chromatograph. The instrument has been calibrated and analyses are in progress but there are presently too few data for summary. (S. Likens)

i. Objective: Identify superior male and female sources of high alpha-acids having good storage stability and low cohumulone.

Progress: Thirty males were identified with alpha ratios greater than 70 and with potentially good storage (HSI less than 0.4 after the 3-hr crush test). Acc. Nos. 63015M, 7303-105M, 7306-013M, 7309-045M, 7311-020M, 7311-122M, and 7311-141M had safe periods exceeding 6 hrs. Seventy-six lines were identified by 5-cone analysis to have more than 12% alpha. Of these, 1 was a commercial variety, 5 were from the 1970 high alpha crosses, 13 were from 1973 high alpha crosses and the remaining 57 were from the 1976 high alpha crosses. Storage tests on female samples are in progress and cohumulone values will be measured on selected samples of both male and female lines. (S. Likens)

j. Objective: Determine correlations of quality factors in both male and female lines.

Progress: Eleven commercial genotypes were ranked from 1 to 10 for their aroma values as recognized by the trade. Aroma scores improved with decreasing cohumulone values and with increasing values of the ratio of humulene to caryophyllene, C/H (sesquiterpone constituents of the essential oils). High correlations between cohumulone and C/H were found for both female and male samples . . . -0.90 and -0.87 respectively. It appears that the new value C/H may be useful in identifying aroma types either for advancement or for breeding. (S. Likens)

k. Objective: Establish whether the relationship between alpha-acids content and specific essential oil components have a bearing on acceptability of potential new varieties.

Progress: It was hypothesized that the oil component humulene was desirable because its oxidation products appear to be associated with hoppy character. Further, humulene concentration in proportion to alpha-acids (H/α) should be high because the hopping rate is adjusted according to the alpha level in hops. Trials with 11 varieties showed no relation between acceptability and H/α.

During the course of this work, it was discovered that a good general relationship exists between acceptability as aroma types and the humulene/caryophyllene ratio (C/H). Analysis of 77 commercial varieties and experimental lines showed that premium commercial aroma varieties have H/C greater than 3.0, that medium aroma varieties have H/C between 2.0 and 3.0, and that low aroma types have H/C values below 1.o . Observations under j and k may be useful in identifying premium aroma parental material and selections within progenies (S.Likens).

TO (2) Develop new and improved cultural and management practices for fruits, nuts, and specialty crops that increase yield, minimize production losses, improve quality, and conserve use of natural resources.

1. Progress Report - 5809-20010-006

a. Objective: Produce virus-free planting stock of Bullion and Brewer's Gold hop varieties for release to growers.

Progress: A commercial nursery agreed to increase planting stock of virus-free Bullion and Brewer's Gold for Oregon hop growers on a contract-fee basis. Starter material was provided by the USDA hop research project free of charge. By mid-summer 1979 over 50,000 potted plants of each cultivar were ready for distribution to interested growers. Due to limitations of manpower and greenhouse space, a project of this magnitude could not have been successful without the cooperation of a commercial interest. This phase of work in the future will be continued by commercial propagators. (A. Haunold)

b. Objective: Increase planting stock of introduced hop varieties Styrian, Hersbrucker and Hüller Bitterer for regional agronomic and quality evaluation.

Progress: Hüller Bitterer was found to be infected with a strain of prunus necrotic ringspot virus and was removed from all field trials. Potted plants were sent to the plant pathologist at Prosser, WA, who confirmed the presence of hop viruses. He initiated a program to remove all hop viruses from this cultivar by a combination of heat treatment and meristem tip culture. This phase of work will be included under Technological Objective (1), (Hop varieties and production) in future years. Styrian and Hersbrucker were increased vegetatively from soft-wood cuttings. Commercial test plots of both cultivars were planted in Oregon as discussed under Technological Objective (1), hop varieties and production, Objective e. (A. Haunold)

c. Objective: Cooperate with SAES scientist for evaluation of herbicides suitable for hop culture.

Progress: Replicated tests with the herbicide Ronstar in experimental plots near Corvallis and at two commercial locations gave good yield and efficacy data. Visual evaluations were made on three dates. Two treatments plus appropriate controls were harvested. Residue samples of green cones, dry cones, and foliage were collected from both trials and shipped to the USDA laboratory at Yakima, WA for analysis. (A. Haunold)

d. Objective: Control the early spring epidemic phase of hop downy mildew disease with systemic fungicides.

Progress: Five test plots in different commercial hop yards in the Willamette Valley, OR were treated with Ridomil. A total of 2,029 hills was treated either as a soil drench in early April or as

foliar spray later in the season. Hops were harvested from two of the five plots and compared to an equal number of control plots. A single application of Ridomil as a soil drench in early spring effectively controlled hop downy mildew. Some phytotoxicity was noted on young shoots which was probably due to the carrier compound used for the Ridomil formulation.

Due to the retirement of the principal investigator, this project will be transferred to the Oregon Agricultural Experiment Station, Oregon State University, in 1980. (C. E. Horner)

5800-09-15-00

B. The following CRIS Work Unit Progress Reports are attached:

5809-20010-006
5809-20010-007
5090-20013-009-A
5090-20014-010-A

C. Principal Accomplishments and Significance.

Eight triploid hop pollinators with medium early, medium, and late pollen shedding dates, respectively, were released to commercial hop growers. These males have the potential of significantly increasing hop yields through physiological stimulation of increased cone size coupled with minimal production of unwanted seeds. The pollinators will be particularly useful to Washington hop growers for stimulating higher yields of Bullion and Brewer's Gold, and to Oregon growers producing medium-late to late flowering hop cultivars with reduced seed content.

2. Progress Report:

a. Tangible achievements:

1. Haunold, A. and G. B. Nickerson. Hop yield stimulation by triploid males under field conditions. Crop Science 19:27-31. 1979.

2. Haunold, A., C. E. Horner and G. B. Nickerson. Registration of eight triploid hop pollinators. Crop Science 19:753-754. 1979.

3. Nickerson, G. B. and S. T. Likens. Hop Storage Index. Am. Soc. Brewing Chemists Journal 37:184-187. 1979.

4. Roberts, D. D. Mint breeding and genetic research. Oregon Essential Oil Growers League, Proceedings of 30th Annual Meeting, 1979. pp. 7-8.

5. Roberts, D. D. Programs to reach yield potential for mint. Irrigated Agriculture Fertilizer Conference, Proceedings, 1979. pp.6-7.

b. Other achievements:

1. Haunold, A., S. T. Likens and G. B. Nickerson. Annual Report to the U.S. Hop Research Council: 1979 Hop Research. December 1979. 38 pp.

2. Haunold, A. Hops: History, Botany, Breeding and Production. Course outline, U.S. Brewer's Association Shortcourse on Brewing and Malting Technology. Madison, WI. October 23, 1979. 27 pp.

3. Likens, S. T. and A. Haunold. Oral report on hop research during 1978, presented at the Annual Hop Convention, Sacramento, CA. January 15, 1979.

4. Likens, S. T. and A. Haunold. U.S. Hop Research Advisory Committee, report on hop research activities during 1978. Sacramento, CA. January 16, 1979.

5. Roberts, D. D. Invited presentation, Mint Breeding and Genetic Research. Washington Mint Commission 18th Annual Meeting, January 9, 1979 Yakima, WA.

6. Roberts, D. D. Invited presentation, Northwest Mint Research. Idaho Mint Growers Association 9th Annual Meeting. January 15, 1979 Boise, Idaho.

7. Roberts, D. D. Presentation at Mint Breeding and Genetic Research, National Mint Research Conference, July 9-10, 1979, Portland, Oregon.

U.S. DEPARTMENT OF AGRICULTURE

RESEARCH WORK UNIT/PROJECT DESCRIPTION - PROGRESS REPORT

U.S. DEPT. OF AGRICULTURE, STATE AGRICULTURAL EXPERIMENT STATIONS AND OTHER INSTITUTIONS

15 FEB 80

ACCESSION NO.	2. AGENCY IDENTIFICATION NO.	3.	4.	5. WORK UNIT/PROJECT NO	6. STATUS TERMINATED	30. ESTIMATED TERMINATION DATE
0044254	ARS	5809	1500000000	5809-20010-006	E ☐	17 JAN 1983

TITLE

IMPROVED HOP VARIETIES AND PRODUCTION PRACTICES

PERFORMING ORGANIZATION

USDA-ARS FLD CRPS BREED PROD
CARCLEY HALL
OREGON STATE UNIV
CORVALLIS
OREGON 97331

(12) INVESTIGATOR NAME(S)

1 ~~HUMFELD C E~~
2 HAUNOLD A
3 LIKENS S T
4
5
6

13A. PERIOD COVERED BY THIS REPORT (Month & year)

From: 0179 Thru: 1279

PROGRESS REPORT

The early maturing triploid USDA 21091 had substantially higher yields than Fuggle at the same location, but lower alpha acid content. The high-alpha acid selection USDA 21193 averaged about 13% alpha acid in Oregon and Washington tests, significantly higher than Brewer's Gold. Eight male triploid genotypes were released as "pollinators" to commercial hop growers. Eighty-five aroma-type female and 20 male selections were selected from about 1,200 genotypes analyzed for agronomic and quality characteristics, including storage stability. These selections were planted in replicated plots for further evaluation. Twenty-three aroma and 25 high-alpha selections from Prosser, WA were planted in a seedless location for advanced testing. The European aroma cultivars Styrian (USDA 21049) and Hersbrucker-G (USDA 21185) were planted in large off-station field trials in Oregon. Eight early flowering triploid males were planted in a commercial Oregon Fuggle yard for evaluation of pollen shedding and yield stimulation. Feeding radioactive CO2 to immature hop shoots showed that alpha- and beta-acids are synthesized simultaneously and at nearly equal rates on a molecular basis, indicating they probably arise from a common precursor. A high positive correlation was found between published aroma values of commercial hop cultivars and the ratio of humulene:caryophyllene in their essential oils.

PUBLICATIONS

1. HAUNOLD, A. and NICKERSON, G. B. 1979. Hop yield stimulation by triploid males under field conditions. Crop Science 19:27-31.

2. HAUNOLD, A., HORNER, C. E. and NICKERSON, G. B. 1979. Registration of eight triploid pollinators. Crop Science 19:753-754.

3. NICKERSON, G. B. and LIKENS, S. T. 1979. Hop storage index. J. Am. Soc. Brewing Chemists 37:184-187.

APPROVED (Signature) /s/ TITLE ARC DATE 2-15-80

ANNUAL RESEARCH PROGRESS REPORT (FY 1979)

I. Research Unit: Field Crops Breeding and Production Research Unit

USDA, SEA-AR
416 Weniger Hall
Oregon State University
Corvallis, Oregon 97331

II. Research Progress:

A. Technological Objective:

20160 Introduction, classification, maintenance, evaluation and documentation of plant germplasm.

(1) Expanded collections and improved maintenance, evaluation and distribution of plant germplasm as sources of useful genetic material to improve existing crops and developing new crops.

1. Progress Report - 5809-20160-002: Collection, preservation and evaluation of mint and hop germplasm.

a. Objective: Establish, maintain and evaluate genetic stocks of mints (Mentha) and hop (Humulus) germplasm.

Progress: A collection of about 650 Mentha genotypes was maintained and serves as a germplasm source for a mint breeding and genetic research program. About 150 new mint plants representing six species were evaluated for possible inclusion to the collection. Only about five of the 150 is worthy of maintaining in the collection. Data were obtained from entries in the collection for vigor, maturity, fertility, and resistance to rust and powdery mildew. Oils were collected and analyzed by GLC from about 450 of the entries. The hop germplasm collection was expanded by introduction of new genotypes from England, West Germany and Yugoslavia. Hop germplasm was distributed to scientists in: Australia, Yugoslavia and West Germany. (D. Roberts and A. Haunold)

B. Progress Report for CRIS Work Unit 5809-20160-002 is attached.

FORM AD 421 (6/79) U.S. DEPARTMENT OF AGRICULTURE

RESEARCH WORK UNIT/PROJECT DESCRIPTION - PROGRESS REPORT

U.S. DEPT. OF AGRICULTURE, STATE AGRICULTURAL EXPERIMENT STATIONS AND OTHER INSTITUTIONS

DATE (Day, Mo., Yr.): 15 FEB 80

1. ACCESSION NO.	2. AGENCY IDENTIFICATION NO.	3.	4.	5. WORK UNIT/PROJECT NO	6. STATUS TERMINATED	30. ESTIMATED TERMINATION DATE
0044359	ARS	5809	1500	5809-20160-002	E ☐	01 MAR 1982

TITLE

COLLECTION, PRESERVATION AND EVALUATION OF MINT AND HOP GERMPLASM

7. PERFORMING ORGANIZATION	12. INVESTIGATOR NAME(S)	
USDA-ARS FLD CRPS BREED PROD CARDLEY HALL OREGON STATE UNIV CORVALLIS OREGON 97331	1 HOP-TC-C-F 2 HAUNOLD A 3 Roberts, D. D.	4 5 6
	84. PERIOD COVERED BY THIS REPORT (Month & year)	
	From: 0179	Thru: 1279

13. PROGRESS REPORT

A collection of about 650 Mentha genotypes was maintained and serves as a germplasm source for a mint breeding and genetic research program. About 150 new mint plants representing six species were evaluated for possible inclusion to the collection. Only about five of the 150 is worthy of maintaining in the collection. Data were obtained from entries in the collection for vigor, maturity, fertility, and resistance to rust and powdery mildew. Oils were collected and analyzed by GLC from about 450 of the entries.

The hop germplasm collection was expanded by introduction of new genotypes from England, West Germany and Yugoslavia. Hop germplasm was distributed to scientists in: Australia, Yugoslavia and West Germany.

14. PUBLICATIONS

None.

APPROVED (Signature) | TITLE: ARL | DATE: 2-15-80

5800-09-15-00

ANNUAL RESEARCH PLANS (FY 1980)

I. Research Unit: Field Crops Breeding and Production Research

USDA, SEA-AR
2080 Cordley Hall
Oregon State University
Corvallis, Oregon 97331

II. Program Mission Statement:

The mission of the Field Crops Breeding and Production Unit at Corvallis, Oregon, is improved varieties and production practices for hops, mint, wheat and triticale. In addition, the unit gives attention to the acquisition, maintenance and preservation of hop and mint germplasm. The hop and mint work is both basic and applied research with emphasis on developing new and improved varieties through the genetic application of polyploidy, mutation and hybridization. The work with wheat and triticale is mostly basic research. The wheat genetics program emphasizes new sources of virulence and inheritance of resistance to diseases, while the biochemical focus is on new controls for the wheat smut diseases and the identification of new wheat hormone systems.

III. Research Unit Leader:

C. E. Horner, Supervisory Plant Pathologist
FTS: 425-4507
COM: (503)754-4507

IV. Program Identification:

20010 - Breeding and Production - fruits, nuts and specialty crops
20050 - Breeding and Production - wheat, oats, barley, rice and other small grains
20160 - Introduction, classification, maintenance, evaluation, and documentation of plant germplasm
20280 - Weed control

V. Approvals:

Research Unit Leader _____ (Recommend) May 9, 1979 (Date)

Area/Center Director _____ (Concur) _____ (Date)

Regional Administrator _____ (Approval) _____ (Date)

VI. Cris Work Unit Relationships:

CRIS Work Unit			Termination	Percent of CWU's to TO (FY 1980)	
Work Unit No.	SY	Title	Date	NRP/SRP TO No.	Percent
Inhouse					
5809-20010-006		Improved hop varieties	17 JAN 83	No. 1	90
Haunold, A.	1.0	and production practices		No. 2	10
Likens, S.	1.0				
Horner, C.	0.5				
5809-20010-007		Improved mint varieties	24 MAR 83	No. 1	80
Roberts, D.	1.0	and production practices		No. 2	20
Horner, C.	0.5				
5809-20050-001		Genetics and evaluation of	21 JUL 81	No. 1	100
Metzger, R.	1.0	bunt and other diseases in wheat and triticale			
5809-20050-002		The use of natural regula-	21 JUL 80[a/]	No. 2	100
Trione, E.	0.9	tory substances to enhance the development of wheat and to control wheat bunt			
5809-20050-003		Development of new tests to	27 DEC 81	No. 2	100
Trione, E.	0.1	identify pathogenic races of the sugarcane smut fungus			
5809-20160-002		Collection, preservation	01 MAR 82	No. 1	100
Haunold, A.		and evaluation of mint and			
Horner, C.		hop germplasm			
	6.0				
Extramural					
5090-20013-009-A		Evaluation of mint strains	31 DEC 79	No. 1	100
(C. Horner, Purdue)		for resistance to Verticil-lium wilt			
5090-20014-010-A		Screening and evaluation of	31 DEC 79	No. 1	100
(C. Horner Wash. St. Univ.)		mint strains for disease resistance, yield and quality			
5090-20282-003-A		Mint weed control in	31 DEC 79	No. 2	100
(C. Horner Ore. St. Univ.)		southern Idaho and eastern Oregon			
8001-20050-003		Development and evaluation	18 AUG 79[b/]	No. 1	100
(R. Metzger, India)		of triticale			
8002-20050-115		Improvement of triticale for	02 OCT 82	No. 1	100
(R. Metzger, PAK)		yield and yield components			

[a/] To be revised in FY 1980.

[b/] Terminated but listed because renewal or extension is pending.

VII. Plan of Work:

NRP 20010 Breeding and production - fruits, nuts, and specialty crops.

A. Technological Objective No. 1: Develop new and improved varieties of fruits, nuts and specialty crops that combine improved yield potentials; quality characteristics; better resistance to pests; tolerance to environmental stress; and adaptation for mechanical culture, harvesting, and handling.

1. CRIS Work Unit 006 - Improved hop varieties.

a. Objective: Evaluation of high alpha acid hop selections.

Plan: Evaluate nursery material from the third cycle of recurrent selection for high alpha acid content. Evaluate three promising selections from the first cycle (1970 crosses) in the Yakima Valley and at Parma, Idaho and one selection in field trials at three locations in Oregon, all planted spring 1979. Obtain agronomic and quality data from selections of the second cycle (1973 crosses) after the second year of mature field testing at Corvallis.

b. Objective: Commercial evaluation of early maturing triploid USDA 21091.

Plan: Harvest third mature crop from commercial plot in Oregon and channel hops into plant scale brewing trials of a cooperating brewer. The first mature crop of 21091 from a second location in Oregon planted in 1979, will be harvested in 1980 for commercial brewing trials.

c. Objective: Commercial testing of early flowering triploid pollinators.

Plan: Eight early flowering triploid males planted in a seedless Fuggle yard in Oregon in 1979, will be evaluated for the first mature year in 1980. Data on pollen production, vigor, agronomic performance and seed set and cone size stimulation of Fuggle will be obtained, as well as synchronization of flowering time with the target cultivar Fuggle.

d. Objective: Selection of aroma varieties with low cohumulone and good storage stability.

Plan: Eighty-six selections from a progeny on Cascade (1976 Nursery) that were planted in a seedless five hill observation nursery in 1979 will be evaluated for the first mature year in 1980. A small number of selections sent to Prosser, Washington in spring 1979 will also be evaluated in 1980 as mature plants. Yield and agronomic data in addition to alpha and beta acids content, storage stability, cohumulone content, oil composition and aroma characteristics will be obtained.

e. Objective: Evaluation of foreign aroma type hop cultivars.

Plan: Styrian, an aroma variety from Yugoslavia that was increased for planting of 15 acres on a commercial location in Oregon in 1979 will be harvested in 1980. Baled hops will be made available to a cooperating brewer for plant-scale brewing trials.

Hersbrucker, a German aroma-type hop that was increased from two plants to three acres in 1979 will be harvested for the first mature year in 1980. Bale quantities will be available for plant-scale brewing trials. In addition, agronomic data will be obtained at the two commercial locations in Oregon for both Styrian and Hersbrucker.

Tettnanger, a German late-maturing aroma-type hop that was planted at two commercial locations in Oregon in 1978 and 1979 will be evaluated under commercial conditions and compared with other aroma-type hop cultivars. Ten-hill plots from ten randomly selected Tettnanger plants from the first commercial location in Oregon (1978 planting) will be evaluated and compared with the standard Tettnanger and Swiss Tettnanger in a seedless test location near Corvallis in 1980. This test was planted in spring 1979.

f. Objective: Improved techniques for long-term hop pollen storage.

Plan: Continue cooperation with another SEA Scientist for storage of hop pollen in liquid nitrogen. Study germination of hop pollen on artificial media and correlate germination data with seed set from hand pollinations.

g. Objective: Introduction of foreign hop germplasm.

Plan: Continue efforts to obtain additional genetic material from major hop breeding centers around the world, particularly in England, Germany, Czechoslovakia, Yugoslavia, and others. Soft-wood cuttings made from 15 introductions obtained from Yugoslavia in 1979, will be planted in the germplasm collection in 1980.

h. Objective: Identify sources of both high and low cohumulone in both male and female lines and to cooperate with the geneticist to determine inheritance patterns. Low cohumulone is associated with improved foam stability in beer.

Plan: The present method for cohumulone estimates is believed to be unreliable. After improvement of the method certain groups of germplasm will again be screened for cohumulone. This will be followed by chemical analysis of samples from progenies of crosses involving high and low parents.

i. Objective: Identify superior female and male sources of high alpha acids having good storage stability and low cohumulone.

Plan: Five hundred to 1000 samples from female plants (lines) will first be analyzed for alpha-acids. These will be stored under controlled conditions and reanalyzed to identify storage stability. Lines showing both good storage and high alpha will be analyzed for cohumulone content. In addition, male lines from both germplasm and crosses will be assessed for alpha ratios. Those exceeding 70 will be screened further for antioxidant level. The best of these will be screened for permeability of their lupulin pellicles.

j. Objective: Determine correlations of quality factors in both female and male lines.

Plan: Although this is largely a mathematical exercise with data acquired under objective (i) it is important to the geneticist when combinations of quality traits are attempted. Standard statistical methods will be used.

k. Objective: Establish whether the relationship between alpha-acids content and specific essential oil components have a bearing on the acceptability of new varieties.

Plan: It appears that humulene or its oxidation products may contribute to the "hoppy" character of beer flavor. High alpha varieties will be analyzed for oil contents and the oils will be analyzed for humulene content. The range of ratios of alpha-acids to humulene will be established and related to flavor profiles.

2. CRIS Work Unit 007 - Improved mint varieties.

a. Objective: Determine the genetic complement of factors regulating biosynthesis of major chemical components in oils of selected Mentha citrata genotypes.

Plan: Data collected from replicated progeny tests will be analyzed by gas chromatography to determine the complement of genetic factors regulating oil biosynthesis of selected genotypes of Mentha citrata in the mint germplasm collection.

b. Objective: Breed for vigorous, high yielding lavendaceous odored mints.

Plan: Select for desirable agronomic and quality characteristic in progeny populations derived from inter- and intraspecific crosses with Mentha citrata and other Mentha species.

c. Objective: Breed for high yielding menthol type mints.

Plan: Establish, for selecting mints with oil high in menthol, progeny populations derived from controlled inter- and intra-specific crosses with Mentha arvensis and other Mentha species.

d. Objective: Determine the chemical composition of oils from selected genotypes to establish the variation within and between Mentha species in the germplasm collection.

Plan: Oil will be collected from selected mint genotypes by steam distillation and analyzed by gas chromatography. Major chemical components of the oils will be identified by mass spectrographic analysis. The data will be analyzed and summarized to provide immediate information on the variability of important chemical compounds in oils present in the mint germplasm collection as well as basic information needed for future genetic studies.

e. Objective: Identify sources of mint rust resistance in the mint germplasm collection as a preliminary step to initiating a rust resistance breeding program.

Plan: Continue evaluating each of over 600 individual mint genotypes to identify resistance to both peppermint and spearmint rust.

3. CRIS Work Unit 009-A (CA, Purdue University) - Evaluation of mint strains for wilt resistance.

a. Objective: Complete contract research on determination of level of resistance to Verticillium wilt disease in irradiation-induced mutant clones of spearmint and peppermint.

Plan: Irradiation-induced mutant clones of spearmints and peppermints supplied by SEA-AR will be vegetatively propagated. Uniform plants of each clone will be inoculated with a virulent strain of Verticillium dahliae. Levels of resistance will be determined under environmentally controlled conditions.

4. CRIS Work Unit 010-A (CA, Washington State University) - Screening and evaluation of mints for resistance, yield and quality.

a. Objective: Identify strains of mints resistant to wilt, powdery mildew and rust, and evaluate selected resistant strains for agronomic characteristics.

b. Plan: Conduct field and greenhouse tests for disease resistance using strains of mints provided by SEA-AR. Select resistant strains and grow these in field plots to evaluate their general agronomic suitability as new varieties.

B. Technological Objective No. 2: Develop new and improved cultural and management practices for fruits, nuts, and specialty crops that increase yield, minimize production losses, improve quality, and conserve use of natural resources.

1. CRIS Work Unit 006 - Improved hop production practices.

a. Objective: Cooperate with SAES scientists for evaluation of herbicides suitable for hop culture.

Plan: Provide hop cultivars in sufficient numbers for replicated testing of promising herbicides for hops. Currently the herbicide oxadiazone (ronstar) is under investigation and the second year of field trials will be available in 1980.

b. Objective: Control the early spring epidemic phase of hop downy mildew disease with systemic fungicides.

Plan: Systemic fungicides Ridomil and Alliette will be applied to replicated plots at key locations in Oregon and Washington where hop downy mildew is or has epidemic potential. Treatments will be made only in early spring to control the systemic, crown-infecting stages and to reduce probability of residues in the harvested crop. Standard phytopathological procedures will be used to determine efficacy.

2. CRIS Work Unit 007 - Improved mint production.

a. Objective: Develop soil assay tests for the presence and level of Verticillium dahliae fungus in soils used for hop and mint production.

Plan: Additional refinements of existing methods, or new techniques of soil microbiological analyses will be tested for their efficacy in detecting and enumerating V. dahliae in soil populations. Tests will involve selective media containing inhibitors of other soil microbes and new techniques for physically concentrating propagules of the target fungus.

NRP 20160 Introduction, classification, maintenance, evaluation and documentation of germplasm.

A. Technological Objective No. 1: Expanded collections and improved maintenance, evaluation and distribution of plant germplasm as sources of useful genetic material to improve existing crops and developing new crops.

1. CRIS Work Unit 002 - Collection, preservation, evaluation of mint and hop germplasm.

a. Objective: Collect, maintain, evaluate catalog and preserve genetic stocks of mints and hops.

Plan: About 600 mint and 300 hop genotypes will be maintained as clonal material until turned over to the National Plant Germplasm Repository in 1981. New accessions will be added from Asia, Africa and Europe.

POSITION RESOURCE MANAGEMENT SUMMARY

PLANNING UNIT: Field Crops Breeding and Production

LOCATION CODE: 5800-09-15-00

ORGANIZATION/LOCATION: Oregon-Washington Area Corvallis, Oregon

DATE: May 30, 1979

TYPE OF FUND	WRU NUMBERS AND AMOUNTS	TOTAL
Regular (X01)	20012, $214,800; 20050, $117,000; 20051, a/; 20162, $17,700	$ 349,500
Reimbursable (X08)		
Contributed (993)		

I – FUNDS	GOAL FY 1981	FISCAL YEAR 19 80
Salary and related costs	$280,400	$277,000
All Other	51,400	72,500
Total available to Research/Administrative Unit	$331,800	$349,500
II – MANAGEMENT CRITERIA		
Percent in Salaries	85%	79% (73%) b/
Support Years per SY	0.7	0.6 (1.4) c/
"Bench Dollars" per SY	$ 55,300	$ 58,250 d/
Clerical Years per Specialist/Technician Years		

III – DISTRIBUTION OF RESOURCES	GOAL FY 1981 MY	GOAL FY 1981 FUNDS	FISCAL YEAR 19 80 MY	FISCAL YEAR 19 80 FUNDS
Salary and Related Costs *(Staffing Summary attached)*		$		$
SY's	6.0	$224,100	6.0	$222,100
Professional Support				
Specialists				
Technicians/Aids	3.5	45,000	3.5	44,500
Trade and Craft Occupations (WG)				
Secretarial/Clerical	1.0	10,300	0.9	9,400
Overtime, Holiday/Sunday Premium, Night/Shift Diff.		1,000		1,000
Promotions, Awards, QSI				
Sub-Total	10.5	$ 280,400	10.4	$ 277,000
All Other:				
Travel		$ 12,000		$ 13,000
Rent, Communications, Utilities				
Other Services				
Broad Form CA's (Supplies & Services)		4,000		3,000
Supplies and Materials		20,000		30,000
Equipment		7,900		15,300
Extramural				
BFCA Temp. Employees	1.0	10,000	1.5	15,000
Federal Temp. Employee	0.5	5,200	0.5	4,800
Biochemist-GS-9 or GCA	1.0	18,100	1.0	17,200
Sub-Total	2.5	$ 77,200	3.0	$ 98,300
TOTAL e/	13.0	$ 357,600	13.4	$ 375,300
IV – NON-FEDERAL CONTRIBUTIONS	3.0	$ 80,000	3.0	$ 82,700

REMARKS:

a/ Sugarcane smut research $25,800, placed under "all other".

b/ Percent in salaries when all funds considered.

c/ Support years per SY when non-federal support considered.

d/ Bench dollars per SY = $72,000 when non-federal support considered.

e/ Total excludes $19,600 and 1 MY directed to location support and $2,250 for location vehicle fund.

5800-09-15-00

IMPLEMENTATION PLAN - NARRATIVE

The missions of the unit require extensive field, greenhouse and laboratory facilities and equipment. Ability to obtain and expand these facilities was enhanced by Congressional increases in FY 1978 and 1979 for mint research, and an increase in FY 1979 for a new program on sugarcane smut.

The unit has substantial, ongoing support from the national Mint Industry Research Council, national Hop Research Council, regional and state wheat industry groups and state commodity commissions. In FY 1980, these funds are expected to total about $80,000. All industry funds are channeled through Oregon State University at no or low overhead charges and are used to support three or four state positions assigned to the unit and for supplies and services.

Long Range Goals:

The mint industry is seeking additional appropriations from Congress to increase the mint research program by two SY's. Should increases materialize, the priorities of the unit would be to add a plant pathologist and an entomologist. The hop chemist, S. T. Likens, plans to retire in September, 1981. If his slot can be retained within the hop research program, serious consideration should be given to expanding the federal hop research program at Prosser, WA. Both the hop growers and industry groups desire to expand the program at Prosser and are willing to give financial support. Growers and industry representatives have indicated that the greatest need is for a new variety development program.

Short Range Goals:

With the increase for sugarcane smut work we propose to add a GS-9 Biochemist, fixed term appointment, to work under the supervision of Dr. E. J. Trione. We also plan to increase Jeanette Uhden, Clerk Dictating Machine Transcriber, from 35 hours PPT to PFT as soon as a slot becomes available.

Retirement (June 1979) of Mr. B. Silbaugh in Dr. Metzgers program presents a special problem. A very large amount of genetic material is already under field testing. Much of this material already has several years of research invested in it which should be completed. Therefore, we are working with the Area Director to retain the funds and refill the position.

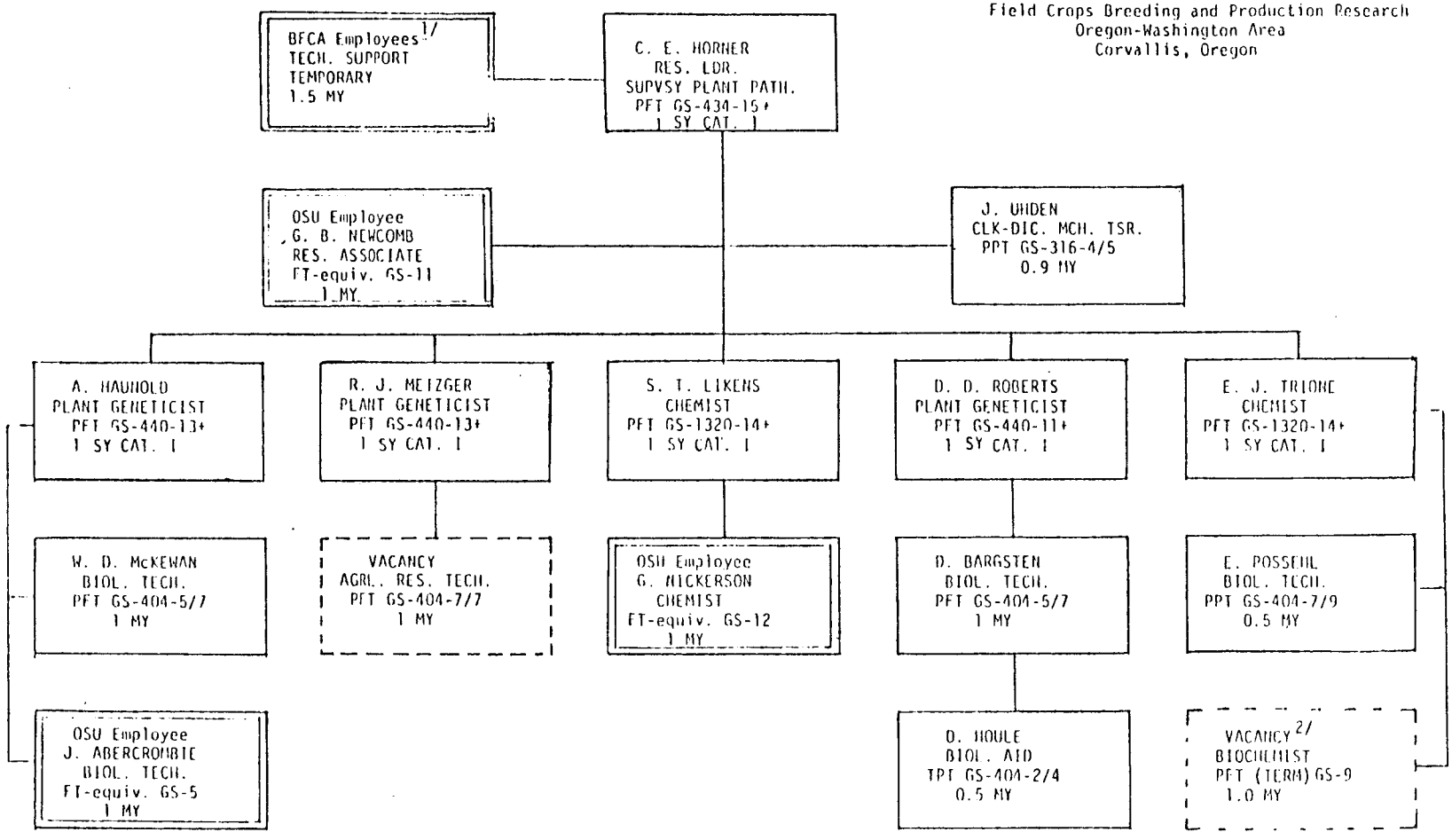
Funds in WRU 20160, hop and mint germplasm ($17,700), will be retained by this unit through FY 1980. In FY 1981, we plan to transfer the responsibility and funds to the National Plant Germplasm Repository at Corvallis, OR.

Signature and Title Research Leader — Date June 4, 1979

Signature and Title — Date

IMPLEMENTATION PLAN

5800-09-15-00
Field Crops Breeding and Production Research
Oregon-Washington Area
Corvallis, Oregon



1/ BFCA temporary part-time employees assigned to programs as needed.

2/ To be funded from Regional Reserves; to be filled by TFT initially.

H O P P A T H O L O G Y

Virus testing by C. B. Skotland, Prosser, WA. March 1979.
Two plants each (-1, -2) started in greenhouse (Corvallis), Feb. 20, 1979; rhizomes dug Feb. 1979.
Material transported to Prosser, March 12, 1979, in boxes to avoid contamination.
Plants tested by ELISA technique with the apple, hop PNRSV,and hop mosaic antiserum .

Accession Number	Name	Apple 1/ PNRV		Hop PNRV		Hop Mosaic		Hop virus 24	
		rhizome	leaves	rhizome	leaves	rhizome	leaves	rhizome	leaves
21016-1	Fuggle N (v. free)	0	0	+	0	+	+	0	0
-2	"		0		+		0		0
48209-1	Fuggle H (infected)	0		0		0		+	
-2	" "		0		0		0		0
21056-1	Bullion 10A (vf)	0	0	+	0	+	+	+	+
-2	" "		0		+		+		+
64100-1	Bullion (inf.)	0	0	+	+	+	+	+	+
-2	" "		0		+		+		+
21092-1	Cascade (vf)	0	0	+	+	+	0	0	0
-2	" "		0		+		+		0
56013-1	Cascade (inf.)	0		+	+	+	+	+	+
-2	"	too weak for testing							
21116-1	Brewer's Gold (vf)	0	0	0	0	+	+	0	0
-2	"		0		0		+		0
19001-1	Brewer's Gold (inf.)	0	0	+	+	+	+	+	+
-2	"		0		+		+		+
21093-1	No. Brewer (vf)	0	0	0	+	0	0	0	0
-2	"		0		+		0		0
64107-1	No. Brewer (inf.)	0	0	+	+	+	+	0	+
-2	"		0		+		+		0

1/ Blank space: plant too small - will be analyzed later.

ELISA TESTS FOR HOP VIRUSES: June 25, 1979.

Dr. R. Converse, USDA, OR. State University, Dep. of Botany & Pl. Pathology.

All tests for hop mosaic were negative: HMV and APMV

Prunus necrotic Ringspot Virus: possible positive reaction:

USDA 21104 M
USDA 21102 M

Prunus necrotic Ringspot Virus: negative reaction:

USDA 21105 M
21106 M
21175 M
21176 M
21177 M
21178 M

All the above genotypes are triploid males suitable for pollination

1979 20-POT DOWNY MILDEW PROGENY TEST
17 August - 24 October

HOP GENOTYPE		HEALTHY	LIGHT	MODERATE	SEVERE	TOTAL	DISEASE INDEX	RESISTANCE RATING	REMARKS
65102	Yak.Cluster				20	20	3.0	S	Susceptible control
21188	NP2/55	11	5(pith)			16	.31	R	very slightly developed spike
21187	South.Br.	16	2(pith)			18	.11	R	
19005M		2	18i			20	.90	I?	
19009M		12	9i			21	.43	R	
19036M		20				20	0	R	
19039M	✓	14	4	2		20	.4	R	
19040M	✓	15	5i			20	.25	R	
19041M		8	5 + 3i	4		20	.8	I	
19170M		9	3i			12	.25	R	
19172M		20				20	0	R	
19183M		16	5i			21	.24	R	
21017M		21				21	0.0	R	spike
21059M		17	3i			20	.15	R	
21061M		17	1(pith)	3		21	.33	R	
21065M		11	4			15	.26	R	spike
21067M		16		5		21	.48	R	
21076M		22				22	0.0	R	
21087M		15	1	2	3	21	.66	R	

GENOTYPE	HEALTHY	LIGHT	MODERATE	SEVERE	TOTAL	DISEASE INDEX	RESISTANCE RATING	REMARKS
21088M	20	1i			21	.05	R	
21089M	14	4		2	20	.50	R	
21090M	20	2			22	.09	R	
21094	6				18	2.0	S?	12 dead* - weak plants
21095	8(weak)				20	1.8	S?	12 dead* - very weak plants
21103M	12	3(pith)+4i	1		18	.50	R	
21107M	19	2			21	.10	R	
21109M	9	4	6		19	.84	I	
21110M	20	1			21	.05	R	
21111M	4	7	1		12	.75	I	
21130M	15	4i			19	.21	R	spike
21131M	1		6	13	20	2.25	S	
21132M	14	2	4		20	.5	R	
21135M	8	4 + 8i			20	.6	R	
21142M	20	1			21	.05	R	
21167 Hybrid-2	15	5(pith)			20	.25	R	spike
48209 Fuggle-H	19		1		20	.10	R	resistant control
51114M	12	2 + 6i			20	.40	R	
52042M	13	7i		1	21	.48	R	
52047M	5	4 + 4i			15	.93	I?	2 dead*

GENOTYPES	HEALTHY	LIGHT	MODERATE	SEVERE	TOTAL	DISEASE INDEX	RESISTANCE RATING	REMARKS
60026M	14	5 + 1 pith			20	.30	R	
63011M	20				20	0.0	R	spike
64032M	14	6	1		21	.38	R	
64033M	15	4	1		20	.30	R	
64035M	10	10i			20	.50	R	
64037M	13	3	4		20	.55	R	
64100 Bullion	5	9i	1	6	21	1.28	I	Intermediate control
64102M	21			1(?)	22	.14	R	

* counted as severe; spike = some spike development by 17 September

i = immune response

Disease index = average score of plants based on rating of: Healthy = 0, Light = 1, Moderate = 2, Severe = 3.

Resistance rating = disease index score of: R 0 - .66

I .75 - 1.28

S 1.8 - 3.0

UNITED STATES DEPARTMENT OF AGRICULTURE
SCIENCE AND EDUCATION ADMINISTRATION

FEDERAL RESEARCH
WESTERN REGION
Field Crops Breeding and Production Research Unit
Department of Botany and Plant Pathology
Oregon State University, Corvallis, OR 97331

January 29, 1979

Subject: New Downy Mildew Control Research Program

To: Oregon Hop Commission

Research with new, systemic fungicides in England and Europe has resulted in an exceptionally promising new control for downy mildew. In the U.S. last year, the new fungicide "Ridomil" (Ciba Geigy # 48988) was tested on several downy mildew diseases (cucumbers, cabbage, onions) with outstanding results. It was not tested on hop mildew in the U.S.

The Rosemaund Experimental Farm in England reported these results on hops:

> "Trials over the past 3 years have shown that a pre-training spray can prevent mildew sporulation and in many cases clean up infected rootstock. It is envisaged that a single application, applied to young shoots in April will give almost complete protection for 4 to 6 weeks."

Last fall we developed plans for extensive tests on hops, to begin in April, 1979. In November, 1978, we hired a graduate student, Mr. Robert Hunger, to work on the project. We also proposed last summer that the U.S. Brewers Association assist in the funding of this project. The USBA declined and, as you know, terminated all hop research funding on December 31, 1978.

We believe this project is very important to hop growers, especially Oregon growers. Therefore, we have ordered material from Ciba - Geigy for the 1979 tests and have adjusted other work so that funds will be available for Bob Hunger through June 30, 1979. It will take at least two years of test data to get Ridomil registered for use on hops. We are seeking funding for the project so that Bob Hunger can spend essentially full time on it during the next 2 or 3 growing seasons.

For the period July 1, 1979 through June 30, 1980, we would need a minimum of $6,000. During the FY 1980-81, we would need $7,500.

At this time, it is uncertain whether the plan developed at the Sacramento HGA meeting to salvage the hop research program will be successful. If it is, perhaps some or all of the funding for the downy mildew project could come from the new plan. Also, Anheuser-Busch has expressed some interest in funding specific hop research projects if the new plan falls through.

Because of the uncertainties about future hop research funding, and because we feel the downy mildew control work should be started now and continue for at least two years, we plan to submit a formal proposal to the Oregon Hop Commission for funding for the 1979-80 fiscal year. We plan to request $6,000 for FY 1979-80.

Please advise me whether the Oregon Hop Commission is interested in funding the work on downy mildew. If the $6,000 - $7,500 is beyond the means of the Commission, would the Commission be interested in pursuing a jointly funded proposal, with Anheuser-Busch, for example?

In the meantime, we will start the work this spring in anticipation of financial support from some source beginning July 1, 1979.

C. E. Horner
Research Leader

cc:
Dr. Paul Hoskins

WYE, ASHFORD, KENT
TN25 5AH

WYE 812401 (STD 0233)

DEPARTMENT OF HOP RESEARCH

8th March 1979

Dr. C.E.Horner
Department of Botany and Plant Pathology
Oregon State University
Corvallis
Oregon 97331
U.S.A.

Dear Jack,

Thank you for your letter of 24th January which ashamedly I have not replied to before due to visits to the continent and other demands on my time.

Ridomil (metalaxyl) is to be launched by Ciba-Geigy for use on hops in the U.K. this year and I attach their recommendations. The criterion for drenching early in the season is the quantity of a.i. per hill. The effect of volume is largely unknown. This can make it rather expensive with close-planted hops but the potential benefits, if they contain a reasonable amount of hill infection, is considerable.

This fungicide really does seem to be quite remarkable for early-season control. We need more information on the response to sprays of both leaf and cone infection, since in the U.K. these days downy mildew appears to be less serious in the late-season and trial work has been unlucky in this respect.

Our plans for research on downy mildew mainly concern use of systemics like Ridomil within timed spray schedules suggested by weather-based predictions. We are also planning a long-term trial to see if annual Ridomil drenching will clean up infected rootstocks. Also, we shall probably look into the use of drenches at other times of year and the up-take and persistence of the chemical - a chemist is on hand with a method to analyse for residues in soil and tissue. At the moment we have little time for much else since our basic research effort is directed towards the powdery mildew problem. You are therefore clear to pursue whatever you please and it would indeed be valuable to know more of the mechanisms of Ridomil action.

I feel that with fungicides in general, we lack satisfactory information about thir particular qualities in order to utilise them as effectively as we might. Ridomil seems to be mainly antisporulant but as far as I know nothing is known of the persistence of efficacy nor of the effects of environment on its perfermance.

A rather urgent question here concerns the likelihood of tolerance to metal-axyl developing in the pathogen. We have no clues and experiments to generate information are difficult to carry out.

We should keep in closer touch on downy mildew work. Let me know if you would like more detail about any of the Ridomil items. I shall be most interested to know your choice of topic for Mr. Hunger and, in due course, how he progresses.

With all good wishes,

Yours sincerely,

NEW TREATMENT FOR DOWNY MILDEW

In 1979, subject to PSPS clearance, Ridomil the new Ciba-Geigy fungicide will be recommended for use on hops. The preferred programme of treatment will be a soil drench followed by Foliar sprays. In trials the results have been outstanding.

The soil drench requires that each hop plant should be treated in late March to mid April when the average shoot length is 50 - 100mm (2 - 4 in). 100ml (3½ fl.oz) of spray solution is required for each plant, sprayed over an area of 300mm x 300mm (12in x 12in).

Growers wishing to adopt the soil drench technique can use the following equipment:-

a] The Wargent applicator

This machine can be used without modification, as the operator can ensure that the spray is distributed over the crown of the hop plant.

b] The Phillips applicator

To ensure adequate cover of the plant, a nozzle should be fitted to the outlet pipe. This will require the following parts:-
1 x TeeJet 6570 tip (brass)
1 x TeeJet 1325 nozzle cap (brass)
1 x nozzle adaptor — This part will be manufactured by Heath Engineering Works. There are two alternative adaptors available depending on the thread on the original equipment.

c] The Hewboom

This machine can be modified by blocking off all except one of the lower spray outlets, fitting a suitable spray tip, an anti-drip device, and a suitable timer. A complete kit is available from Heath Engineering Works at a cost of about £100. If required it can also be fitted by Heath or their agents.

RECOMMENDATIONS FOR USE OF RIDOMIL ON HOPS

Protective Soil Drench Treatment

Timing

A soil drench should be applied to each hop plant between late March and mid-April when the average shoot length is 2 - 4". This drench will give control of downy mildew for 8 - 10 weeks up to mid-June.

Dose and Volume

8 lb Ridomil 25 WP in 100 gallons of water applied at 3½ fl.oz per plant.

Protective Foliar Spray Treatment

Timing

Foliar sprays should be applied every 14 days whenever there is a likelihood of disease occurring.

Where a soil drench has been used the start of the spray programme may be delayed until mid-June.

To ensure protection of the cones a complete schedule of Ridomil sprays must be applied from the beginning of burr onwards.

Dose and Volume

13 oz Ridomil 25 WP in 100 gallons of water with the volume of the water applied increasing as the bine develops from initially 50 gallons per acre at training to a minimum of 133 gallons per acre at full bine development.

In those hop growing areas e.g. South East, where volumes of between 100 - 133 gallons per acre are applied at full bine development, it is important that the concentration of the sclution is adjusted so that 17 oz Ridomil 25 WP per acre are applied at this stage of hop growth.

Under no circumstances should less than 100 gallons of solution per acre be applied at full bine development.

Control of Hop Downy Mildew with a New Systemic Fungicide, Ridomil

Robert M. Hunger and Chester E. Horner
Oregon State University
Graduate Res. Assistant and Research Professor, resp.,

Introduction

Hop downy mildew was first reported in the Pacific Northwest in the early 1930's. Since that time this disease has become the primary disease problem on hops in the United States. In the Willamette Valley of Oregon, abundant rainfall and mild temperatures in spring and early summer favor this disease reaching epidemic proportions. Hops grown in other areas (Washington, California, and Idaho) also incur some losses; however, less frequent rainfall usually prevents hop downy mildew from reaching epidemic proportions.

Hop downy mildew is caused by the fungus Pseudoperonospora humuli (Miy et Tak) Wils. This fungus is an obligate parasite and thus is not able to survive and reproduce if separated from a suitable host. P. humuli overwinters primarily in the perennial rootstock (crown) of systemically infected hops. Severe infection, or infection of highly susceptible varieties (for example Clusters, Comet, and Talisman) may result in rotting of the crown and complete hill die-out. For this reason, varieties with resistance to hop downy mildew are commonly grown in the Willamette Valley where climatic conditions favor infection and disease development. These include the variety Fuggle which is resistant to foliar and crown (systemic) infection, and three other varieties (Cascade, Bullion, and Brewer's Gold) exhibiting moderate resistance to crown infection and slight resistance to foliar infection. It is with these moderately resistant varieties that control of P. humuli is necessary to insure reasonable yields of hops.

Spring and early summer (April - mid-June) in the Willamette Valley are typically wet and mild, and hop downy mildew flourishes. However, high temperatures and sparse rain from mid-June through August inhibits sporulation and disease spread. Thus, if growers are able to control hop downy mildew during the wet spring, subsequent hot and dry weather beginning in mid-June usually suppresses disease development until hops are harvested. However, in some years rainfall in late summer before harvest causes a flare-up in downy mildew resulting in extensive cone losses. The early-season control practices include:

1. Deep pruning of hop hills in early spring to remove buds and tissue infected with P. humuli.
2. Removal of trained vines with terminally infected shoots and retraining of healthy shoots.
3. Stripping infected lower leaves on otherwise healthy trained vines to remove sources of disease spread.
4. Periodic killing of new basal growth with chemicals and/or covering basal growth with soil (hilling-up). This serves to remove infected shoots and juvenile, succulent growth highly susceptible to infection.

Research financed by a grant from Anheuser Busch Inc.

5. Spraying or dusting foliage with zineb, a carbamate fungicide effective as a treatment preventing infection.

Employing these control measures does not guarantee a successful crop of hops. Zineb, while preventing infections, is not redistributed after application. Growth of hops following application, and foliage covered incompletely remain susceptible to infection. Consequently, weekly applications of zineb are recommended when weather conditions favor disease spread. The expense of weekly zineb applications added to the salaries of labor crews hired to remove infected shoots and retrain healthy vines is considerable. Further, reduced yields are imminent if healthy vines are not trained by late May, or if fewer than six vines are trained per hill.

In 1977, Ciba-Geigy Corporation introduced the acylalanines, a new class of systemic fungicides. One of these compounds, Ridomil (Table I), is highly effective in controlling several downy mildews and other diseases caused by closely related fungi including potato late blight (Phytophthora infestans), blue mold and black shank of tobacco (Peronospora tabacina and Phytophthora parasitica var nicotianae), and downy mildews on cabbage, grapes, and lettuce (1-5). These reports indicating the high level of effectiveness of Ridomil against diseases related to hop downy mildew as well as favorable reports of hop downy mildew control in England prompted field testing of Ridomil on hops in the Willamette Valley in 1979. This paper reports the results of those tests, the present status of Ridomil regarding registration, and plans for future testing of Ridomil.

Methods

Five test plots located in separate commercial hop yards in the Willamette Valley were used in 1979. Two plots were in hop yards planted with the variety Brewer's Gold (field plot numbers 1 and 2), two with the variety Cascade (field plot numbers 3 and 5), and one with the variety Bullion (field plot number 4) (Table II). The number of hills treated with Ridomil in each of these plots is shown in column 4 of Table II. A total of 2,029 hills were treated with Ridomil in 1979. In all plots, an equal number of hills not treated with Ridomil were utilized as controls.

Ridomil was applied as a soil drench in mid-April at 0.3 gm ai/hill in 50 ml solution. All treated plots were divided in late May, one-half of the hills receiving a foliar application of Ridomil at 0.12 gm ai/hill in 100 ml solution. Subplots of field plot numbers 2 and 3 were divided again in mid-July, one-half of these hills receiving a second foliar application of Ridomil at the same rate as applied in late May (0.12 gm ai/hill in 100 ml solution). All applications were made with an 8-liter capacity hand sprayer. Following treatment with Ridomil, the occurrence of spikes (shoots infected with P. humuli) was noted in treated and control plots. Counting of spikes was done at two week intervals from early May until mid-July, after which arid conditions and high temperatures effectively suppressed further disease development.

Hops were harvested from two of the five field plots (field plot numbers 2 and 3) just prior to commercial harvesting of the yard. Three replications of five hills each were harvested from each plot. An equal number (15) of treated and control hills were harvested from each plot. Hills to be harvested were determined by random selection. Vines from each plot were kept separate and

I. NOMENCLATURE, CHEMICAL AND PHYSICAL PROPERTIES

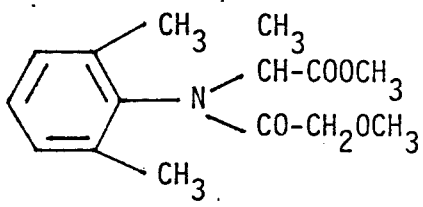
Chemical Class: Acylalanine

Common Name (Proposed): Metalaxyl

Trade Name (Proposed): Ridomil™

Chemical Name: N-(2,6-Dimethylphenyl)-N-(methoxyacetyl)-alanine methyl ester

Chemical Structure:



II. TOXICOLOGY OF TECHNICAL RIDOMIL

A. Acute Mammalian Toxicity

Acute Oral LD_{50} (rat)	= 669 mg/kg
Acute Dermal LD_{50} (rat)	> 3100 mg/kg
Primary Skin Irritation (rabbit)	= Mildly Irritating

B. Fish and Wildlife

Bluegill 96-Hr. LC_{50}	= 150 mg/L
Rainbow Trout 96-Hr. LC_{50}	= 130 mg/L
Mallard Duck, Acute Oral LD_{50}	= 1,466 mg/kg
Mallard Duck, 8-Day LC_{50}	> 10,000 ppm
Bobwhite Quail, 8-Day LC_{50}	> 10,000 ppm

Table I. Technical information pertaining to Ridomil, an acylalanine fungicide developed by CIBA-Geigy Corporation. Ridomil is a trademark of CIBA-Geigy Corporation.

hops were removed from vines with a small harvester at the Oregon State University Hop Farm. Weight of harvested hops and number of vines per treatment were recorded.

Results

Results from 1979 show that a single application of Ridomil as a soil drench in early spring effectively controlled hop downy mildew. Reduction in number of spikes in treated plots as compared to control plots was impressive (Table II). A total of 19,859 infections were observed in 2,029 control (untreated) hills as compared to 90 in the same number of Ridomil treated hills. Further, hop yields from hills in treated plots were 25% and 75% greater than respective controls (Table III).

The value of foliar applications of Ridomil could not be delineated in 1979. One application of Ridomil as a soil drench in mid-April provided excellent disease control through the spring rains. Foliar sprays were applied to determine their value if wet and humid conditions prevailed or reoccurred later in the summer. In 1979 the summer months remained dry and hot, and thus disease spread and development was climatically curtailed. However, the significantly greater yields and reduction of infection in spring and early summer indicate the value of Ridomil in controlling hop downy mildew.

Some phytotoxicity of foliage and young shoots which were just emerging was observed in hills treated with the soil drench. This probably was caused by the carrier in the Ridomil formulation (emulsifiable concentrate) rather than the active ingredient. Phytotoxicity probably resulted from the organic carrier in the Ridomil formulation due to application in a low volume. This is supported further by the complete absence of reports of phytotoxicity when Ridomil was applied at comparable rates to hops and other crops as a wettable powder or in a larger volume. In our study it was necessary to apply Ridomil at a low volume because hand-carried sprayers with small volumes were used to apply Ridomil to a large number of hills (2029). No hills were permanently or adversely damaged from the soil drench, and no phytotoxicity was observed following subsequent foliar sprays.

Two additional Ridomil plots were established in Washington, but complete absence of downy mildew in the plots prevented getting control data.

Conclusions and Future Plans

Considering the data from 1979, Ridomil was highly effective in controlling downy mildew of hops in the Willamette Valley. According to Dr. William Anliker, technical representative of Ciba-Geigy Corporation, Ridomil is currently registered in 20 countries for use on 11 different crops. In addition, Ridomil is registered for use on hops in 1980 in England, Austria, Belgium, Rumania, and West Germany.

According to Dr. Anliker, 1982 is the earliest year in which Ridomil will be registered for full use in the United States. A tentative schedule calls for a delineation of rates in 1980, a residual program in 1981 and final registration in 1982. Specific plans for future testing of Ridomil include:

1. Hills of hops at three separate hop yards in the Willamette Valley were treated in fall 1979 with Ridomil as a post-harvest soil drench. A total

of 1260 hills were treated at 0.2 gm ai/hill applied in 50 ml solution. This test is designed to determine if application of Ridomil as a post-harvest soil drench will eradicate systemic crown infection or protect hops emerging the following spring.

2. Treatment of hops in spring of 1980 with Ridomil as a soil drench at 0.3 and 0.6 gm ai/hill. In conferring with Dr. Anliker, he felt that data regarding the efficacy of Ridomil at these rates would best facilitate registration.

3. Determination of protection afforded by foliar sprays applied alone and following a soil drench will be attempted. However, data collected in 1979 indicate that Ridomil applied as a soil drench is highly efficacious in controlling hop downy mildew in the Willamette Valley and foliar sprays should only be necessary in the event of extended spring rains or long periods of late summer rains to protect hop cones prior to harvest.

In addition to these test plots with Ridomil, testing of two other systemic fungicides will be started in spring of 1980. These two compounds are Aliette produced by Rhone-Poulenc (Rhodia) Company, and Previcur produced by NoR-Am Company. Both compounds are reported effective against fungi similar to P. humuli, and initial tests with Aliette on hops in England have been encouraging. A small field plot (291 hills) at one location in the Willamette Valley was treated with Aliette in 1979. Results indicated good control with Aliette as compared to hills not treated; however, the rate at which Aliette was applied was less than recommended, and further testing is necessary before any conclusions should be drawn.

In summary, Ridomil appears highly promising as a future tool to control hop downy mildew. In addition, several other chemicals also are potentially effective in controlling this disease. Hopefully all or at least one of these compounds will serve to mitigate the economic losses resulting from hop downy mildew which is an annual threat to hop production in the Willamette Valley, and an intermittent threat in other U.S. hop production areas.

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	RIDOMIL	
Method of Ridomil Application	Recommended Rate	Actual Rate Applied
Soil Drench Applied to individual hills in early-mid April, 1979	.00055 lb ai/hill in 3.5 fl oz (.25 gm ai/hill in 103 ml) .42 lb ai/774 hills, applied in 21 gal (193 gm ai/774 hills, applied in 80 liters)	.00066 lb ai/hill in 1.7 fl oz (.3 gm ai/hill in 50 ml) .51 lb ai/774 hills, applied in 10 gal (232 gm ai/774 hills, applied in 38.9 liters)
Foliar Spray Applied to hop foliage during the last week of May,, 1979	.203 lb ai/774 hills, applied in 100 gal (92 gm ai/774 hills, applied in 378.5 liters)	.203 lb ai/774 hills, applied in 20 gal (92.4 gm ai/774 hills, applied in 76 liters)

Table I. Rates of application of Ridomil on hops in the Willamette Valley during 1979.

0.3 g/hill = ½ lb active/acre
0.12 g/hill = ¼ " " .

Plot Number and Variety	Ridomil Treatment Dates	Ridomil Treatment Rates (gm/hill)	No. Hills per Plot	Base Infection Level (spikes) on 4/21	Infection Levels (spikes) at Dates After Ridomil Applications 5-5	5-19	6-2	6-16	6-30	7-13	Cumulative Totals
1. Brewer's Gold	4/12	.3	264	159	0	0	0	0	0	0	0
	5/25	.12	133 of 264				0	0	0	0	0
	Control	---	264	145	264	410	277	287	190	124	1552
2. Brewer's Gold	4/12	.3	375	224	1	0	1	0	0	1	3
	5/25	.12	186 of 375				2	0	0	0	2
	7/20	.12	93 of 186								
	Control	---	375	347	579	960	1436	735	296	247	4235
3. Cascade	4/17	.3	607	88	1	0	0	0	0	0	1
	5/25	.12	305 of 607				1	0	0	0	1
	7/20	.12	152 of 305								
	Control	---	607	99	1736	685	2556	2907	188	170	8242
4. Bullion	4/17	.3	605	217	17	15	5	26	5	6	74
	5/25	.12	300 of 605				0	1	1	0	2
	Control	---	605	305	780	925	300	2070	75	127	4277
5. Cascade	4/12	.3	178	181	7	0	0	0	0	0	7
	5/25	.12	84 of 178				0	0	0	0	0
	Control	---	178	162	261	1085	140	36	7	5	1534
Totals	4/12&4/17	.3	2029	869	26	15	6	26	5	7	85
	5/25	.12	1008 of 2029				3	1	1	0	5
	7/20	.12	245 of 491								
	---	---	2029	1058	3620	4065	4709	6035	756	673	19859

Table II. Summary of 1979 field tests with Ridomil for hop downy mildew control in the Willamette Valley of Oregon. Preliminary results, not for publication without permission from Dr. C. E. Horner, USDA-SEA-AR, Dept. Botany and Plant Pathology, Oregon State University, Corvallis, OR 97331. *Ridomil applied as a soil spray-drench on 4/12 and 4/17, and as a foliar spray on 5/25 and 7/20. Hills receiving foliar applications were among those treated previously with a soil spray-drench.

Plot Number and Variety	No. Reps	No. Hills/Rep	Total Hills	Number Vines per Treatment	Wt. (gm) of Hops/Treatment	Extrapolation to Hop Yield per Acre	
						pounds	bales**
Treated	3	5	15	73*	62,300*	1,614.1	8.1
2. Brewer's Gold							
Control	3	5	15	60	50,000	1,295.6	6.5
Treated	3	5	15	80	71,450*	1,851.7	9.3
3. Cascade							
Control	3	5	15	66	40,450	1,049.1	5.3

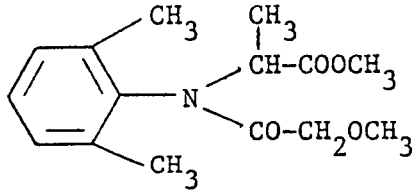
Table III Summary of 1979 field tests with Ridomil for hop downy mildew control. Effect of Ridomil on hop yield from two locations in the Willamette Valley of Oregon. *Treatment mean differs significantly from control mean (no Ridomil applied) at the P = 0.05 level (unpaired t-test). **One bale weighs approximately 200 lb. Preliminary results, not for publication without permission from Dr. C. E. Horner, USDA-SEA-AR, Dept. Botany and Plant Pathology, Oregon State University, Corvallis, OR 97331.

RIDOMIL*

EXPERIMENTAL FUNGICIDE

Ridomil (which is also known as CGA-48988) is a new type of systemic fungicide which shows promise as a foliar, soil and seed treatment on agricultural crops. It has activity against the soil-borne diseases caused by Pythium and Phytophthora as well as the foliar diseases caused by the Phycomycetes.

I. NOMENCLATURE, CHEMICAL AND PHYSICAL PROPERTIES

Chemical Class:	Acylalanine
Common Name (Proposed):	Metalaxyl
Trade Name (Proposed):	Ridomil^{TM}
Chemical Name:	N-(2,6-Dimethylphenyl)-N-(methoxyacetyl)-alanine methyl ester
Chemical Structure:	
Empirical Formula:	$C_{15}H_{21}NO_4$
Molecular Weight:	279.34
Solubility at 20°C:	Water 7100 ppm, 65% in methanol, 75% in methylene chloride, 55% in benzene, and 27% in isopropanol.
Vapor Pressure at 20°C:	2.2×10^{-6} mm Hg

*Ridomil is a trademark of CIBA-GEIGY Corporation.

II. TOXICOLOGY OF TECHNICAL RIDOMIL

A. Acute Mammalian Toxicity

Acute Oral LD_{50} (rat)	= 669 mg/kg
Acute Dermal LD_{50} (rat)	> 3100 mg/kg
Acute Dermal LD_{50} (rabbit)	> 6000 mg/kg
Primary Skin Irritation (rabbit)	= Mildly Irritating
Eye Irritation (rabbit)	= Mildly Irritating
Skin Sensitization (guinea pig)	= Not a Sensitizer

B. Fish and Wildlife

Bluegill 96-Hr. LC_{50}	= 150 mg/L
Rainbow Trout 96-Hr. LC_{50}	= 130 mg/L
Daphnia magna 48-Hr. LC_{50}	= 28 mg/L
Mallard Duck, Acute Oral LD_{50}	= 1,466 mg/kg
Mallard Duck, 8-Day LC_{50}	> 10,000 ppm
Bobwhite Quail, 8-Day LC_{50}	> 10,000 ppm

III. SAFETY PRECAUTIONS

Keep out of reach of children. Wash thoroughly after handling. Do not store near food or feed. Causes eye irritation, do not get in eyes, on skin, or on clothing. Avoid breathing dust/spray. Use with adequate ventilation. Crops treated with this compound should be destroyed, since it is an experimental fungicide.

IV. FORMULATIONS

Ridomil (2E)	- Emulsifiable concentrate containing 2 lbs. of active ingredient per gallon.
Ridomil (15G)	- Granule containing 15% active ingredient.
Ridomil (5G)	- Granule containing 5% active ingredient.
Ridomil + PCNB (9G) (1:8 ratio)	- Granule containing 1% Ridomil and 8% PCNB.
Ridomil + PCNB (9.5G) (1:16 ratio)	- Granule containing 0.56% Ridomil and 8.94% PCNB.

V. BIOLOGICAL ACTIVITY

Ridomil has provided excellent control of many of the diseases caused by the Oomycetes (Phycomycetes); i.e., the late blight downy mildew foliar diseases on vegetables and the soil-borne diseases caused by Pythium and Phytophthora. Ridomil has little or no activity against the Ascomycetes, Basidiomycetes and Fungi Imperfecti.

Ridomil has systemic and corrective (curative) activity as well as residual-protectant activity. Ridomil is absorbed through leaves, stems and roots. Acropetal systemic movement of Ridomil occurs after foliar spray applications or soil treatments. Results show that foliar sprays of Ridomil are effective at very low rates and do not need to be applied as frequently as the presently available fungicides. On potatoes, foliar applications of Ridomil provide better control of late blight tuber rot than the standard fungicides. Soil applications of Ridomil have exhibited systemic activity against downy mildew of lettuce and cole crops as well as late blight of potatoes.

Soil applications have also shown activity against black shank of tobacco. Seed treatments of Ridomil provide control of cotton seedling disease caused by Pythium species.

VI. RECOMMENDATIONS FOR TESTING

A. Potatoes

Foliar Treatment	Spray Interval	Lbs. Active/A
Late Blight* - Preventive Program		
Ridomil 2E Alone	14 Days	0.187, 0.25, 0.375

Late Blight and Early Blight* - Preventive Program

Ridomil 2E can be tank mixed with Bravo, Difolatan, Dithane M-45 or Manzate 200 for the control of both early blight and late blight.

***Curative (Corrective) Treatment for Late Blight**

If late blight appears in the field, immediately apply Ridomil 2E at 0.25 to 0.375 lbs. active/A and retreat 7 days later. Continue on a 14-17 day spray schedule when late blight is under control.

Soil Application

Some limited testing of Ridomil as a soil applied systemic fungicide for the control of late blight of potatoes is suggested.

Soil Treatment	Method of Application	Lbs. Active/A
Ridomil 15G	In-Furrow at Planting	1.5 or 2.0
Ridomil 15G	Band over the row in front of hillers or cultivator at hilling or at emergence.	1.5 or 2.0

Soil applications of Ridomil 15G can be followed with one to three foliar applications of Ridomil 2E at 0.187 to 0.375 lbs. active/A starting 11 to 15 weeks after planting.

B. Late Blight of Tomatoes

Treatment	Spray Interval	Lbs. Active/A
Ridomil 2E Alone	7-10 Days	0.187
Ridomil 2E Alone	14 Days	0.375

Ridomil 2E can be tank mixed with Bravo or Dithane M-45 for the control of early blight, anthracnose and late blight.

C. Downy Mildew of Cucurbits

Treatment	Spray Interval	Lbs. Active/A
Ridomil 2E Alone	7-10 Days	0.125
Ridomil 2E Alone	10-14 Days	0.25

Ridomil can be tank mixed with Bravo or Benlate for the control of powdery mildew, anthracnose, gummy stem blight and downy mildew.

D. Downy Mildew of Cole Crops and Lettuce

Treatment	Method of Application	Lbs. Active/A
Ridomil 2E	Foliar every 14-21 days*	0.125-0.25
Ridomil 2E	Soil-Preplant Broadcast	0.25, 0.5

E. Other Downy Mildew Diseases

Crop/Pest	Spray Interval	Lbs. Active/A Ridomil 2E
Onions/Downy Mildew	10-14 Days*	0.125, 0.25

*On cole crops and onions, add a spreader-sticker.

		Lbs. Active/100 Gal. Ridomil 2E	Ridomil 2E + Phaltan
Grapes/Downy Mildew	Regular Spray Schedule	0.125	0.094 + 0.5

F. Tobacco Black Shank[a/]

1. Preplant Soil Incorporation (Broadcast or Row Treatment)

Tobacco Type	Use Directions	Lbs. Active/A[c/]
Flue Cured	Broadcast before bedding[b/]	0.5,1.0*,2.0*,3.0
Burley	Broadcast[b/]	2.0*,3.0*
Burley	Band (per 12,500 ft. of row)[b/c/]	2.0*,3.0[c/]

a/ In addition to the black shank ratings, we would appreciate ratings for the control of Pythium damping off of tobacco (% final stand ratings).

b/ Incorporate in the top 2 or 3 inches of soil after application.

c/ A band treatment of 2 and 3 lbs. active/A of tobacco (12,500 ft. of row) is equal to 73 and 110 grams active per 1,000 ft. of row, respectively, for any row spacing. Apply in an 18-inch band.

*Preferred rates for testing.

G. Cottonseed Treatment

Use Ridomil 2E at 0.5 oz. active/100 lbs. of cottonseed in combination with the labeled rate of Captan, Vitavax, Demosan, or Terraclor (PCNB).

H. Other Crops

Foliar and soil applications of Ridomil 2E look promising for the control of downy mildew of hops and blue mold of tobacco. Soil applications of Ridomil 2E have activity against Phytophthora cinnamomi on avocado, Phytophthora parasitica on citrus, Phytophthora root rot of soybeans, Phytophthora root rot of conifers and Phytophthora root rot of strawberries. Granule formulations of Ridomil with Terraclor in 1:8 and 1:16 ratios have shown promise as in in-furrow soil treatments at 1.25 to 1.75 lbs. active/A, for the control of cotton seedling disease.

I. Rating Suggestions

Yield data would be appreciated in trials where Ridomil is evaluated as a foliar or soil fungicide. Ridomil provides little or no control of foliar diseases other than the late blight-downy mildew diseases. Thus, we would appreciate knowing whether early blight (Alternaria solani) or diseases other than late blight or downy mildew are present. For potato late blight trials, we suggest that ratings on the percent of blighted tubers be made in addition to the foliar late blight ratings.

Agricultural Division
CIBA-GEIGY Corporation
P. O. Box 11422
Greensboro, North Carolina 27409

January, 1979

rhône-poulenc phytosanitaire

rhône-poulenc

Rhodia AG
A SUBSIDIARY OF RHONE POULENC

TECHNICAL DATA SHEET

Aliette

RONALD J. BURR
Product Development Representative

Rhodia Inc. Agricultural Division
Bus: P.O. Box 125, Monmouth Junction, N.J. 08852 / (201) 297-0100
Contact: 5835 Basil St. NE, Salem, OR 97301 / (503) 585-9857

EXPERIMENTAL FUNGICIDE

LS 74 783 — Aliette

aluminium tris (-O-éthyl phosphonate)

RHONE-POULENC PHYTOSANITAIRE
Direction Développement Biologique
B.P. 9163 LYON 09 - 69263 LYON CEDEX 1
FRANCE

YELLOW
DH/mb/279
OCTOBER 1977
No 4

SYSTEMIC FUNGICIDE LS 74 783

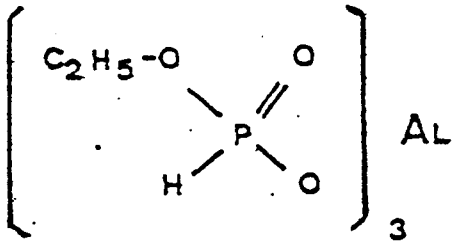
Aliette

LS 74 783 is an experimental fungicide belonging to a new family of fungicides discovered and patented by RHONE-POULENC PHYTOSANITAIRE. This compound is characterized by its powerful systemic activity, being able to move upwards as well as downwards in the plant. The Phycomycetes are included in the spectrum of activity of this product.

I - ACTIVE INGREDIENT

. Empirical formula : $C_2 H_{18} Al O_9 P_3$

. Chemical formula :



. Chemical name : aluminium tris (-O-ethyl phosphonate) formerly referred to as aluminium ethyl phosphite

. Other names : LS 74 783 , EPAL, 32545 RP (aluminium salt), ALIETTE

. Molecular weight : 354

. Physical nature : solid white crystals

. Solubility at 20°C : water : 120 g/l
acetonitrile : < 80 mg/l
methyl glycol : < 80 mg/l

. Vapour pressure : negligible at 20°C

. Stability : both the technical material and formulated product are stable under normal storage conditions. In a solution of 1 g/l of water at 20°C, the half-life of the product is more than 100 days.

Reference	Type	Composition	Use
EXP 1659	WP	80 % LS 74 783	All crops
EXP 1710	WP	50 % LS 74783 + 25 % folpet	Vine
EXP 1733	WP	44 % LS 74783 + 26 % mancozeb	Vine
EXP 1771	WP	40 % LS 74783 + 40 % captan	Fruit trees

Other formulations are now being studied.

III - ANALYTICAL METHODS

1 - Formulations : the amount of LS 74 783 in simple or mixed formulatio may be conveniently determined by an oxydimetric assay after alkalir hydrolysis.

2 - Residues : the residues of LS 74 783 and its principal metabolites may be determined by gas-liquid chromatography with specific detecti by flame photometry after aqueous extraction and clean up and methylation with diazomethane.

IV - TOXICOLOGY

1 - Acute toxicity

LD 50 expressed in mg/kg weight, after an observation period of 15d			
Product	Species	Method of Administration	LD 50 (mg/kg)
Technical LS 74783	Rat	oral	5800
	Mouse	oral	3700
	Mouse	percutaneous	atoxic at 3200 mg/kg
	Guinea pig	oral	2780
	Dog	oral	without lethal effect at 2140 mg/kg
	Rabbit	oral	2680
EXP 1659 (WP 80%LS 74783)	Rat	oral	8150 mg/kg
	Rat	percutaneous	atoxic at 5000 mg/kg

In the local tolerance studies on the rabbit neither technical LS 74783 nor the formulation EXP 1659 showed any irritant activity on the skin ; in the eye, EXP 1659 in an aqueous suspension has no irritant activity at a dose rate of 3 % and only a very slight irritance at 10 %.

2 - Chronic toxicity

Medium term (90 days) toxicity studies showed no evidence of toxicity even at the maximum dose rate tested of 25,000 ppm in the feed (study on the rat) or 50,000 ppm in the feed (study on the dog).

Long term (2 years) toxicity tests and 3 generation reproduction studies are now underway.

3 - Other studies

In the rabbit no teratogenic effect was observed at doses of 125-250, and 500 mg/kg body weight.

None of the studies have shown evidence of any mutagenic effects.

4 - Toxicity to wildlife (technical product)

Species	Toxicity
Rainbow trout (*Salmo gairdneri*)	LC 50 (96 hours) : 428 ppm (wt/vol)
Harlequin fish (*Rasbora heteromorpha*)	LC 50 (96 hours) : 161 ppm (wt/vol)
Daphnia (*Daphnia pulex*)	LC 50 (96 hours) : 189 ppm (wt/vol)
Japanese quail (*Cothurnix japonica*)	LD 50 (oral) :4997 mg/kg
Honey bee (*Apis mellifera*)	LD 50 (ingestion) > 400 mg a.i./bee LD 50 (contact) > 200 mg a.i./bee

LS 74783 thus appears to be of low toxicity to wild life.

V - BIOLOGICAL PROPERTIES AND PRINCIPAL USES

LS 74783 is particularly effective against Phycomycetes although activity is also shown against other groups of pathogens. It is important to note that tests carried out *in vitro* or on excised plant parts may not give an accurate indication of the *in vivo* activity.

LS 74783 is a systemic fungicide having great mobility in plants. Biological efficacy tests, radio-tracer studies and residue analysis show that the fungicide possesses good systemic action moving upwards as well as downwards in the plant.

The activity of LS 74783 against several Phycomycetes has been shown to be both preventive and curative. Applied several days after infection, the product is capable of stopping the growth of the parasite and preventing development of fruiting bodies.

Experimental work carried out to date has shown the principal uses of LS 74783 to be as follows :

CITRUS

Because of its ability to be translocated downwards LS 74783 may be used as a foliar spray (200 - 300 g a.i./hl) once a month to control canker and gummosis of citrus caused by Phytophthora parasitica,Drenches at the base of the plant (15 g a.i./tree every 3 weeks) have also been shown to be effective. LS 74783 may also be used as foliar sprays to prevent damping off caused by Phytophthora on young citrus seedlings.

PINEAPPLE

Dipping the young plants before transplanting in a solution containing 500 - 2000 ppm a.i. of LS 74783 ensures excellent protection of the plants against heart-rot caused by Phytophthora parasitica. LS 74783 is equally effective as a foliar spray at the beginning of flowering at doses between 50 and 200 g a.i./ hl.

AVOCADO

Because of its ability to be translocated downwards, LS 74783 applied as a foliar spray may be used to control root and collar rot caused by Phytophthora cinnamomi. The doses used range from 200 g a.i./hl for monthly applications to 300 g a.i./hl for treatments carried out every 6 weeks. Good results have also been obtained by drenching at the base of the plant (200 g a.i./tree) every 4 months.

ORNAMENTAL HEATHERS (Erica sp., Calluna sp.)

Drenching of 4 - 8 g a.i./m^2 of soil, gives good protection against Phytophthora cinnamomi.

ORNAMENTAL CONIFERS (Chamaecyparis)

Wilt and die-back of container grown ornamental conifers is caused by Phytophthora cinnamomi and may be effectively controlled by monthly drenches at the base of the plant at dose rates of 4 - 8 g a.i./m^2 of soil. Incorporating LS 74783 in the compost (80 - 160 a.i./m^3) before potting has given good protection too.

RHODODENDRONS

Wilt and die back of Rhododendrons caused by Phytophthora cinnamomi may be controlled by a drench at the base of the plant once a month at dose rates of 4 - 8 g a.i./m^2.

CAULIFLOWER

Incorporation of LS 74783 in the soil at dose rates of 10 - 20 g a.i./m^2 has prevented infection by Peronospora parasitica var. brassicae.

CUCURBITS

LS 74783 has been shown to be effective against Pseudoperonospora cubensis as a foliar spray at dose rates of 130 - 200 a.i./hl

STRAWBERRY pre-plant, soak

LS 74783 is effective against collar rot caused by Phytophthora cactorum when the strawberry plants are soaked for 15 mins in a solution containing 100 ppm of the active ingredient before planting. The product should then be applied during the month after planting as several drenches to the base of the plant giving a total dose rate of 0.1 - 0.2 g a.i./plant.

LS 74783 also controls red-core disease (Phytophthora fragariae) if the roots are dipped in a solution of 300 g a.i./hl before planting. Soil drenches and foliar sprays at the same rate also give some control.

HOP

LS 74783 has shown promise in controlling hop downy mildew (Pseudoperonospora humuli) by applying foliar sprays or drenches at dose rates of about 200 g a.i./hl from when infected basal spikes appear.

LETTUCE

Applied as a foliar spray at doses of 160 - 300 g a.i./hl, LS 74783 is effective against Bremia lactucae (downy mildew).

ONION

Using foliar sprays at dose rates of 300 g a.i./hl every three weeks, LS 74783 has effectively protected seed crops against attacks of Peronospora destructor.

POINSETTIA

Drenching the soil at the base of the plants at dose rates of 60 - 125 g a.i./hl has protected Poinsettia crops against Pythium sp.

PEPPER

Used as a drench at the base of the plant at dose rates of 0.2 - 0.4 g a.i./plant per treatment, LS 74783 gives good protection of peppers against neck rot caused by Phytophthora capsici.

APPLE

Dipping apples after harvesting in a solution of 300 g/hl LS 74783, appears to arrest development of moulds caused by the Phytophthora cactorum/P.syringae complex during storage.

VINE

Use of LS 74783 in foliar applications (1.5 to 3.0 kg a.i./ha) gives good protection of the foliage of the vine against Plasmopara viticola. This protection is particularly effective when the foliage is young and actively growing, whereas on older leaves the activity of LS 74783 is reduced.

However a mixture of LS 74783 with a reduced dose of a contact fungicide (folpet, mancozeb) results in a synergistic effect and gives better protection of foliage and bunches than that obtained with conventional products, even in cases of very severe attack. For this reason, trials on vines must be carried out with mixed formulations(EXP 1710, EXP 1733)and not with the product alone (EXP 1659).

For the control of Plasmopara viticola, the best results have been obtained by mixing LS 74783 with folpet (formulation EXP 1710), but mixtures with mancozeb, captafol or copper may also be used. The mixture with maneb is not recommended.

The powerful systemic action of LS 74783 may be demonstrated by the fact that even after the treatments have been stopped, the developing leaves remain resistant to mildew for several weeks.

This protection of the non-treated parts is of particular interest in vineyards where the practice of pruning is difficult or impossible.

When the fungus is present, the persistance of LS 74783 and its redistribution within the plant allows the treatments to be made at longer intervals than would be possible with the conventional contact fungicides, and thus reduces the total number of applications necessary during the programme. This is particularly useful in nursery vineyards where treatments are normally very numerous.

In the case of mature vines, suggested dose rates are about 3 kg/ha for the formulation EXP 1710 and 3.5 kg/ha for the formulation EXP 1733.

Trials carried out to date have shown evidence for the curative activity of LS 74783; in the case of applications made after infection, the best results have been obtained when the treatment has been carried out in the 48 hours following infection.

In early treatments following bud-burst, LS 74783 alone or in mixtures has been shown to be effective against canker caused by Phomopsis viticola. LS 74783 also has an inhibitory effect on vine powdery mildew (Uncinula necator).

LS 74783 does not affect the fermentation of musts or alter the organoleptic properties of wines, and does not pass into brandies during distillation.

The formulation EXP 1710 (LS 74783 + folpet) has been tested on several hundreds of vine varieties in Europe without showing any phytotoxic effects.

OTHER CROPS

Preliminary results show that LS 74783 is also active against Peronospora sparsa on roses, Phytophthora porri on leeks and cabbage and Pythium sp. on turf. It has however, very little activity on Phytophthora infestans on potato or tomato.

SUGGESTIONS FOR FUTURE EXPERIMENTS WITH LS 74783

The studies carried out to date, in the field and in different countries have provided evidence of the activity of LS 74783 against several important Phycomycetes. The trials must carry priority for this group of pathogenic fungi, against which there is no currently available fungicide which is both systemic and curative.

The experiments should seek to take advantage of the characteristic properties of the product (systemic action upwards and downwards in the plant, persistance, curative ability), with a view to eventually developing different application techniques from those used with contact fungicides.

Samples of LS 74783 may be obtained by contacting :

Project Leader - Fungicide Development
Rhodia Inc. Agricultural Division
P.O. Box 125
Monmouth Junction, NJ 08852

VI - SAFETY PRECAUTIONS

Although LS 74783 is a product of low toxicity, the routine precautions normally associated with the handling of pesticides should be observed.

Rhodia

RHODIA INC. AGRICULTURAL DIVISION
23 Belmont Drive. Somerset. New Jersey 08873
Telephone: 201-469-9680 • Telex. 833414

TECHNICAL DATA SHEET

LS 74-783 = A l i e t t e

Experimental Fungicide

CHEMICAL AND PHYSICAL CHARACTERISTICS:

LS 74-783 is available as an 80% water soluble powder. This compound is a stable white solid that is very soluble in water.

TOXICOLOGY:

The toxicology of this product has not been completely explored, and caution should be exercised in its handling and use. Initial studies suggest that its general toxicity is very low. The oral LD_{50} in rats is > 6800 mg/kg.

In handling this pesticide, avoid ingestion or contact with the skin or eyes. Do not store this product near foodstuffs.

FUNGICIDAL PROPERTIES:

LS 74-783 is a systemic fungicide having both protective and eradicant activity. This compound is active against soil-borne fungi and foliage pathogens belonging primarily to the Phycomycetes. Crop tolerance is generally good, although some slight phytotoxicity on grapes may occasionally be encountered.

ACTIVITY SPECTRUM:

Various trials indicate that LS 74-783 is active against the following fungal pathogens:

Plasmopara viticola - downy mildew of grape
Pythium sp. - damping-off
Peronospora tabacina - blue mold of tobacco
Phytophthora cinnamomi - Phytophthora root rot of avocado
P. parasitica - various rots
P. cactorum - leathery rot of strawberry
P. capsici - pepper blight
Guignardia bidwellii - black rot of grape

Thielaviopsis basicola - tobacco root rot
Cercospora arachidicola - peanut leaf spot
Cercospora beticola - sugar beet leaf spot
Piricularia oryzae - rice blast

SUGGESTIONS FOR FURTHER TESTING:

Further studies should be conducted on peanuts (Cercospora leaf spot), grape (downy mildew, black rot), ornamentals (soil drench for the control of root rots, damping-off), turf (soil drench for the control of Pythium blight), tobacco (blue-mold, black shank), and as a seed treatment or drench (damping-off, root rots, seed decay and seedling blights). Preliminary use rates of 0.5 and 1.0 lbai/A (or per 100 gal) for topical foliage or soil applications, and 2.0 and 4.0 ozai/100 lbs for seed treatment are being tested, however, rates up to 2.5 lbai/A (or per 100 gal) may be required.

HOP ENTOMOLOGY

FIELD RESEARCH REPORT

1978 treatment.

PRODUCT AND FORMULATION: ORTHENE 75S

CROP/VARIETY: Hops. Cultivar 'Cascade'

INSECT(S), WEED(S), DISEASES(S): Hop aphid, *Phorodon humuli*

PRINCIPAL INVESTIGATOR (INSTITUTION): Ralph Berry, Entomology, Oregon State University, Corvallis, Or 97331

DETAILS OF TEST:

TEST LOCATION: Corvallis, Or. USDA/SEA Experimental Hop Breeding Farm

PLOT SIZE (NO. REPS.): 4 hill plots (each hill on an 8 ft center). 4 replicates/treatment in randomized plot design.

APPLICATION EQUIPMENT: Stiel powered mist blower

SOIL TYPE: Willamette Silt Loam

GALS. SPRAY/ACRE: 150 gallons/acre (sprays applied at a rate of 1 quart/hill=1 gallon/plot).

SPREADERS/ADDITIVES (OZ/100 GAL.): None

APPLICATION DATE(S): 1st: 11 July 1978; 2nd: 1 Aug. 1978; 3rd: 29 Aug. 1978

RATING DATE(S): Pretreatment: 11 July 1978; 3 days: 13 July 1978; 7 days: 18 July 1978; 21 days: 1 Aug. 1978.

OTHER INFORMATION (WEED/INSECT/DISEASE PRESSURE, GROWTH STAGE AT TREATMENT, PLANTING DATE, PHYTOTOXICITY, ETC.): Harvested: 12 Sept. 1978. Plants had reached the 12 ft overhead trellis by 1st treatment date. Aphid population was moderately high on date of 1st application, but declined 21 days post-treatment. No phytotoxicity noted in any of the treatments by visual examination at weekly interval for 60 days. Irrigated with sprinklers 31 July 1978.

RESULTS OF TEST:

(ATTACH TABLE OF DATA) See Attached.

CONCLUSIONS: Orthene 75S significantly reduced the aphid population in this study as compared with Malathion 5E standard and the untreated check plots. The aphid population remained high in the check plots for 7 days following treatment, but declined after 21 days. No additional efficacy data were collected after the first application even though a 2nd and 3rd application was made.

Table 1.—Efficacy of Orthene (75S) against hop aphid, *Phorodon humuli*. Corvallis, Or. 1978.

Treatment	Rate[b] (lbs a.i./A)	$\bar{X}$ Aphids/leaf[a] Pretreatment 11 July '78	2 days 13 July '78	7 days 18 July '78	21 days[c] Aug. 1 '78
Orthene 75S	1/2	22.6	0.8	0.2	0.6
Orthene 75S	3/4	15.9	0.4	0.1	0.1
Orthene 75S	1.0	17.4	0.3	0.1	0.2
Malathion 5E	1.25	13.4	2.8	2.2	2.6
Check	-	12.6	15.8	16.6	2.0

[a] $\bar{X}$ no. aphids from 10 leaves/replicate. Replicated 4X in randomized plot.

[b] Treated 11 July 1978.

[c] Aphid population remained too low to evaluate efficacy after first application.

Title: Efficacy of ORTHENE 75S against hop aphid. Corvallis, Or. 1978.

Location: USDA/SEA Experimental Hop Breeding Farm. Corvallis, Or.

Dates Treated: 1st application: 11 July 1978
2nd application: 1 August 1978
3rd application: 29 August 1978

Dates Sampled: Aphids. 10 leaves were selected for each of 4 plants/treatment in each of 4 replicates and examined under 10X in the laboratory.
Pretreatment sample: 11 July 1978
3 days sample: 13 July 1978
7 days sample: 18 July 1978
21 days sample: 1 August 1978

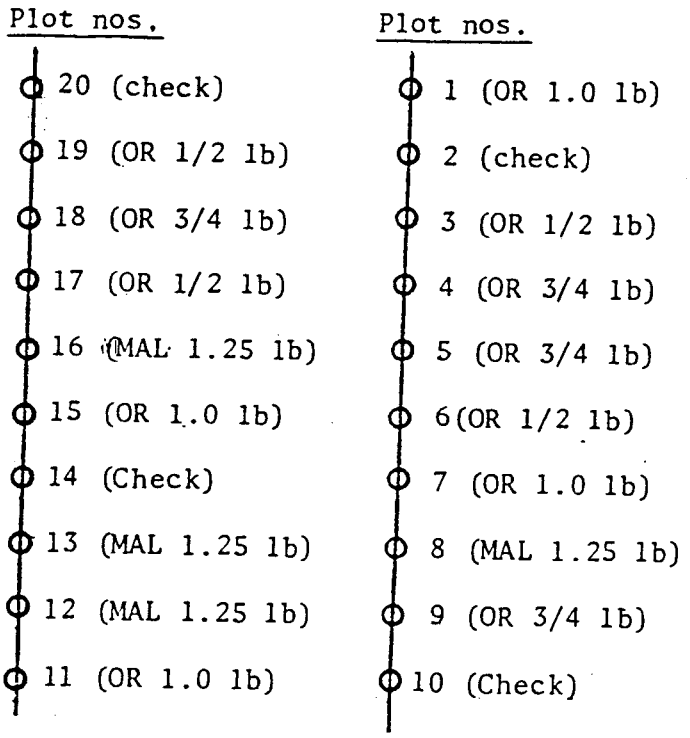
Residue Samples: 5 September 1978 (7 days post-treatment)
12 September 1978 (14 days post-treatment & harvest date)

Treatments:
1) Orthene 75S 1/2 lb a.i./A (plots 6, 17, 3, 19)
2) Orthene 75S 3/4 lb a.i./A (plots 5, 9, 18, 4)
3) Orthene 75S 1.0 lb a.i./A (plots 15, 7, 11, 1)
4) Malathion 5E 1.25 lbs a.i./A (plots 12, 16, 8, 13)
5) Check (plots 2, 14, 10, 20)

Treatment Methods: Applied in 1 quart water/hill with Stiel powered mist blower. 1 gallon water/4 hill replicate equivalent to 150 gallons/A

Experimental Design: Randomized plots with 4 hop hills in each of 4 replicated (plants on 8 ft centers). One hill was left between each plot to reduce effects of drift.

Plot Plan:



T-4906 FIELD RESEARCH REPORT

1979 treatment.

PRODUCT AND FORMULATION: ORTHENE 75S

CROP/VARIETY: Hops. Cultivar 'Cascade'

INSECTS(S), WEED(S), DISEASES(S): Hop Aphid, *Phorodon humuli*

PRINCIPAL INVESTIGATOR (INSTITUTION): Ralph Berry, Entomology, Oregon State University, Corvallis, OR 97331

DETAILS OF TEST:

TEST LOCATION: Corvallis, OR. USDA/SEA Experimental Hop Breeding Farm

PLOT SIZE (NO. REPS): 4 hill plots (each hill on a 8 ft center) 4 replicates/treatment in randomized plot design (see attached).

APPLICATION EQUIPMENT: Stiel powered mist blower

SOIL TYPE: Willamette Silt Loam

GALS SPRAY/ACRE: 150 gallons/acre (sprays applied at a rate of 1 quart/hill=1 gallon/plot).

SPREADERS/ADDITIVES (OZ/100 GAL.): None

APPLICATION DATE(S): 1st: 27 July 1979, 2nd: 10 August 1979, 3rd: 24 August 1979

RATING DATE(S): Pretreatment: 26 July 1979, 3 days: 30 July 1979, 7 days: 3 August 1979.

OTHER INFORMATION (WEED/INSECT/DISEASE PRESSURE, GROWTH STAGE AT TREATMENT, PLANTING DATE, PHYTOTOXICITY, ETC.): Harvest 7 September 1979. Plants had reached the 12 ft overhead trellis by 1st application date (27 July 1979). Aphid populaiton was relatively low on date of 1st application and remained low during the 7 day posttreatment evaluation period. No phytotoxicity was noted in any of the treatments by visual examination of the foliage at weekly intervals for 4 weeks. Irrigated with sprinkler irrigation 8 August 1979.

RESULTS OF TEST: See Attached (Table 1).

CONCLUSIONS: Orthene 75 S significatnly reduced the aphid population in this test as compared with pretreatment estimates of the aphid population in all plots and the untreated check plots. The aphid population continued to increase in the check plots during the 7 days of this test, but declined in all plots treated with Orthene 75 S or malathion. No additional efficacy data were collected after the first application because the aphid population never recovered. At harvest (7 September 1979), all plots were heavily infested with spider mites.

Table 1.—Efficacy of Orthene (75S) against the hop aphid, *Phorodon humuli*. Corvallis, Or. 1979.

Treatment	Rate[b] (lbs a.i./A)	$\bar{X}$ Aphids/leaf[a]		
		Pretreatment	3 days	7 days[c]
		26 July '79	10 Aug. '79	24 Aug. '79
Orthene 75 S	1/2	0.75	0	0
Orthene 75 S	3/4	2.53	0	0.03
Orthene 75 S	1.0	1.08	0	0
Malathion 5E	1.25	1.03	0.03	0
Check	-	1.03	2.58	3.85

a/ $\bar{X}$ no. aphids from 10 leaves/replicate. Replicated 4X in randomized plot.

b/ Treated 27 July 1979.

c/ Aphid population remained too low to evaluate efficacy after first application.

Title: Efficacy of ORTHENE against hop aphid--1979 Variety Cascade
Location: USDA/SEA Hop Research Farm, Corvallis, OR
Dates Treated: 1st application: 27 July 1979
2nd application: 10 August 1979
3rd application: 24 August 1979

Dates Sampled: APHIDS Presample:
Post-treatment: 3, 5, and 7 days post-treatment

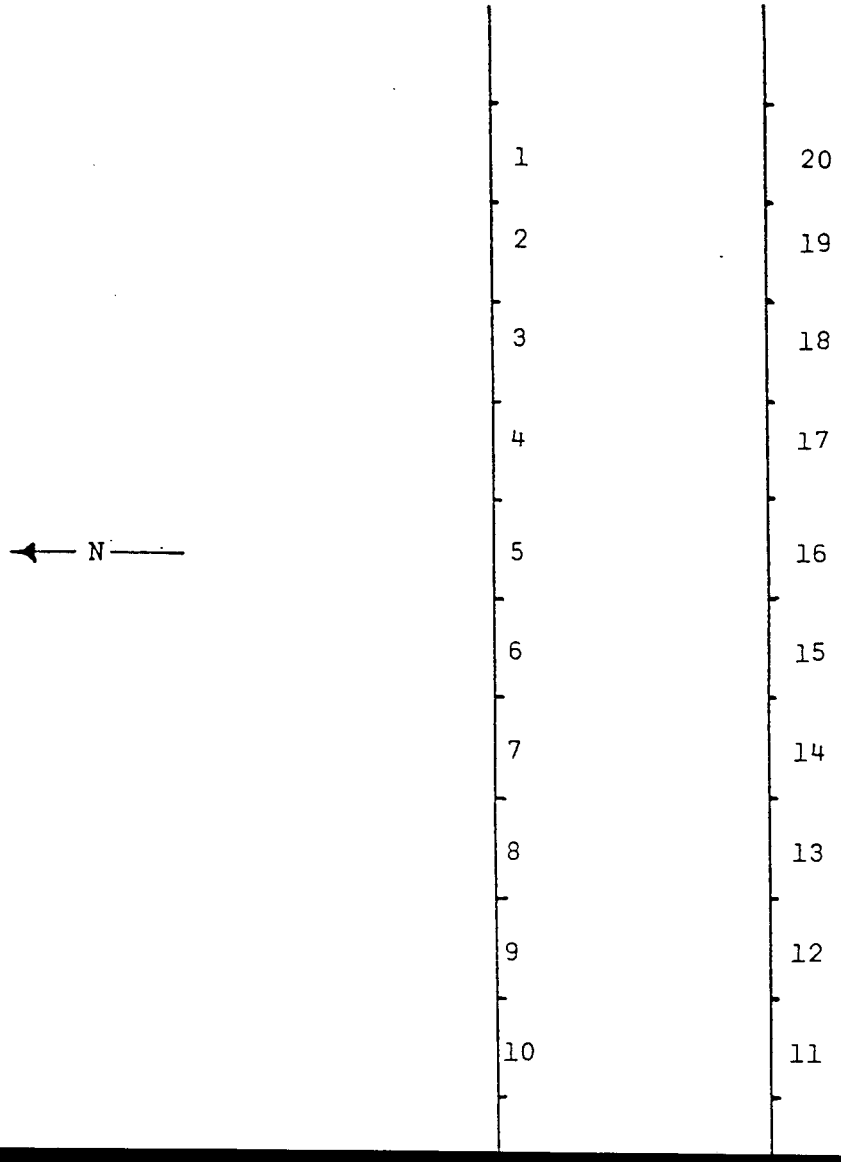
Residue Samples: 1/2 and 1 lb a.i./acre treatments only
0 days after last treatment (fresh frozen and dry cones) 24 August
7 days after last treatment (" ") 31 August
14 days after last treatment (" ") (HARVEST) 7 Sep

Experimental Design: Randomized plots with 4 hills in each of 4 reps/treatment
One hill left between plots to reduce effects of drift.

Treatments: 1) Orthene 1/2 lb a.i./acre (2.0 gm/gal water) PLOTS 15, 5, 8, 13
2) Orthene 3/4 lb a.i./acre(3.0 gm/gal water) PLOTS 2, 14, 12, 18
3) Orthene 1 lb a.i./acre(4.0 gm/gal water) PLOTS 10, 19, 6, 11
4) Malathion 5E 1.25 lb a.i./acre (6.3 ml/gal water)PLOTS 3, 16, 1, 9
5) Check PLOTS 4, 17, 7, 20

Treatment Methods: Apply with Stiel mist blower in 1 quart water/hill (1 gallon water/replicate)

Plot Diagram:



Carzol® SP

MITICIDE / INSECTICIDE

DATA SHEET 73-6

CARZOL SP - STABILITY

Research data has indicated that CARZOL SP is not stable in highly alkaline water. In some areas where alkaline water conditions exist and the pH exceeds 8.0, it is recommended that an acidifier or buffering agent be used with CARZOL.

Laboratory tests were established to determine the amount of time required for one half the given amount of CARZOL SP to decompose at various pH levels. The following results were determined.

pH	Half Life
5	4 days
7	14 hours
9	3 hours

Water samples were taken at several locations where CARZOL SP was being used for mite control. Application methods were considered good in all cases. Water sources and pH were considered to be the only variable. From ten locations the following information was obtained.

WATER pH	MITE CONTROL
6.6	Good
7.1	Good
7.4	Good
7.4	Good
7.5	Good
7.6	Good
7.8	Good
8.1	Fair
8.3	Poor
8.3	Poor

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AGRICULTURAL PRODUCTS, INC.
20 N. WACKER DRIVE CHICAGO, ILLINOIS 60606

INFORMATION BULLETIN

CARZOL® SP MITICIDE/INSECTICIDE

SECTION 18 EXEMPTION...FOR THE CONTROL OF TWO-SPOTTED SPIDER MITES ON HOPS GROWN IN YAKIMA AND BENTON COUNTY - WASHINGTON

DIRECTIONS FOR USE

Applications are to be made with ground equipment of the airblast type. Either commercial growers or licensed commercial applicators may apply Carzol SP.

Applications are authorized only when Washington State extension agents or licensed private consultants determine that two-spotted spider mite populations are reaching levels requiring treatment with Carzol SP.

Add the desired amount of Carzol SP directly to the spray tank, half full of water with the agitator running. Fill up the tank with the remainder of the water.

NOTICE: Do not use water with a pH above 8.0. Carzol SP is not stable in alkaline water. Do not prepare the spray mixture until just before application. Do not prepare more spray mixture than will be used within 4 hours.

RATE

Three applications of Carzol SP, (a.i. formetanate hydrochloride) are authorized. The first application will be made at a dosage rate of 1.0 lb. product (0.92 lb. a.i. acre). The second and third applications are to be made at three week intervals and at a dosage rate of 1.5 lb. product (1.38 lb. a.i./acre).

USE PRECAUTIONS

There is to be a pre-harvest interval of 14 days.

Hops refuse must not be fed to livestock.

Dried hops with a residue level of formetanate hydrochloride not exceeding 150 PPM may enter interstate commerce. Beer with residue levels of formetana hydrochloride not exceeding 0.5 PPM may also enter interstate commerce, the Food and Drug Administration, DHEW, has been advised of this action.

(continued on reverse)

NOR-AM®
AGRICULTURAL PRODUCTS, INC.
20 N WACKER DRIVE CHICAGO, ILLINOIS 60606

A full report of the results of this program must be submitted to the E.P.A. by the end of February, 1979.

The E.P.A. shall be immediately informed of any adverse effects resulting from the use of Carzol SP in connection with this exemption.

In order to minimize adverse effects to natural predators, precautions must be taken to avoid or minimize drift to non-target areas.

All applicable label use directions, precautions, and restrictions must be followed.

This specific exemption expires on September 30, 1978.

OBEY ALL CAUTIONARY STATEMENTS ON THE LABEL FOR CARZOL SP, #776, E.P.A. Registration No. 2139-99

JUN 1 5 1978

TELEGRAPHIC MESSAGE

NAME OF AGENCY	PRECEDENCE	SECURITY CLASSIFICATION
FEDERAL COMMUNICATIONS COMMISSION EPA - Washington, D.C. 20460	ACTION R INFO.	UNCLAS
ACCOUNTING CLASSIFICATION	DATE PREPARED	TYPE OF MESSAGE ☐ SINGLE ☐ BOOK ☐ MULTIPLE ADDRESS
FOR INFORMATION CALL		
NAME Patricia Critchlow, Team Leader	PHONE NUMBER (202) 426-0223	

THIS SPACE FOR USE OF COMMUNICATION UNIT

Telefax Copy to John Heller - EPA Region X - Pesticides

MESSAGE TO BE TRANSMITTED (Use double spacing and all capital letters)

TO:

MR. GLENN E. SMERDON
PESTICIDE SPECIALIST & REGISTRAR
GRAIN & CHEMICAL DIVISION
WASHINGTON STATE DEPARTMENT OF AGRICULTURE
406 GENERAL ADMINISTRATION BLDG.
OLYMPIA, WASHINGTON 98504

RECEIVED
JUN
COMMUNICATIONS CENTER

DEAR MR. SMERDON:

THE ENVIRONMENTAL PROTECTION AGENCY HEREBY GRANTS A SPECIFIC EXEMPTION, UNDER THE PROVISIONS OF SECTION 18 OF THE FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT, AS AMENDED, TO THE WASHINGTON STATE DEPARTMENT OF AGRICULTURE FOR THE USE OF CARZOL SP TO CONTROL TWO-SPOTTED SPIDER MITES ON 22,000 ACRES OF HOPS LOCATED IN THE COUNTIES OF YAKIMA AND BENTON. THIS EXEMPTION IS SUBJECT TO THE FOLLOWING RESTRICTIONS:

1. THREE APPLICATIONS OF CARZOL SP, (A.I. FORMETANATE HYDROCHLORIDE) (EPA REGISTRATION NUMBER 2139-99) ARE AUTHORIZED. THIS FIRST APPLICATION WILL BE MADE AT A DOSAGE RATE OF 1.0 LB. PRODUCT (0.92 LB. A.I./ACRE). THE SECOND AND THIRD APPLICATIONS ARE TO BE MADE AT THREE WEEK INTERVALS AND AT A DOSAGE RATE OF 1.5 LB PRODUCT (1.38 LB. A.I./ACRE).

SECURITY CLASSIFICATION		
	PAGE NO. 1	NO. OF PGS. 3

AUTOVON FORM 14
REVISED AUGUST 1967

APHIS MESSAGE

OF AGENCY	PRECEDENCE	SECURITY CLASSIFICATION
FEDERAL COMMUNICATIONS COMMISSION EPA - Washington, D.C. 20460	ACTION: R INFO:	UNCLAS
ACCOUNTING CLASSIFICATION	DATE PREPARED	TYPE OF MESSAGE ☐ SINGLE ☐ BOOK ☐ MULTIPLE ADDRESS
FOR INFORMATION CALL		
NAME Patricia Critchlow, Team Leader	PHONE NUMBER (202) 426-0223	

THIS SPACE FOR USE OF COMMUNICATION UNIT

MESSAGE TO BE TRANSMITTED (Use double spacing and all capital letters)

TO:

2. A MAXIMUM OF 80,960 POUNDS ACTIVE INGREDIENT MAY BE USED.

3. APPLICATIONS ARE AUTHORIZED ONLY WHEN WASHINGTON STATE EXTENSION AGENTS OR LICENSED PRIVATE CONSULTANTS DETERMINE THAT TWO-SPOTTED SPIDER MITE POPULATIONS ARE REACHING LEVELS REQUIRING TREATMENT WITH CARZOL SP.

4. APPLICATIONS ARE TO BE MADE WITH GROUND EQUIPMENT OF THE AIRBLAST TYPE. EITHER COMMERCIAL GROWERS OR LICENSED COMMERCIAL APPLICATORS MAY APPLY CARZOL SP.

5. THE WASHINGTON STATE DEPARTMENT OF AGRICULTURE MUST CONTINUE TO WORK TOWARD THE ESTABLISHMENT OF A PERMENENT TOLERANCE OF PERMETANATE HYDROCHLORIDE ON HOPS. THESE STEPS WILL DETERMINE IF FUTURE SPECIFIC EXEMPTIONS FOR THE USE OF THIS PESTICIDE WILL BE GRANTED.

6. THERE IS TO BE A PRE-HARVEST INTERVAL OF 14 DAYS.

7. HOPS REFUSE MUST NOT BE FED TO LIVESTOCK.

SECURITY CLASSIFICATION		
	PAGE NO. 2	NO. OF PGS. 3

STANDARD FORM 14

GRAPHIC MESSAGE

OF AGENCY	PRECEDENCE	SECURITY CLASSIFICATION
FEDERAL COMMUNICATIONS COMMISSION EPA - Washington, D.C. 20460	ACTION R INFO.	UNCLAS
ACCOUNTING CLASSIFICATION	DATE PREPARED	TYPE OF MESSAGE ☐ SINGLE ☐ BOOK ☐ MULTIPLE ADDRESS
FOR INFORMATION CALL		
NAME Patricia Critchlow, Team Leader	PHONE NUMBER (202) 426-0223	
THIS SPACE FOR USE OF COMMUNICATION UNIT		

MESSAGE TO BE TRANSMITTED (Use double spacing and all capital letters)

TO:

8. DRIED HOPS WITH A RESIDUE LEVEL OF FORMETANTE HYDROCHLORIDE NOT EXCEEDING 150 PPM MAY ENTER INTERSTATE COMMERCE. BEER WITH RESIDUE LEVELS OF FORMETANATE HYDROCHLORIDE NOT EXCEEDING 0.5 PPM MAY ALSO ENTER INTERSTATE COMMERCE, THE FOOD AND DRUG ADMINISTRATION, DHEW, HAS BEEN ADVISED OF THIS ACTION.

9. A FULL REPORT OF THE RESULTS OF THIS PROGRAM MUST BE SUBMITTED TO THE EPA BY THE END OF MARCH 1980.

10. THE EPA SHALL BE IMMEDIATELY INFORMED OF ANY ADVERSE EFFECTS RESULTING FROM THE USE OF CARZOL SP IN CONNECTION WITH THIS EXEMPTION.

11. IN ORDER TO MINIMIZE ADVERSE EFFECTS TO NATURAL PREDATORS, PRECAUTIONS MUST BE TAKEN TO AVOID OR MINIMIZE DRIFT TO NON-TARGET AREAS.

12. ALL APPLICABLE DIRECTIONS, PRECAUTIONS, AND RESTRICTIONS ON THE PRODUCT LABEL MUST BE FOLLOWED.

13. THIS SPECIFIC EXEMPTION EXPIRES ON SEPTEMBER 30, 1979.

EDWIN L. JOHNSON
DEPUTY ASSISTANT ADMINISTRATOR
FOR PESTICIDE PROGRAMS (TS-766)
DATED:

SECURITY CLASSIFICATION		
	PAGE NO. 3	NO. OF PGS. 3

STANDARD FORM 14
REVISED AUGUST 1967

W E E D C O N T R O L

Dr. Arnold P. Appleby and Bill D. Brewster
Dept. Crop Science, Oregon State University. 1979.

Hop Sucker Control with Oxadiazon 1978-79

Two trials were conducted on Marion County farms to evaluate oxadiazon (Ronstar) for hop tolerance, hop sucker control, and field bindweed *(Convolvulus arvensis)* control. Three repeat applications were made to each of the treated plots. Treatments were applied with a CO_2 backpack sprayer. The first application was made with a two-nozzle (8004 TeeJet), 1-m boom. The second application was made after stringing so a one-nozzle wand was used and each half of each plot was sprayed separately. The third application was made with a 1-m, two-nozzle boom with 8006 flat fan tips. In the third application, the plots were sprayed 2-m wide to get adequate coverage of the hop suckers. Each half of each plot was sprayed separately.

Visual evaluations were made on three dates and two treatments and the checks were harvested at crop maturity. Residue samples of green cones, dry cones, and foliage were collected from both trials.

Crosby Farm, Woodburn, Marion County, Oregon

This trial area was oversprayed with dinoseb on July 15, 1979. The dinoseb application did not mask the effect of the oxadiazon. Treatments 2 and 3 were effective on field bindweed and hop suckers without visible injury to the hop plants. The most useful timing of oxadiazon for sucker control is immediately after stringing since there is no other chemical sucker control treatment that early.

The greatest yield of green cones came from treatment 3 while the lowest came from the untreated control.

Kerr Farm, Hopmere, Marion County, Oregon

Treatment 3 was definitely the best treatment for field bindweed and hop sucker control. No hop injury was noted with any treatment. As at the Crosby location, the green cone yield was highest in treatment 3 and lowest in the untreated control.

Hop Sucker Control with Oxadiazon
Kerr Farm, Hopmere, Marion County, Oregon
1978-79

Experiment No. 79-40

Visual Evaluations[a] - % Injury or Control

Treatment	Rate kg a.i./ha	Evaluated January 30, 1979										Evaluated May 30, 1979														
		Henbit					Common Chickweed					Hops					Hop Suckers					Field Bindweed				
		R1	R2	R3	R4	Avg	R1	R2	R3	R4	Avg	R1	R2	R3	R4	Avg	R1	R2	R3	R4	Avg	R1	R2	R3	R4	Avg
Applied December 7/May 20/July 12																										
1. oxadiazon	2.25/1.12/2.25	0	20	0	0	5	0	30	0	20	12	0	0	0	0	0	50	60	60	50	55	80	90	80	100	88
2. oxadiazon	4.5/2.25/4.5	5	20	0	0	6	0	30	20	0	12	0	0	0	0	0	70	30	40	60	50	90	60	70	90	78
3. oxadiazon	9/4.5/9	0	20	20	30	18	20	30	30	40	30	0	0	0	0	0	80	80	80	75	79	100	100	95	100	99
4. oxadiazon	18/9/18	50	-	-	-	-	40	-	-	-	-	0	-	-	-	-	90	-	-	-	-	100	-	-	-	-
5. Check	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Treatment	Rate kg a.i./ha	Evaluated August 31, 1979															Green Cones (g/plot)				
		Hops					Hop Suckers					Field Bindweed									
		R1	R2	R3	R4	Avg	R1	R2	R3	R4	Avg	R1	R2	R3	R4	Avg	R1	R2	R3	R4	Avg
Applied December 7/May 20/July 12																					
1. oxadiazon	2.25/1.12/2.25	0	0	0	0	0	20	50	25	60	39	20	60	10	90	45	-	-	-	-	-
2. oxadiazon	4.5/2.25/4.5	0	0	0	0	0	80	50	50	80	65	70	60	50	80	65	11,700	10,600	11,700	11,300	11,325
3. oxadiazon	9/4.5/9	0	0	0	0	0	90	90	75	80	84	95	100	90	95	95	12,700	11,100	12,300	13,400	12,375
4. oxadiazon	18/9/18	0	-	-	-	-	80	-	-	-	-	90	-	-	-	-	-	-	-	-	-
5. Check	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12,400	13,600	8,400	8,900	10,825

[a]Evaluation Scale: 0 = no effect, 100 = complete control

$LSD_{.05}$ = n.s.
C.V. = 16%

Date of Evaluation: January 30, May 30, 1979
Date of Harvest: August 31, 1979
Planting Date: 1976

Application Data

Date:	December 7, 1978	May 20, 1979	July 12, 1979
Conditions:			
Air temperature	7 C	22 C	22 C
Soil temperature	3 C	24 C	23 C
Humidity	68%	80%	85%
% Cloud cover	0	60	100
Wind speed	3-4 km/h	Calm	Calm
Wind direction	West	-	-
Method of Application:	Broadcast	Broadcast	Broadcast
Carrier volume	230 l/ha	230 l/ha	458 l/ha
Nozzle size	8004 flat fan	8004 flat fan	8006 flat fan
Pressure	2.0 kg/cm^2	2.0 kg/cm^2	4.2 kg/cm^2
Stage of Growth:			
Hops	Dormant	1 to 1.5 m tall (suckers 0.5 m or less)	1 to 2 m past top of trellis
Bindweed	Nearly dormant		
Henbit	Flowering		
Common chickweed	Flowering		

General Information
Crop: Hops (Cascade var.)
Plot size: 2 by 6.86 cm
Soil type: Cloquato silt loam
Soil organic matter: 3.0%; pH 5.1
Other pesticides: None
Irrigation: Sprinkler

Hop Sucker Control with Oxadiazon
Crosby Farm, Woodburn, Marion County, Oregon
1978-79

Experiment No. 79-41

Treatment	Rate kg a.i./ha	Visual Evaluations[a] - % Injury or Control: Evaluated Jan. 30, 1979 — Annual Bluegrass R1	R2	R3	R4	Avg	Hops R1	R2	R3	R4	Avg	Evaluated May 30, 1979 — Hops R1	R2	R3	R4	Avg	Hop Suckers R1	R2	R3	R4	Avg	Field Bindweed R1	R2	R3	R4	Avg
Applied December 7/May 20/July 16																										
1. oxadiazon	2.25/1.12/2.25	10	20	10	10	12	0	0	0	0	0	50	75	80	75	70	0	80	100	100	70					
2. oxadiazon	4.5/2.25/4.5	30	30	20	10	22	0	0	0	0	0	60	20	90	80	62	80	0	100	100	70					
3. oxadiazon	9/4.5/9	60	30	50	60	50	0	0	0	0	0	80	90	85	80	84	100	100	100	100	100					
4. oxadiazon	18/9/18	90	-	-	-	-	0	-	-	-	-	90	-	-	-	-	100	-	-	-	-					
5. Check	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					

Treatment	Rate kg a.i./ha	Evaluated August 31, 1979 — Hops R1	R2	R3	R4	Avg	Hop Suckers R1	R2	R3	R4	Avg	Field Bindweed R1	R2	R3	R4	Avg	Green Cones (g/plot) R1	R2	R3	R4	Avg
Applied December 7/May 20/July 16																					
1. oxadiazon	2.25/1.12/2.25	0	0	0	0	0	25	25	85	80	54	0	60	90	100	62	-	-	-	-	-
2. oxadiazon	4.5/2.25/4.5	0	0	0	0	0	50	70	80	85	71	70	90	90	100	88	12,000	13,200	11,600	10,300	11,775
3. oxadiazon	9/4.5/9	0	0	0	0	0	80	85	90	95	88	90	100	90	100	95	12,300	12,600	13,500	12,500	12,725
4. oxadiazon	18/9/18	0	-	-	-	-	95	-	-	-	-	100	-	-	-	-	-	-	-	-	-
5. Check	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13,500	10,700	10,900	8,900	11,000

[a]Evaluation Scale: 0 = no effect, 100 = complete control

$LSD_{.05}$ = n.s.
C.V. = 10%

Date of Evaluation: January 30, May 30, 1979
Date of Harvest: September 4, 1979
Planting Date. 1974

Application Data

Date:	December 7, 1978	May 20, 1979	July 16, 1979
Conditions:			
Air temperature	4 C	20 C	39 C
Soil temperature	3 C	21 C	31 C
Humidity	70%	75%	40%
% Cloud cover	0	60	0
Wind speed	2-4 km/h	4-6 km/h	Calm
Wind direction	Southwest	North	-
Method of Application:	Broadcast	Broadcast	Broadcast
Carrier volume	230 l/ha	230 l/ha	458 l/ha
Nozzle size	8004 flat fan	8004 flat fan	8006 flat fan
Pressure	2.0 kg/cm^2	2.0 kg/cm^2	4.2 kg/cm^2
Stage of Growth:			
Hops	Dormant	1.5 to 2 m, suckers up to 1 m	1/2 to 2 m, past top of trellis, flowering
Field bindweed	Dormant		
Annual bluegrass	Early flower		
Common chickweed	Early bloom		

General Information
Crop: Hops (Cascade var.)
Plot size: 2 m by 6.86 m
Soil type: Amity silt loam
Soil organic matter: 4.1%, pH 6.2
Other pesticides: dinoseb 0.62 lbs/A July 16
Irrigation: Sprinkler

NOTES: Oversprayed with dinoseb July 16

C-5

Hop Sucker Control with Oxadiazon
East Farm, Corvallis, Linn County, Oregon
1979

Oxadiazon (Ronstar 2 E.C.) was evaluated for hop sucker control on established 'Cascade' hops. Several small replants were present in the trial site. The experiment was conducted as a randomized block design with five replications. Treatments were applied with a hand-held CO_2-pressurized backpack sprayer. In the first two applications, a single 8004 TeeJet nozzle was used to deliver a 0.5-m band width. Each half of the plot was sprayed separately. On the third application, a two-nozzle boom with 8006 TeeJet tips was used to deliver a 1-m wide band. This increased the plot width from 1 to 2 m.

Results

Severe, although temporary, injury occurred when oxadiazon was sprayed over the tops of the small replants. Although none of the treated plants died, the small replants did not grow as much as they should have because of the setback from the herbicide. Those plants whose terminals were not oversprayed appeared to grow normally.

Early sucker growth control is essential to prevent a serious infection of downy mildew. It is also necessary to control the early growth if later chemical-suckering treatments are to be successful. The dense foliage at the base of a hop plant can prevent adequate penetration of sprays which results in poor sucker control.

The most effective treatment in this trial was treatment 2 which received three applications of oxadiazon. The last application was tank-mixed with paraquat which increased sucker control by about 20%.

Hop Sucker Control with Oxadiazon
East Farm, Corvallis, Linn County, Oregon
1979

Experiment No. 79-42

Treatment	Rate kg a.i./ha	Visual Evaluations[a] - % Injury or Control: Evaluated May 30, 1979 — Hop Injury R1	R2	R3	R4	R5	Avg	Sucker Control R1	R2	R3	R4	R5	Avg	Evaluated July 12, 1979 — Hop Injury R1	R2	R3	R4	R5	Avg	Sucker Control R1	R2	R3	R4	R5	Avg
Stringing/Halfway/Top of Trellis																									
1. oxadiazon/oxadiazon/ oxadiazon	2.24/2.24/ 2.24	0	0	0	0	0	0	60	75	50	70	60	63	0	0	0	0	0	0	80	60	50	60	85	67
2. oxadiazon/oxadiazon/ paraquat + oxadiazon	2.24/2.24/ 0.56 + 2.24	0	0	20*	20*	0	8	75	85	75	75	75	77	0	0	20*	0	0	4	90	85	70	90	90	85
Stringing/Top of Trellis																									
3. oxadiazon/oxadiazon	2.24/2.24	0	0	0	0	0	0	75	80	50	80	90	75	0	0	0	0	0	0	30	20	30	40	50	34
4. oxadiazon/paraquat + oxadiazon	2.24/0.56 + 2.24	0	0	0	40*	0	8	75	75	50	75	75	50	0	0	0	0	0	0	50	50	40	60	50	50
Halfway/Top of Trellis																									
5. oxadiazon/oxadiazon	2.24/2.24	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	50	50	70	70	50	58
6. oxadiazon/paraquat + oxadiazon	2.24/0.56 + 2.24	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	75	85	50	70	70	70
7. Check	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[a]Evaluation Scale: 0 = no effect, 100 = complete control
*Severe injury to small plants

Date of Evaluation: May 30, July 12, 1979

Application Data

Date:	May 21, 1979	June 11, 1979	July 2, 1979
Conditions:	Post stringing	Halfway to trellis	Top of trellis
Air temperature	12 C	23 C	27 C
Soil temperature	11 C	28 C	25 C
Humidity	85%	65%	85%
% Cloud cover	0	0	20
Wind speed	Calm	6-10 km/h	0-4 km/h
Wind direction	--	Southwest	Southwest
Method of Application:	CO_2 backpack	CO_2 backpack	CO_2 backpack
Carrier volume	250 l/ha	250 l/ha	467 l/ha
Nozzle size	8004	8004	8006
Pressure	2.1 kg/cm^2	2.1 kg/cm^2	4.8 kg/cm^2
Stage of Growth:			
Hops	1/2 - 1 cm tall, suckers mostly less than 1/2 m	1/2 - 3 cm tall, suckers up to 1 m long	Top of trellis

General Information
Crop: Hops (Cascade var.)
Plot size: 1 m by 11.4 m (5 hills)
Soil type: Chehalis silt loam
Soil organic matter: 2.1%, pH 5.8
Other pesticides: None
Irrigation: Sprinkler

C-6

Oregon State University

Department of Agricultural Chemistry

Corvallis, Oregon

dry weight basis

FINAL
~~Preliminary~~ report of Certified Hop Analyses October 3, 1979.

Variety	Year	Bales[3]	As is basis (at 8% moistu				
			%α	↓	%β	↓	HSI
Fuggle	1970-74	6,500	4.4	X	2.3	X	---
	1975	2,949	5.0		2.5		---
	1976	1,635	5.0		2.6		---
	1977	0	---		---		---
	1978	2,995	4.3		2.2		.34
	to date 1979	—	—		—		—
English[2]	1970-74	9,300	9.1		4.6		---
	1975	10,355	9.4		3.7		---
	1976	10,649	8.8		4.3		---
	1977	11,542	9.4		4.7		---
	1978	11,859	8.8		4.5		.28
	to date 1979	11,714	8.7	9.5	4.6	5.0	0.29
Cascade	1971-75	615	6.1		4.9		---
	1976	2,050	5.5		4.6		---
	1977	3,251	6.7		5.2		---
	1978	3.435	6.3		5.1		.26
	to date 1979	2,815	5.5	6.0	5.3	5.8	0.28
Willamette	1978	70	6.0	6.5	3.9	4.2	.29
	to date 1979	—	—		—		—
Columbia	1978	55	6.5		3.7		.28
	to date 1979	50	7.0	7.6	4.0	4.3	0.27

NOTES:

1. All analyses run by Agricultural Chemistry Department, OSU by the official ASBC Spectrophotometric Method. Samples collected with a "resin core sampler". To convert results on "as is basis" at 8% moisture to dry weight basis, divide by 0.92.

2. "English" includes Brewers Gold and Bullion.

3. "Bales" is the approximate total number of bales in the lots submitted for analysis.

UNITED STATES DEPARTMENT OF AGRICULTURE
SCIENCE AND EDUCATION ADMINISTRATION

AGRICULTURAL RESEARCH
WESTERN REGION
Field Crops Breeding & Production
Research Unit
Room 437, Weniger Hall
Department of Agricultural Chemistry
Oregon State University
Corvallis, OR 97331

June 11, 1979

Subject: Second APPENDIX to Lab Report, Mar. 29, 1979
"Genetic Identity of Tettnang from two Sources"

To: Haunold
Horner
Nickerson
Romanko
Skotland
Zimmermann

see Acc. # book page 40 handwritten note of SN Brooks: "grown in" ED by Steiner

Chuck has written and pointed out that the statement in the Mar. 29 report that "It (Swiss) had been grown in Idaho by Steiner." was in error. He provided the following information regarding the origin of USDA-61021:

"We recieved a 10x10x10 inch square box, constructed with 1x2 inch wooden strips, containing fifty (50) rhizomes, from Mr. Helmut Steiner in 1960. These hop rhizomes were obtained from Steiners in Laupheim, Germany (Tettnang district) and were sent to S. N. Brooks from St. Gallen, Switzerland. Prior to this time S. Stinor Gimbel was instrumental in obtaining funds for Stan to experimentally grow Hallertau hops in Oregon. Stan did not get the Hallertau planting established in 1958 as planned.

The roots obtained from Steiner were originally called "Swiss" to identify the origin of the shipment - the Hallertau-S was used when discussing our research progress with the brewers (USBF) because they were funding a Hallertau study (the S was retained to identify the origin). Buttery undoubtedly verified a fact."

Chuck also reminds us that "Cal Skotland has reported on numerous occasions that the original 61021, prior to heat treatment, yielded 2/3 less than the PNRV-free 61021 (Tettnanger)."

Sam T. Likens STL

Haunold
Horner
Nickerson
Romanko
Skotland
Zimmermann

LAB REPORT
Mar. 29, 1979
Likens and Nickerson

GENETIC IDENTITY OF TETTNANG FROM TWO SOURCES

A hop variety recorded simply as "Swiss" was received from S.S. Steiner in about 1960 and given the accession number 61021. It had been grown in Idaho by Steiner. It was later loosely referred to as "Hallertau-S." In the middle 60's Ron Buttery noted the similarity of its oil composition to that of a commercial Tettnang sample and 61021 was subsequently considered to be Tettnang.

In about 1969 a variety recorded as Tettnanger was received from A. Coors Co. and assigned accession number 21015. It, too, had been grown in Idaho (Parma) and is considered to be authentic.

We consider it appropriate to establish clearly that the two sources of Tettnang are equal since commercial acreage is being planted. In addition to agronomic information, we submit the following quality data.

Identity	α-acids (%)	β-acids (%)	α-ratio	oil (ml/100g)
21015	5.3	4.3	55	0.6
61021	5.8	5.7	50	1.0

The results above were obtained from bale samples from 2-hill plots in the Smith yard and differences are within sampling variability for a variety.

Most confidence for genetic identity information can be placed in composition profiles of essential oils. The attached gas chromatograms of the oils compare very closely with the exception of a group which appears in 21015 at 41.47-42.61 minutes but is absent in 61021. Differences exhibited in this region can be a result of analytical variables, such as oxidation during

distillation and sample collection. The comparison of fine detail of the rest of the chromatogram*, however, provides good support for concluding that the two genotypes are identical.

Figures 1 and 2

Chromatographic conditions and sample information are given in the box in the upper right corner. Numbers printed above peaks are retention times in hundredths of a minute. Identification of all peaks have not been made but the following reference points are known.

Retention Time		
Fig. 1	Fig. 2	Identity
8.54	8.43	myrcene
20.61	20.59	caryophyllene
22.28	22.21	farnesene
21.26	21.25	methyl undecenoate (?)
22.65	22.57	humulene
22.94	22.93	? selenene (post humulene I)
24.53	24.51	? selenene (post humulene II)

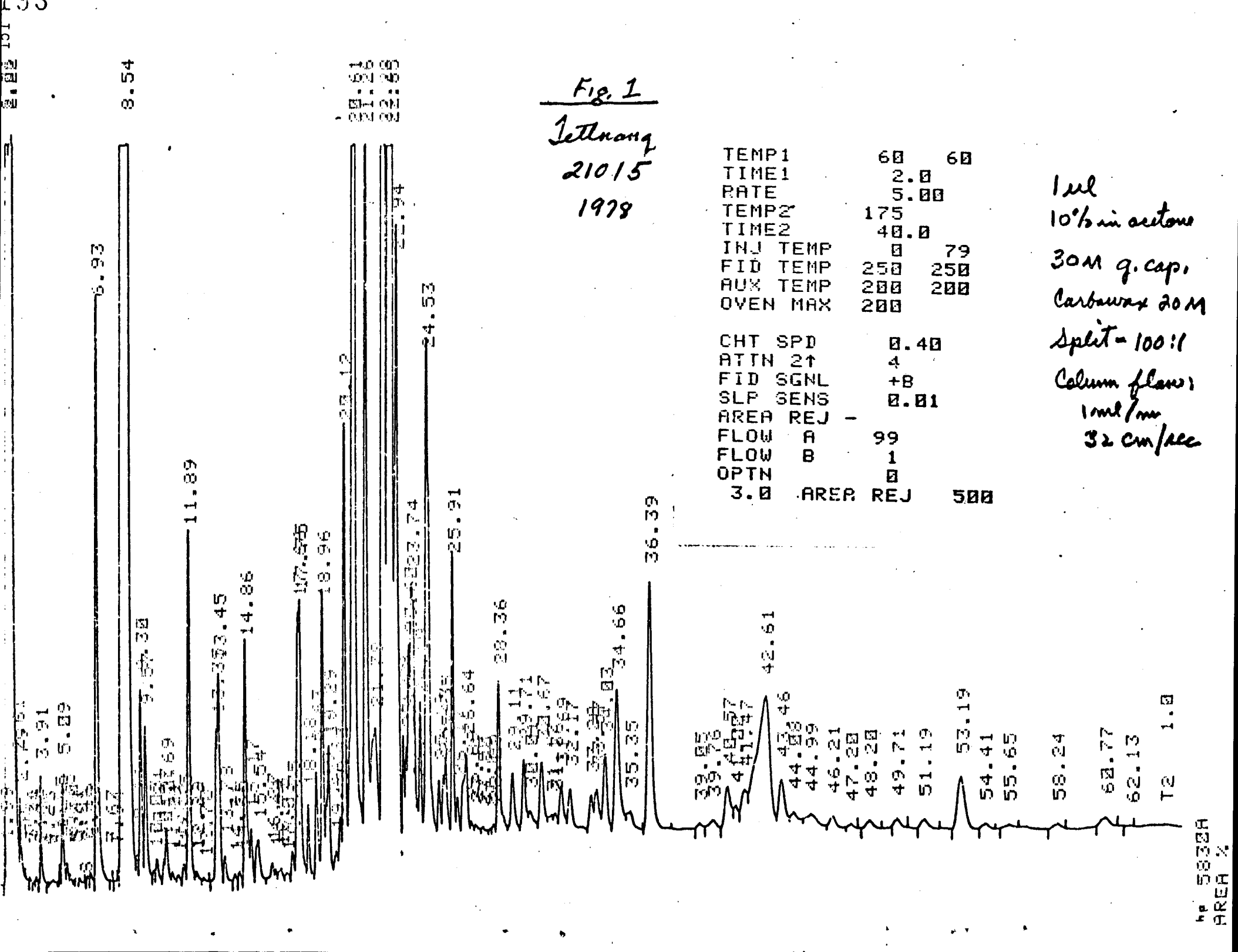
*Comparisons of detail are best accomplished by considering small segments at a time. For example, the couplet at 9.30 m (just following myrcene at 8.54 m in Fig 1); or the 3 peaks at 11.89, 13.45 and 14.86 of which 13.45 is actually a couplet; and so on with groups appearing throughout the chromatogram.

Fig. 1

Tetranq

21015

1978



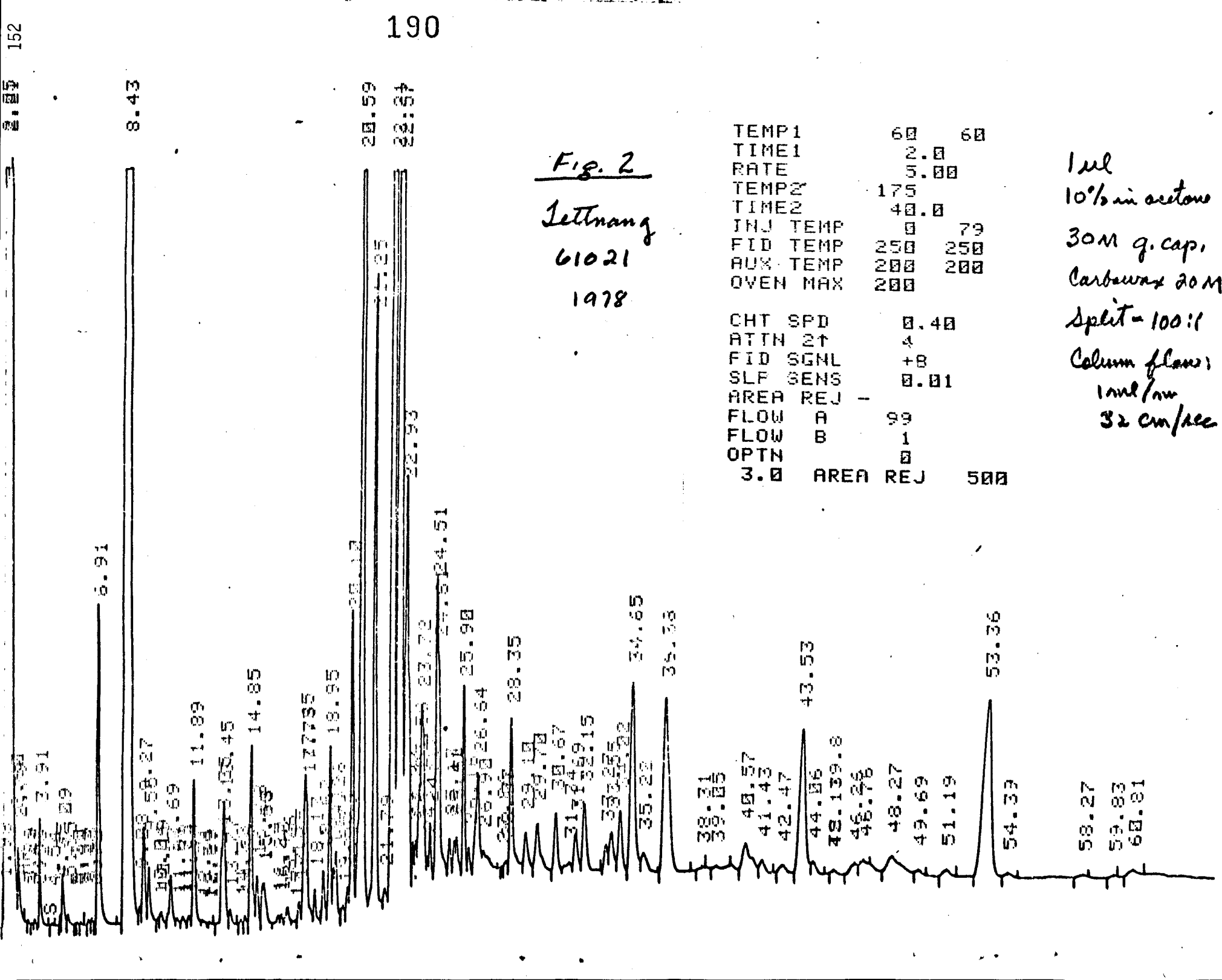


Fig. 2

Lettnang

61021

1978

1 µl

10% in acetone

30 M g. cap.

Carbowax 20 M

Split = 100:1

Column flow:

1 ml/m

32 cm/sec

Department of
Agricultural Chemistry

Oregon State University

Corvallis, Oregon 97331 (503) 754-3791

April 6, 1979

Dr. Vincent S. Bavisotto
Miller Brewing Company
400 West State Street
Milwaukee, WI 53208

Dear Dr. Bavisotto:

I am sending a package to you that contains samples of Fuggle, Columbia and Willamette hop varieties. Unfortunately, we didn't have any extra samples of 21193 (7005-194). I'm enclosing the 1977-78 results for the samples. The actual sample that you are getting is marked by an asterisk in table I.

Sincerely,

Gail Nickerson

xc: STL
AH

:jm

TABLE I(a) COLUMBIA (21040) AND WILLAMETTE (21041), 1978 CROP.

SELECTED GENOTYPES AS OF 79/03/29.

SORTED BY IDENTITY

AT 8 % MOISTURE CONTENT(BALE) OR AS IS BASIS (CONE)

NURSERY OR ACCESSION NUMBER	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	% ALPHA	% BETA	α/α+β ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
21040 COLUMBIA	BALE	226:01-10	9/18/78	2229	187	8.4	4.1	67	12.5	.24	0.00	0	1.67	0	883
21040	CONE	IDAHO	9/01/78	0	0	8.3	4.6	64	12.9	.26	0.00	0	0.00	0	1024
21040*	BALE	309:01-05	9/07/78	1280	86	6.8	4.0	62	10.8	.24	0.00	0	.69	0	1131
21040	CONE	208:23-27	9/18/78	0	0	6.7	3.6	64	10.3	.25	0.00	0	0.00	0	118
21041 WILLAMETTE	BALE	227:01-10	9/18/78	1834	108	5.9	3.8	60	9.7	.26	0.00	0	1.40	0	980
21041	CONE	IDAHO	9/01/78	0	0	5.3	3.5	60	8.8	.31	0.00	0	0.00	0	1016
21041*	BALE	310:01-05	9/07/78	1152	59	5.2	3.4	60	8.6	.26	0.00	0	.78	0	1123
21041	CONE	212:23-27	9/18/78	0	0	5.8	3.5	62	9.3	.28	0.00	0	0.00	0	114

TABLE I(b) FUGGLE H (48209) 1978 CROP.

SELECTED GENOTYPES AS OF 79/03/29.

SORTED BY LOCATION

AT 8 % MOISTURE CONTENT(BALE) OR AS IS BASIS (CONE)

NURSERY OR ACCESSION NUMBER	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	% ALPHA	% BETA	α/α+β ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
48209 (Seeded)	BALE	010:01-04	8/22/78	0	0	4.9	2.3	67	7.1	.30	0.00	0	.96	0	943
48209 "	CONE	139:02	9/20/78	0	0	3.2	2.0	61	5.2	.29	0.00	0	0.00	0	211
48209 "	CONE	150:46	9/22/78	0	0	3.5	1.7	67	5.2	.33	0.00	0	0.00	0	446
48209 "	CONE	158:37	9/25/78	0	0	3.6	1.8	66	5.5	.34	0.00	0	0.00	0	586
48209 "	CONE	173:44	9/26/78	0	0	3.8	2.0	65	5.7	.32	0.00	0	0.00	0	735
48209 (Seedles)	BALE	203:01-10	8/23/78	1331	79	6.0	3.0	66	9.0	.27	0.00	0	1.03	0	89
48209* "	BALE	303:01-05	8/24/78	529	26	5.0	2.6	65	7.7	.28	0.00	0	1.03	0	944

TABLE II (a) COLUMBIA (21040) AND WILLAMETTE, 1977 CROP.

SELECTED GENOTYPES AS OF 79/03/29.
SORTED BY IDENTITY
AT 8 % MOISTURE CONTENT(BALE) OR AS IS BASIS (CONE)

NURSERY OR ACCESSION NUMBER		TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	% ALPHA	% BETA	α/α+β ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN (6 mo)	OIL ML/S/ 100G	COF	SERIAL NUMBER
21040	COLUMBIA	CONE	IDAHO	9/12/77	0	0	6.3	5.5	53	11.8	.26	.75	47	0.00	0	871
21040		BALE	208:23-32	9/06/77	1578	113	7.2	3.3	68	10.5	.28	.46	72	.96	0	909
21040		CONE	041:01-02	9/06/77	0	0	4.2	1.1	79	5.3	.71	.62	56	0.00	0	476
21040		BALE	309:01-05	9/08/77	768	53	7.0	2.9	70	9.9	.29	.46	70	.92	0	946
21041	WILLAMETTE	CONE	IDAHO	9/12/77	0	0	4.0	3.7	52	7.7	.30	.59	58	0.00	0	873
21041		BALE	212:23-32	9/02/77	2483	135	5.4	3.4	61	8.8	.29	.65	63	.89	0	910
21041		BALE	310:01-05	9/08/77	953	51	5.4	3.2	62	8.7	.29	.59	59	1.03	0	947

TABLE II (b) FUGGLE H (48209), 1977 CROP

SELECTED GENOTYPES AS OF 79/03/29.
SORTED BY IDENTITY
AT 8 % MOISTURE CONTENT(BALE) OR AS IS BASIS (CONE)

NURSERY OR ACCESSION NUMBER		TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	% ALPHA	% BETA	α/α+β ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN (6 mo)	OIL ML/S/ 100G	COF	SERIAL NUMBER
48209	(Seeded)	CONE	010:01-04	9/06/77	0	0	3.8	2.2	63	6.0	.33	.47	69	0.00	0	319
48209	(Seedless)	BALE	203:01-10	8/30/77	1169	62	5.4	3.1	63	8.5	.29	0.00	0	1.21	0	920
48209	(")	BALE	303:01-05	8/30/77	683	28	4.1	2.2	64	6.4	.32	.55	73	1.02	0	963

University of Idaho
College of Agriculture
Agricultural Experiment Station
Branch Experiment Station
Parma, Idaho/83660

10 April 1979

Mr. Sam Likens
Dept. Agric. Chem.
Oregon State University
Corvallis, OR 97331

Dear Sam:

These are just some comments on your (and Gail's) lab report dated March 29.

The hop variety: Swiss, alias Hallertauer-S, alias Swiss Tettnang is undoubtedly a Deutscher Frühhopfen, which is comprised of the geographical subtypes Tettnanger and Schwetzinger. Since this hop purportedly originated in Switzerland it would seem almost superfluous to say that it is likely a Schwetzinger but German varieties were originally based on locality of origin, that is what it has to be.

Also, while the cone of the Tettnanger and Schwetzinger may be physically and chemically indistinguishable. This does not preclude the possibility that one of the two subvarieties may have a distinct yield advantage over the other. If there are yield differences, then equating them could result in rather tenuous advice.

Thanks for sending the report.

Sincerely yours,

Bob

R. Robert Romanko
Associate Plant Pathologist

RRR/lf

Dear Cal:

I'm blushing! The conclusions reached in my letter to you last week on the genetic identity of Bates and Folly have to be revised!

Please refer to the second paragraph which said that the best analytical indications of genetic identity are oil profiles. The chromatograms upon which judgement was based were attached and were obviously less than super chromatograms; but these were run on equipment nearly 20 years old and the best we could do.

Don Roberts installed a new chromatograph last week and I re-ran the Bates and Folly oil samples (which I guess shows my uncertainty about the first ones). We had also distilled oil from a 1978 sample of Cluster from our experimental yard since the first test and I used this as a reference. I am attaching all three profiles.

In view of the other analytical similarities and the new profiles, I think you will agree that neither Bates nor Folly can be distinguished from Cluster. Or, to put it differently, it is my opinion that either could be entered into the trade as Cluster.

Sorry for the wrong steer last week. If I can be of further help, please write or call.

Sincerely,

Feb. 13, 1979

Sam Likens

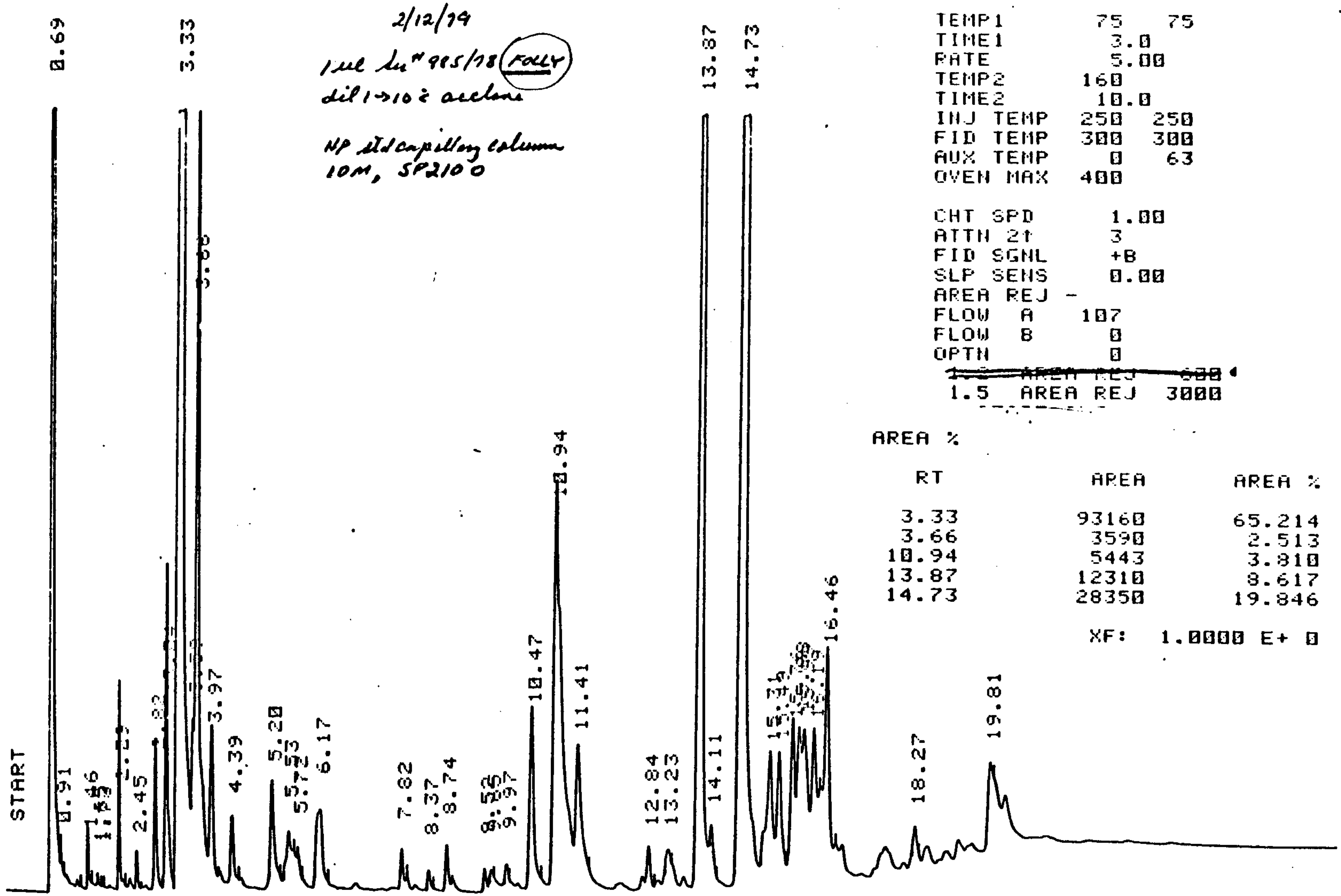
WASHINGTON SAMPLES - CAL SKOTLAND (REC'D 10/19/78)

		At 8% mc						
Sample	Harvest Date	%α	%β	α/β	ml oil 100 g	CoH (NMR)	Location	S/N
Bates	8/21/78	7.0	5.2	1.3	0.51	35	Charvet	984
Bates	8/24/78	7.0	5.6	1.2	0.38	--	Charvet	978
Folly	8/28/78	7.6	5.5	1.4	0.50	38	Charvet	985
L_1	9/ 2/77	4.8	3.0	1.6	0.15	--	Charvet	979
21094	9/ 2/78	5.9	6.9	0.9	0.44	--	Charvet #1	980
21094	9/11/78	6.6	7.2	0.9	0.49	--	Charvet #2	981
21095	9/11/78	5.0	6.7	0.7	0.59	--	Charvet	983
21095	9/18/78	4.4	6.6	0.7	0.63	--		982
65162 (L-1)	9/20/78	5.2	3.7	1.4	0.35	--	Corvallis	1098

070

2/12/79
fuel Ln# 985/78 (FOLLY)
dil 1→10 c acetone

NP std capillary column
10M, SP2100



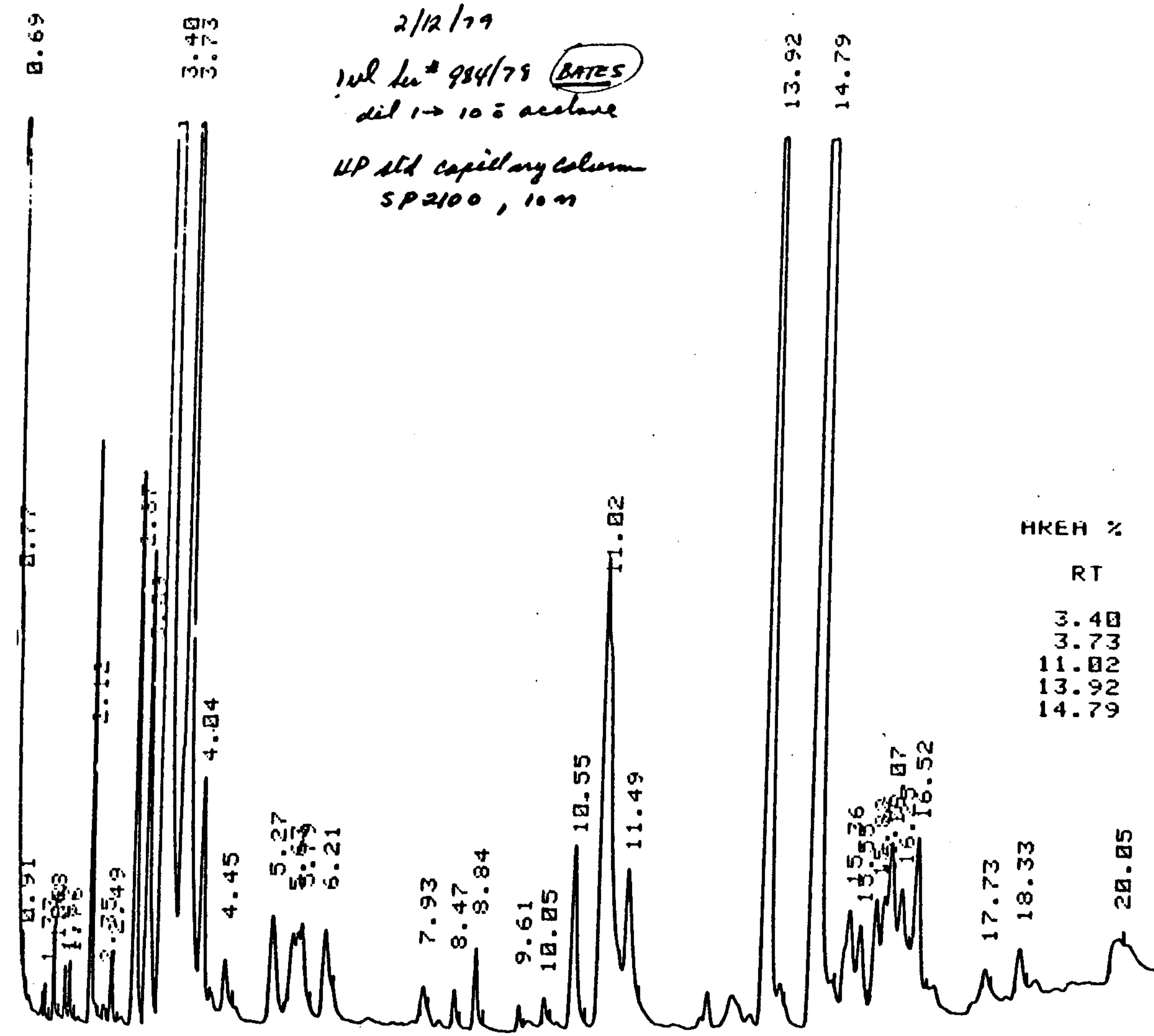
TEMP1	75	75
TIME1	3.0	
RATE	5.00	
TEMP2	160	
TIME2	10.0	
INJ TEMP	250	250
FID TEMP	300	300
AUX TEMP	0	63
OVEN MAX	400	
CHT SPD	1.00	
ATTN 2↑	3	
FID SGNL	+B	
SLP SENS	0.00	
AREA REJ -		
FLOW A	107	
FLOW B	0	
OPTN	0	

~~1.0 AREA REJ 600~~
1.5 AREA REJ 3000

AREA %

RT	AREA	AREA %
3.33	93160	65.214
3.66	3590	2.513
10.94	5443	3.810
13.87	12310	8.617
14.73	28350	19.846

XF: 1.0000 E+ 0



2/12/79
1ul lu# 984/79 (BATES)
dil 1→10 c̄ acetone
HP std capillary column
SP2100, 10 m

TEMP1	75	75
TIME1	3.0	
RATE	5.00	
TEMP2	160	
TIME2	10.0	
INJ TEMP	250	250
FID TEMP	300	300
AUX TEMP	0	63
OVEN MAX	400	

CHT SPD	1.00
ATTN 2↑	3
FID SGNL	+B
SLP SENS	0.00
AREA REJ	–
FLOW A	107
FLOW B	0
OPTN	0

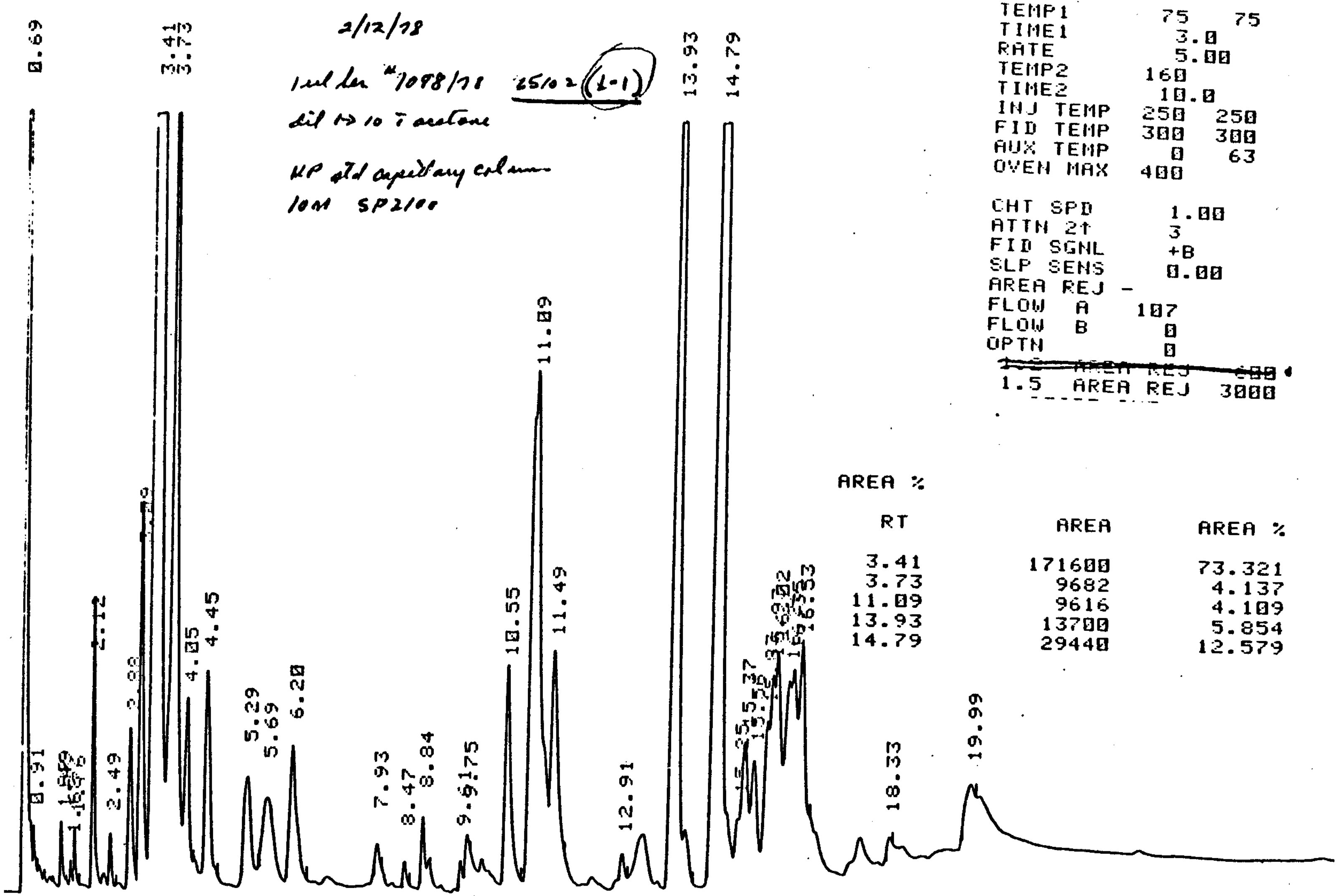
~~AREA REJ~~
1.5 AREA REJ 3000

AREA %

RT	AREA	AREA %
3.40	129400	71.165
3.73	12050	6.627
11.02	5404	2.972
13.92	9998	5.498
14.79	24980	13.738

XF: 1.0000 E+ 0

U/



TEMP1	75	75
TIME1	3.0	
RATE	5.00	
TEMP2	160	
TIME2	10.0	
INJ TEMP	250	250
FID TEMP	300	300
AUX TEMP	0	63
OVEN MAX	400	

CHT SPD	1.00
ATTN 2↑	3
FID SGNL	+B
SLP SENS	0.00
AREA REJ -	
FLOW A	107
FLOW B	0
OPTN	0

~~AREA REJ~~
1.5 AREA REJ 3000

AREA %

RT	AREA	AREA %
3.41	171600	73.321
3.73	9682	4.137
11.09	9616	4.109
13.93	13700	5.854
14.79	29440	12.579

Lab Report
April 10, 1979
Likens and Nickerson

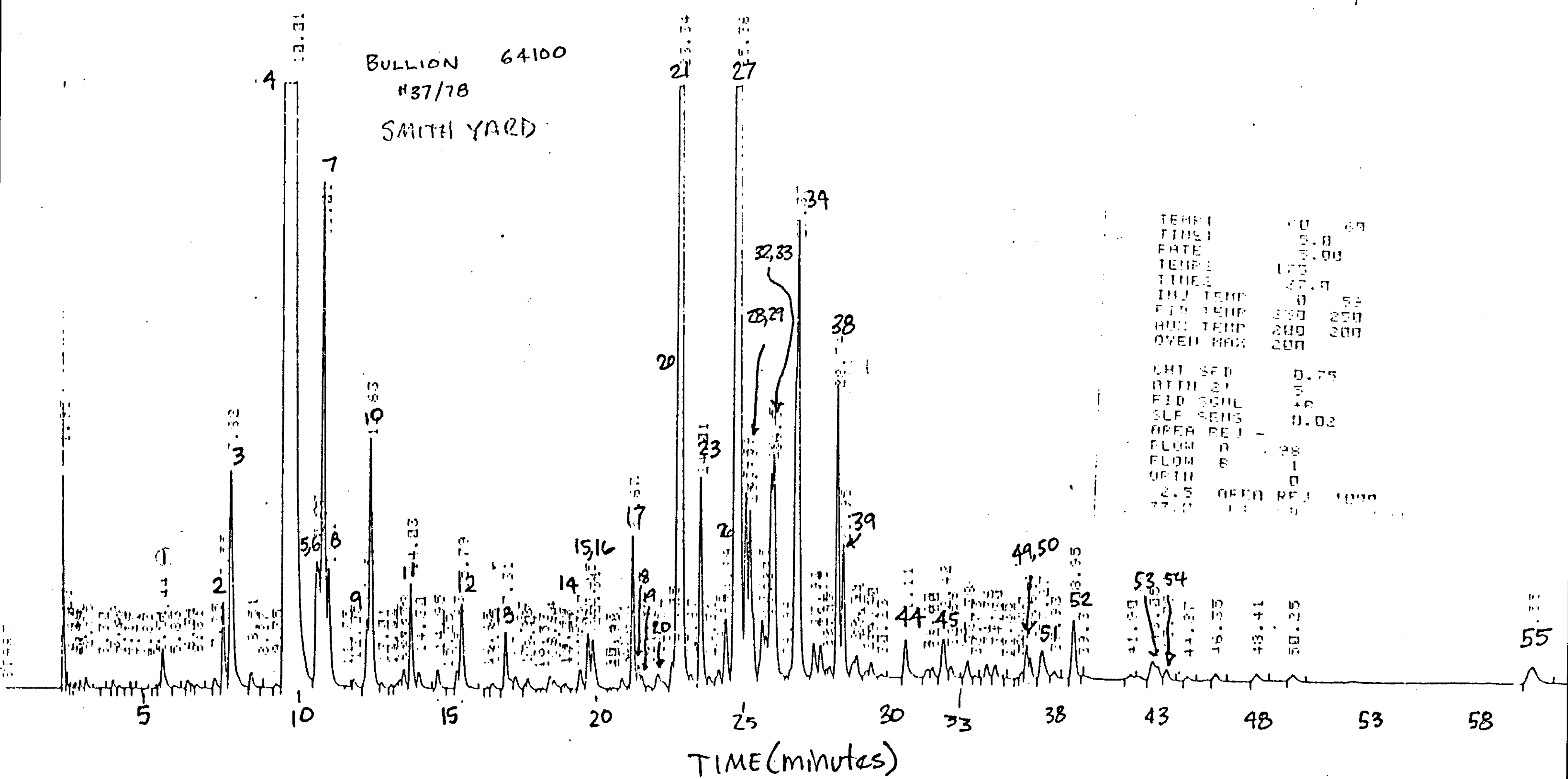
Comparison of Oil Composition of Bullion and Bullion 10-A

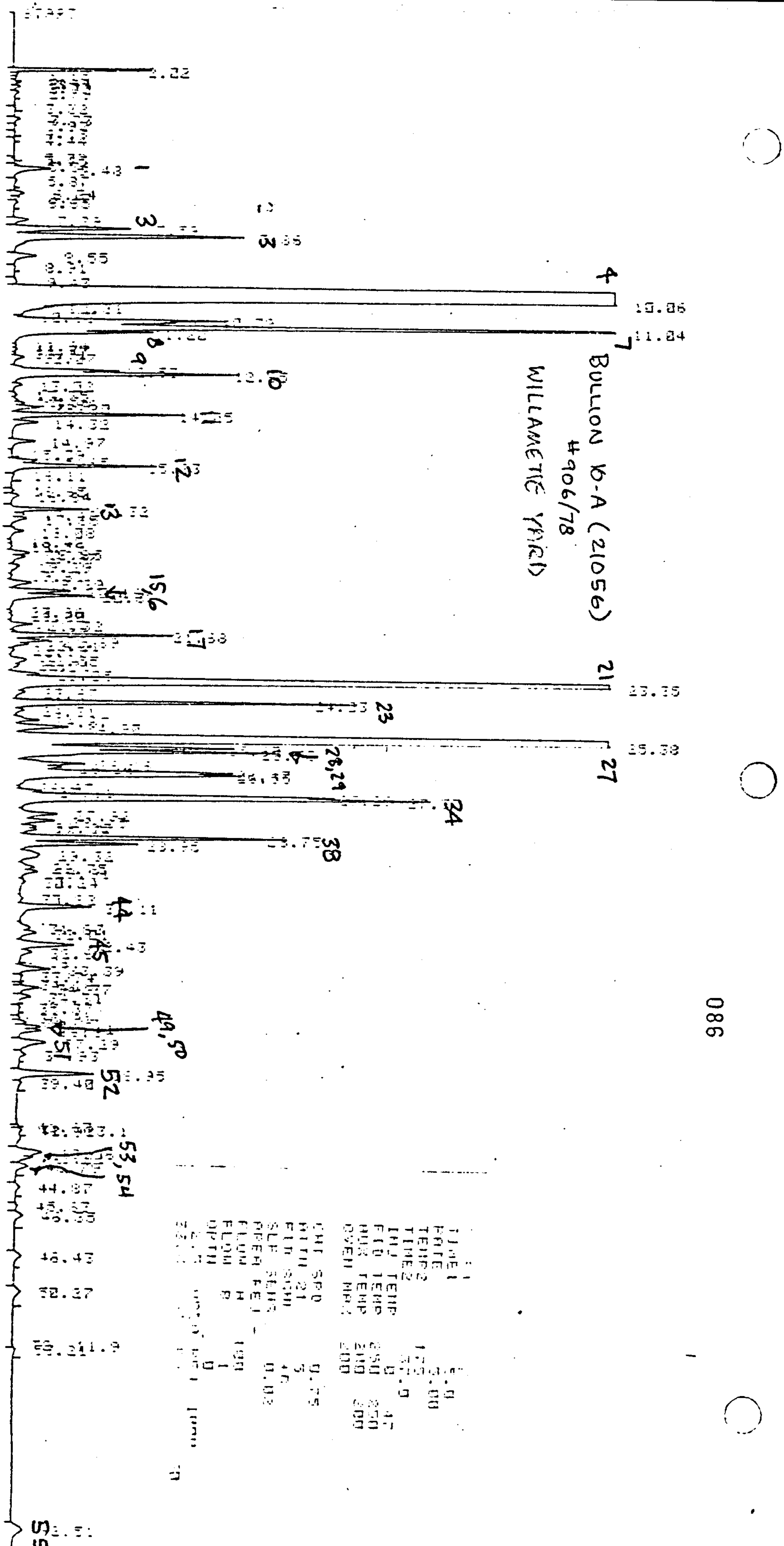
Gas chromatographic analysis of steam distilled hop oil from Bullion and Bullion 10-A shows that the oil compositions are almost identical. The ratios of Humulene/Caryophyllene are 1.69 for Bullion and 1.78 for Bullion 10-A. Peak by peak examination shows some minor differences in the proportions of peaks 5-8, 14-16. Since the % mycene was almost the same for both samples the % composition can be directly compared.

GLC Conditions: 0.1µl Hop oil (1∿100 split ratio) injected onto a 30m glass capillary column coated with Carbowax 20M. Inlet pressure 1 Kg/cm^3. Isothermal at 60°C for 5 min, then temperature programmed at 5°/min to 175°C. Flame ionization detector attenuation 2^5. Chart speed 0.75 cm/min for 33 min then 0.5 cm/min. Total elapsed time, 65 min. Area reject:1000, peaks < 0.5% of total area not counted.

091

092


BULLION 64100
#37/78
SMITH YARD
TIME (minutes)
5
10
15
20
25
30
33
38
43
48
53
58


BULLION 16-A (21056)
#906/78
WILLAMETTE YARD
080

Identification	Peak Number	% Area 64100	% Area 21056	Identification	Peak Number	% Area 64100	% Area 21056
α-pinene ?	1	0.12	0.12		31	0.16	0.14
β-pinene ?	2	0.25	0.25		32	0.62	0.56
sabinene ?	3	0.80	0.79		33	0.89	0.74
Myrcene	4	62.64	62.41	2 peaks	34	2.40	1.93
	5	0.34	0.44		35	0.26	0.26
	6	0.24	0.28		36	0.20	0.09
Mebutylisobutyrate	7	1.57	2.10		37	0.12	0.11
	8	0.36	0.36		38	1.01	0.79
	9	0.17	0.24		39	0.50	0.41
	10	0.79	0.61		40	0.12	0.27
	11	0.30	0.41		41	0.14	
	12	0.31	0.38		42	0.07	0.14
	13	0.20	0.18		43	0.09	0.16
	14	0.08	0.08		44	0.16	0.39
	15	0.18	0.16		45	0.17	0.24
	16	0.20	0.25		46	0.09	0.15
	17	0.43	0.38		47	0.07	0.08
	18	0.08	0.10		48	0.07	<0.05
	19	0.12	0.08		49	0.15	0.09
	20	0.09	0.09		50	0.10	0.10
Caryophyllene	21	7.19	6.47		51	0.22	0.19
	22	0.09	0.08		52	0.34	0.39
Me Undecanoate ?	23	0.69	0.88		53	0.23	0.18
	24	0.07	0.06		54	0.08	0.07
	25	0.11	0.13		55	0.23	0.13
	26	0.29	0.24				
Humulene	27	12.18	11.55				
	28	0.60	0.53				
(2 peaks)	29	0.73	0.78				
	30	0.29	0.27				

hp 5830A
AREA %

BULLION 10-A (21056)
906/78

RT	AREA	AREA %	
5.48	1966	0.116	
7.59	5864	0.347	
7.86	13130	0.777	
8.55	1227	0.073	
10.06	1054000	62.410	MYRCENE
10.31	2568	0.152	
10.79	7484	0.443	
10.86	4795	0.284	
11.04	35390	2.096	METHYL 2-METHYLBUTYLISOBUTYRATE
11.29	6154	0.364	
12.53	4085	0.242	
12.65	10290	0.609	
13.60	1223	0.072	
14.05	6928	0.410	
14.32	1342	0.079	
14.97	1879	0.064	
15.65	1025	0.061	
15.83	6466	0.383	
17.32	3036	0.180	
19.89	1263	0.075	
20.16	3750	0.153	
20.32	4310	0.255	
21.32	1130	0.067	
21.68	6400	0.379	
21.89	1686	0.100	
22.55	1313	0.078	
22.85	1382	0.082	
23.35	109300	6.472	CARYOPHYLLENE
23.67	1297	0.077	
24.00	14830	0.878	
24.31	1033	0.061	
24.67	2182	0.129	
24.90	4050	0.240	
25.38	195000	11.547	HUMULENE
25.60	9682	0.585	
25.78	13120	0.777	
26.16	4595	0.272	
26.28	2440	0.144	
26.47	9388	0.556	
26.55	12510	0.741	
27.11	1565	0.093	
27.29	11760	0.696	
27.37	20840	1.234	
27.92	4336	0.257	
28.15	2992	0.177	
28.35	1445	0.086	
28.46	1834	0.109	
28.75	13330	0.789	
28.95	6884	0.408	
29.32	4589	0.272	
29.75	2393	0.142	
29.91	2662	0.158	
30.24	3227	0.191	
30.82	2296	0.136	
31.11	6572	0.389	
31.83	2147	0.127	
32.01	1775	0.105	
32.43	4062	0.241	
32.67	1146	0.068	
33.39	2518	0.149	
34.37	1420	0.084	
36.44	1584	0.094	
36.64	1687	0.100	
37.29	3246	0.192	
38.95	6584	0.390	
43.06	3097	0.183	
43.31	1421	0.084	
43.79	1258	0.074	
52.51	2258	0.134	

RF: 1.0000 E+ 0

BULLION (64100)
#37/78

RT	AREA	AREA %	
5.44	1876	0.125	
7.55	3815	0.254	
7.82	12070	0.803	
10.01	941400	62.640	MYRCENE
10.77	5055	0.336	
10.83	3647	0.243	
11.01	23670	1.575	Me Butylisobutyrate
11.17	5436	0.362	
12.51	2616	0.174	
12.63	11870	0.790	
14.03	4488	0.299	
15.79	4677	0.311	
17.31	2968	0.197	
19.67	1193	0.079	}
20.15	2677	0.178	}
20.31	3046	0.203	}
21.67	6460	0.430	
21.88	1139	0.076	
22.54	1884	0.125	
23.05	1342	0.089	
23.34	108100	7.193	Caryophyllene
23.67	1326	0.088	
24.01	10380	0.691	
24.31	1103	0.073	
24.65	1704	0.113	
24.89	4305	0.286	
25.36	183100	12.183	Humulene.
25.59	8974	0.597	
25.73	10970	0.730	
26.15	4291	0.286	
26.27	2342	0.156	
26.45	9358	0.623	
26.55	13330	0.887	
27.37	36050	2.399	
27.92	3863	0.257	
28.15	3008	0.200	
28.45	1742	0.116	
28.74	15150	1.008	
28.95	7590	0.505	
29.31	1754	0.117	
29.41	2061	0.137	
29.75	1087	0.072	
29.95	1307	0.087	
31.11	2364	0.157	
32.42	2502	0.166	
33.38	1413	0.094	
34.26	1091	0.073	
34.80	1066	0.071	
36.44	2271	0.151	
36.63	1491	0.099	
37.27	3316	0.221	
38.95	5063	0.337	
43.05	3432	0.228	
43.79	1168	0.078	
62.55	3481	0.232	

XF: 1.0000 E+ 0

Lab Report
September 14, 1979

1979 Male Lupulin Analyses

The crushed storage test (3 hours at 85°C) has been done on 164 of the 440 samples collected this year. The males from 1973 crosses accounted for 96 of the genotypes tested for accelerated storage.

The males used in 1976 crosses: 7303-165M, 7308-023M, and 7311-141M were collected from 4-5 locations. The results show good agreement except for 7303-165M where the crushed HSI was erratic. The table below shows the results for these genotypes.

Genotype	Location	Picked	Alpha Ratio	Alpha + Beta	Crush HSI
7303-165M	037:55-56	7/05	64	62.4	0.99
	139:04	7/12	71	76.4	2.50
	150:07	7/16	69	71.1	2.36
	158:38	7/26	70	66.6	0.45
Average.....			68.5	69.13	1.57
Standard Deviation.....			3.1	6.0	1.01
7308-023M	139:05	7/05	64	67.6	0.44
	055:55-56	7/09	68	65.7	0.43
	150:08	7/09	69	68.5	0.37
	173:46	7/16	64	71.3	0.30
	158:39	7/21	69	63.2	0.38
Average.....			66.8	67.26	0.38
Standard Deviation.....			2.6	3.04	0.06
7311-141M	015:59-60	7/10	68	71.3	0.40
	139:06	7/12	70	75.9	0.37
	173:47	7/18	69	76.8	0.31
	158:40	7/19	70	78.1	0.29
	150:09	7/25	66	64.4	0.38
Average.....			68.6	73.30	0.35
Standard Deviation.....			1.7	5.6	0.05

September 14, 1979

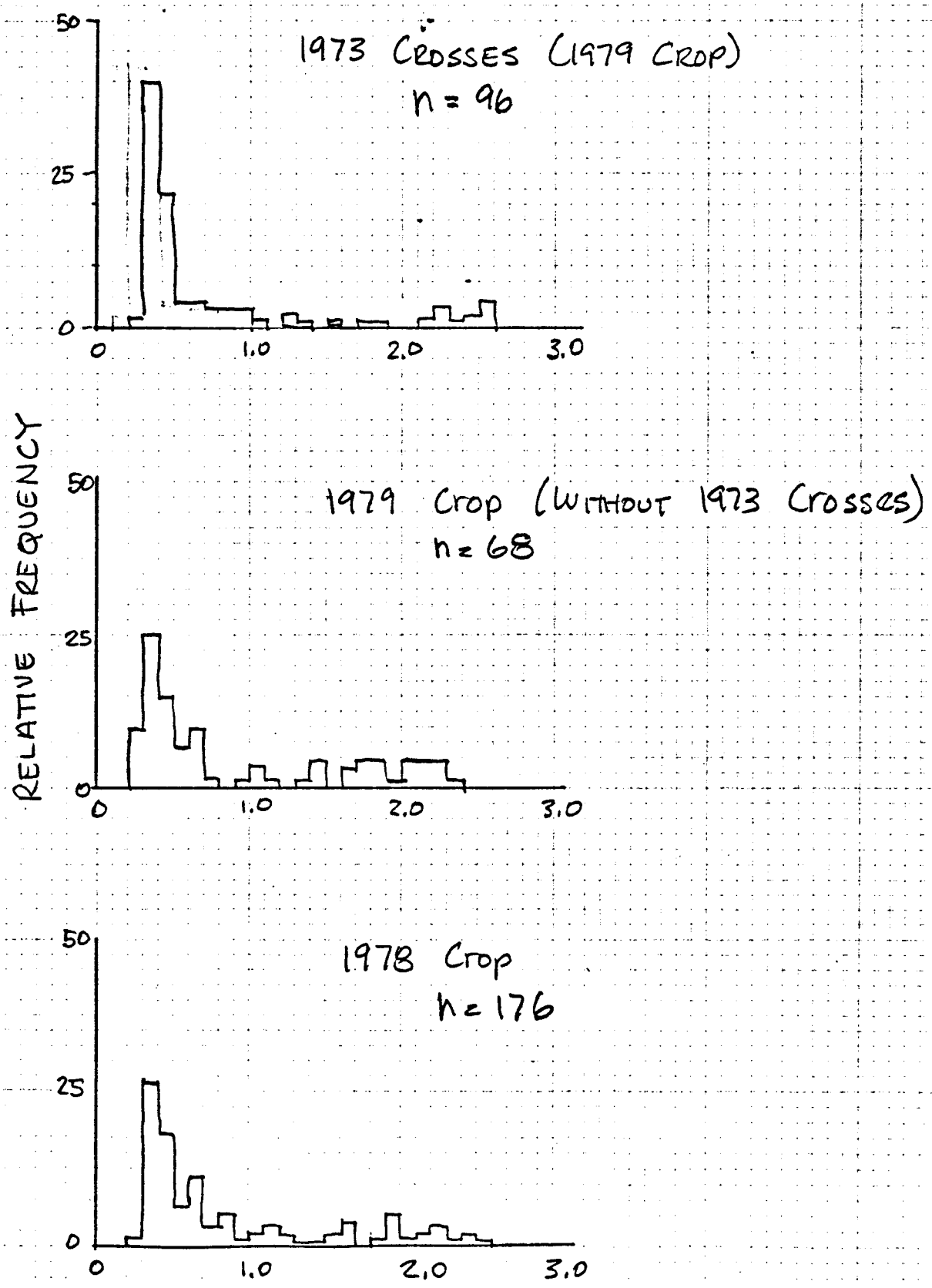
Since these samples were picked all through the harvest period, some variation might be due to maturity. However there was no relationship between picking date and analytical results.

Correlation Coefficients for Picking Date vs:

	Alpha Ratio	Alpha + Beta	Crush HSI
7303-165M	0.66	0.12	-.32
7308-023M	0.27	-0.28	-.60
7311-141M	-0.51	-0.43	-.33

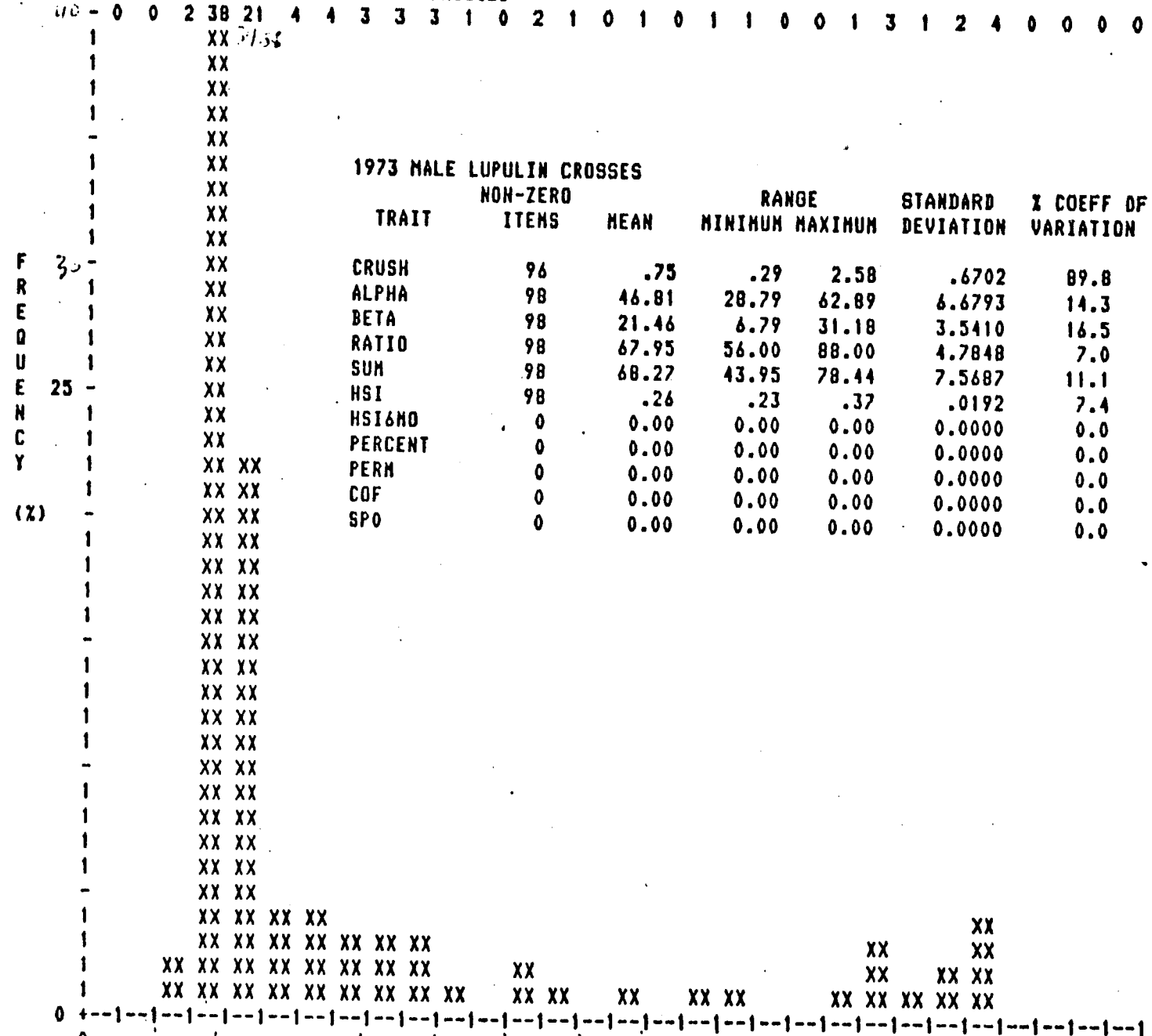
The histograms demonstrate the improvement in male storage that has been achieved.

Three-hour crush test of lupulin for storage evaluation



HSI After Storage of Crushed Lupulin
(3 Hours at 85°C)

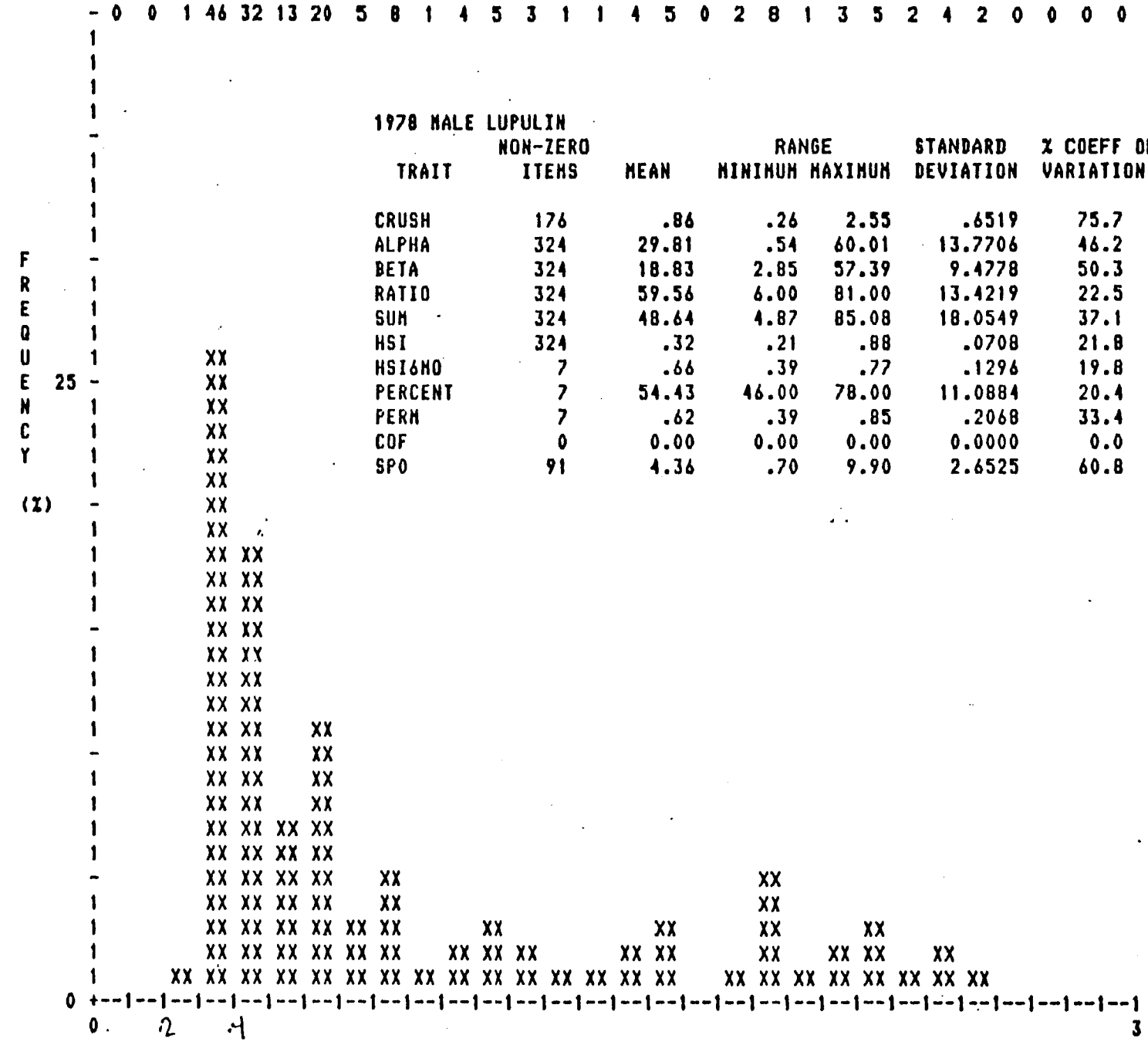
1979 MALE LUPULIN SAMPLES FROM 1973 CROSSES



1973 MALE LUPULIN CROSSES

TRAIT	NON-ZERO ITEMS	MEAN	RANGE MINIMUM	RANGE MAXIMUM	STANDARD DEVIATION	% COEFF OF VARIATION	SUM OF ITEMS	SUM OF ITEMS SQUARED
CRUSH	96	.75	.29	2.58	.6702	89.8	71.68	96.19
ALPHA	98	46.81	28.79	62.89	6.6793	14.3	4587.67	219089.83
BETA	98	21.46	6.79	31.18	3.5410	16.5	2102.85	46338.50
RATIO	98	67.95	56.00	88.00	4.7848	7.0	6659.00	454693.00
SUM	98	68.27	43.95	78.44	7.5687	11.1	6690.52	462322.56
HSI	98	.26	.23	.37	.0192	7.4	25.36	6.60
HSI6MO	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00
PERCENT	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00
PERM	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00
COF	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00
SPO	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00

1978 MALE LUPULIN



1978 MALE LUPULIN

TRAIT	NON-ZERO ITEMS	MEAN	RANGE MINIMUM	RANGE MAXIMUM	STANDARD DEVIATION	% COEFF OF VARIATION	SUM OF ITEMS	SUM OF ITEMS SQUARED
CRUSH	176	.86	.26	2.55	.6519	75.7	151.54	204.85
ALPHA	324	29.81	.54	60.01	13.7706	46.2	9656.87	349074.40
BETA	324	18.83	2.85	57.39	9.4778	50.3	6102.05	143937.49
RATIO	324	59.56	6.00	81.00	13.4219	22.5	19296.00	1207372.00
SUM	324	48.64	4.87	85.08	18.0549	37.1	15758.92	871783.33
HSI	324	.32	.21	.88	.0708	21.8	104.98	35.63
HSI6MO	7	.66	.39	.77	.1296	19.8	4.59	3.11
PERCENT	7	54.43	46.00	78.00	11.0884	20.4	381.00	21475.00
PERM	7	.62	.39	.85	.2068	33.4	4.33	2.94
COF	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00
SPO	91	4.36	.70	9.90	2.6525	60.8	396.75	2362.98

CRUSH INTERVAL = .10 NO. OF ITEMS = 176

TABLE I. Storage Trial Results for Commercial Varieties and Advanced Selections. Grouped by Percent of α + β Acids Lost After Six Months Storage at Room Temperature and Ranked in Descending Order.

Figure in parentheses is initial α-acid content (OSU).

Very Good	Good	Fair		Poor		Very Poor
<10%	10-20%	20-30%	30-40%	40-50%	50-60%	>60%
21057 (5)	Cluster (6)	Bačka (4)	Fuggle H (5)	Lubelska P (5)	21054 (10)	21091 (4)
	S. Brewer (9)	21094 (8)	Fuggle (5)	Record (9)	21198 (9)	Cascade VF (6)
	21095 (6)	Alliance (6)	Styrian (5)	Tettnang (5)	21200 (11)	Comet (10).
	Galena (11)	Vojvodina (8)	Neoplanta (9)	I 31-11A (12)	Bullion 10A VF (11)	Brewers Gold (9)
	L16 (6)	S. Golding (5)	21195 (6)	21201 (10)	W. Target (12)	Brewers Gold VF (10
	Calicross (7)	21202 (5)	Golden Star (4)	Pr. Ringwood (8)	21194 (8)	Atlas (8)
		Bramling Cross (5)	W. Challenger (7)	21099 (9)	Bullion (10)	21098 (7)
		Density (6)	Hybrid 2 India (9)	Apolon (9)	21042 (4)	65009 (10)
		21055 (14)	Talisman (6)	Hallertau (5)	Ahil (10)	
		Dunav (7)	Tettnang (5)	Nadwislanska (5)	Eroica (12)	
		21193 (13)	W. Northdown (9)	Serebrianka (3)	I33-6 (7)	
		Y. Golding (6)	Defender (4)	21180 (9)	211 B1 (7)	
		Progress (7)	Willamette (5)		Cascade (5)	
		Fuggle N VF (6)	Shihshuwase (5)			
		N. Brewer VF (10)	Petham Golding (7)			
		First Choice (5)	Hersbrucker (5)			
		Columbia (8)				
		Aurora (11)				
		N. Brewer (10)				
		Smoothcone (7)				

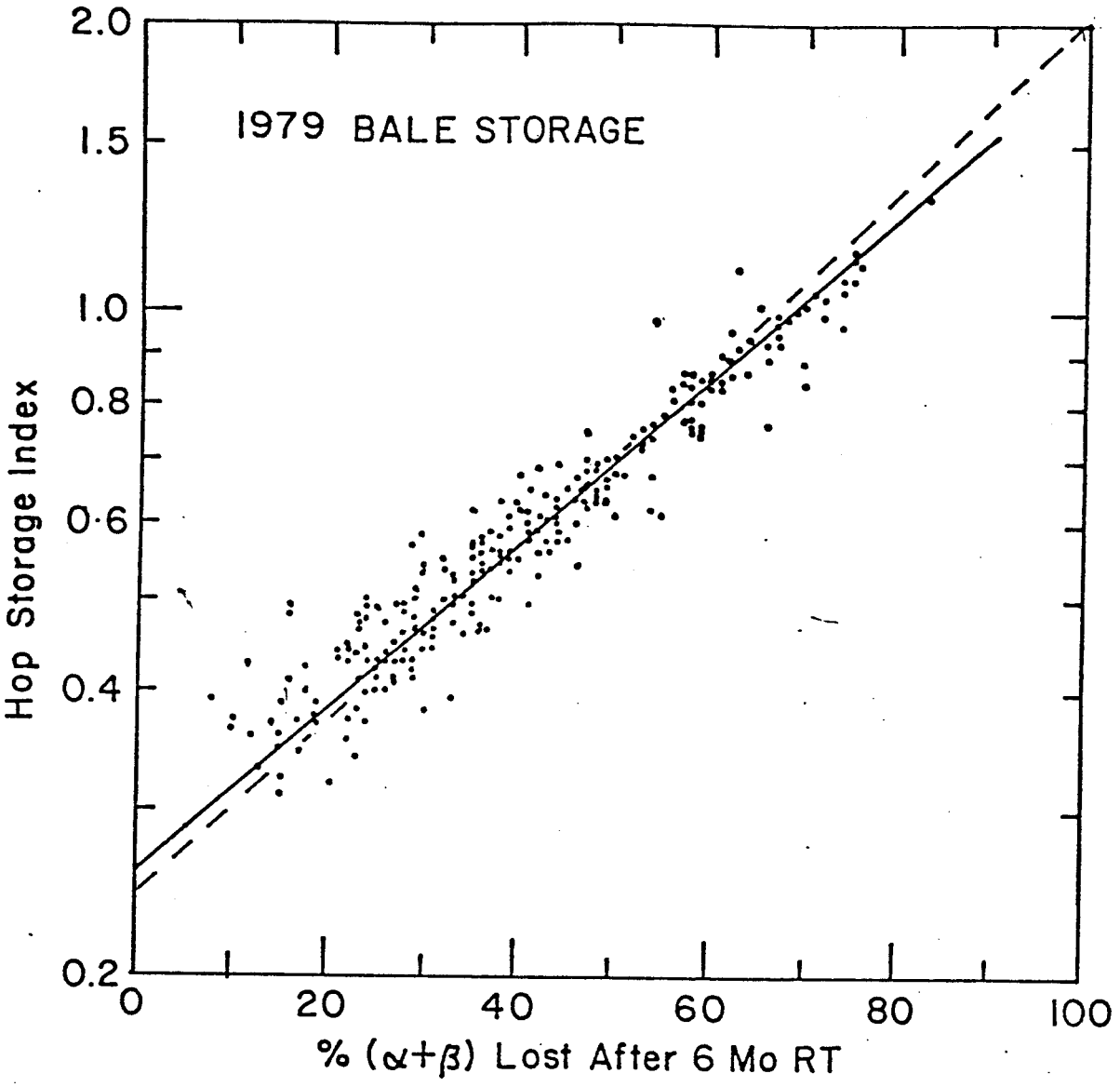


Figure 1. Relationship between % ($\alpha + \beta$) lost and hop storage index after 6 months room temperature storage.
Solid line: 1979, % Lost = 117.7log(HSI/0.262)
Dashed line: 1975-78 avg, % Lost = 110log(HSI/0.25)

TABLE II. 1979 HIGH ALPHA TYPE MALES.

♂ SELECTED GENOTYPES SORTED BY IDENTITY AS OF 80/08/11. (N= 32)

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	LOCATION	HARVEST DATE	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	CRUSH 3 HR HSI	SAFE PERIOD	PERMEA-BILITY	CALC 6 MONTH HSI	CALC % A+B REMAIN	OIL: HUM/ CARY	COH	SERIAL NUMBER
21065M	6616-043M	045:01-02	7/17/79	51.1	18.0	73	69.2	.26	.32	3.75	0.00	0.00	0	0.00	36	244
63015M		001:36	7/26/79	57.1	21.6	72	78.6	.24	.34	6.90	0.00	0.00	0	0.00	18	394
7302-105M		039:53-54	7/12/79	52.0	21.9	70	73.9	.23	.38	2.70	.35	.45	71	.26	27	176
7303-105M		031:55-56	7/20/79	47.9	19.7	70	67.6	.26	.32	6.50	.18	.25	99	.75	21	305
7303-135M		032:55-56	7/12/79	62.9	15.1	80	78.0	.25	.32	5.60	1.03	.85	41	0.00	26	160
7303-138M		033:55-56	7/12/79	56.7	19.0	74	75.6	.24	.33	5.20	.85	.73	49	2.56	29	173
7304-092M		039:55-56	7/06/79	48.6	20.8	70	69.3	.27	.36	4.60	.50	.47	69	0.00	29	52
7304-123M		041:55-56	7/10/79	56.0	18.4	75	74.4	.24	.32	2.75	0.00	0.00	0	.84	21	91
7304-148M		042:55-56	7/10/79	50.9	19.1	72	70.0	.23	.30	4.60	1.03	.91	38	0.00	33	85
7306-013M		048:55-56	7/10/79	55.1	18.8	74	74.0	.26	.29	6.70	.03	.25	99	2.34	20	124
7308-009M		053:55-56	7/09/79	54.8	19.8	73	74.6	.27	.35	4.00	.27	.31	89	3.18	22	94
7308-037M		002:59-60	7/09/79	52.0	22.0	70	73.9	.24	.33	4.00	.40	.42	75	2.42	22	74
7309-004M		003:59-60	7/03/79	53.8	21.5	71	75.3	.26	.33	6.75	.96	.73	48	2.18	22	12
7309-045M		005:59-60	7/03/79	45.3	18.6	70	63.9	.26	.35	6.40	1.35	1.07	30	0.00	23	13
7309-102M		006:59-60	7/05/79	52.9	18.0	74	71.0	.24	.32	4.50	.63	.58	59	2.71	18	27
7311-020M		009:59-60	7/16/79	53.1	21.3	71	74.5	.25	.32	7.10	1.00	.74	48	1.58	32	203
7311-122M		013:59-60	7/20/79	57.5	18.4	75	75.9	.27	.32	6.70	.78	.58	59	1.41	33	307
7311-141M		139:06	7/12/79	53.5	22.4	70	75.9	.24	.37	4.95	.46	.42	75	0.00	28	177
7311-141M		158:40	7/19/79	54.8	23.3	70	78.1	.25	.29	6.85	.59	.42	75	1.25	30	281
7314-019M		031:59-60	7/23/79	53.3	6.8	88	60.1	.30	.37	3.20	0.00	0.00	0	1.35	26	348
7603-036M		142:25	8/01/79	49.1	18.8	72	67.9	.25	.38	0.00	0.00	0.00	0	0.00	23	427
7605-044M		145:16	7/17/79	55.4	21.8	71	77.1	.25	.40	0.00	0.00	0.00	0	0.00	34	243
7610-112M		152:53	7/16/79	52.0	20.4	71	72.4	.26	.40	0.00	0.00	0.00	0	0.00	31	213
7611-102M		156:03	7/30/79	53.6	21.3	71	74.9	.25	.37	0.00	0.00	0.00	0	0.00	30	422
7612-004M		157:41	7/19/79	56.6	22.1	71	78.8	.25	.37	0.00	0.00	0.00	0	0.00	25	283
7613-025M		159:13	7/31/79	56.8	13.7	80	70.5	.25	.33	0.00	0.00	0.00	0	0.00	24	435
7613-042M		159:30	7/23/79	59.0	17.0	77	75.9	.27	.40	0.00	0.00	0.00	0	.77	21	310
7613-089M		160:24	7/13/79	50.7	18.3	73	69.0	.25	.38	0.00	0.00	0.00	0	0.00	39	190
7614-047M		162:19	7/18/79	52.1	16.8	75	68.8	.24	.38	0.00	0.00	0.00	0	0.00	22	255
7614-060M		162:32	7/18/79	54.8	21.4	71	76.2	.25	.39	0.00	0.00	0.00	0	0.00	33	251
7615-146M		167:02	8/06/79	53.7	17.9	74	71.6	.26	.33	0.00	0.00	0.00	0	0.00	19	439
7615-154M		167:10	7/26/79	53.7	20.7	72	74.3	.24	.33	0.00	0.00	0.00	0	0.00	19	397

TABLE III. 1979 SAMPLES WITH HIGH ALPHA (>12%) AND GOOD STORAGE.

SELECTED GENOTYPES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (CONE) SORTED BY IDENTITY AS OF 80/08/11.(N= 62) PAGE 1

ACCESSION OR NURSERY NUMBER	♀ IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL ML/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
21053	AURORA	BALE	219:01-04	8/20/79	1424	178	12.5	5.3	70	17.8	.23	.34	77	1.46	0.00	20	815
21055	6806-080	BALE	212:01-05	8/20/79	657	91	13.9	5.3	72	19.2	.27	.44	72	2.01	1.64	43	860
21055	6806-080	BALE	316:06-10	8/29/79	853	125	14.7	4.8	75	19.5	.28	.41	77	1.93	0.00	45	845
21193	7005-194	BALE	315:16-20	8/31/79	1589	211	13.3	4.9	73	18.2	.26	.44	76	1.53	2.24	27	1101
21193	7005-194	BALE	237:01-05	8/28/79	2058	275	13.4	5.2	72	18.6	.26	.44	70	1.15	2.15	25	879
21193	7005-194	BALE	051:07-08	9/04/79	1023	142	14.0	4.8	74	18.8	.22	.32	85	1.42	0.00	24	923
7005-149		CONE	043:03-04	9/06/79	0	0	12.6	3.6	77	16.3	.24	.41	75	0.00	0.00	40	153
7006-398		CONE	306:21-25	9/13/79	0	0	14.1	7.5	65	21.6	.24	.45	71	0.00	0.00	20	298
7301-126		CONE	033:23-24	9/12/79	0	0	14.3	4.8	75	19.1	.24	.46	70	0.00	0.00	42	223
7303-007		CONE	140:24	9/18/79	0	0	13.2	4.4	74	17.6	.27	.45	70	0.00	2.50	36	552
7303-019		CONE	329:26-30	9/13/79	0	0	12.6	3.8	76	16.4	.25	.43	73	0.00	0.00	33	305
7306-163		CONE	032:25-26	8/31/79	0	0	12.0	3.9	75	16.0	.26	.35	83	0.00	0.00	29	127
7306-193		CONE	036:25-26	8/31/79	0	0	12.4	4.2	74	16.6	.26	.34	84	0.00	0.00	32	125
7311-028		CONE	050:25-26	9/12/79	0	0	15.2	5.5	73	20.7	.24	.39	78	0.00	0.00	38	218
7311-032		BALE	315:31-35	9/05/79	2159	279	13.0	4.0	76	16.9	.28	.39	85	1.50	1.28	34	922
7311-152		BALE	321:31-35	9/06/79	1519	213	14.0	4.9	74	19.0	.28	.47	71	2.01	.22	39	1057
7312-027		BALE	327:31-35	9/06/79	1041	143	13.8	4.2	76	18.0	.28	.46	72	1.92	1.49	29	1035
7312-036		CONE	147:50	9/19/79	0	0	14.9	4.0	78	18.9	.27	.35	83	0.00	0.00	30	667
7312-083		CONE	157:37	9/19/79	0	0	13.9	3.7	78	17.6	.29	.43	73	0.00	0.00	25	712
7312-083		CONE	173:51	9/20/79	0	0	13.1	3.4	79	16.5	.29	.39	78	0.00	0.00	23	770
7312-083		CONE	150:47	9/19/79	0	0	13.8	3.9	78	17.6	.29	.42	74	0.00	0.00	25	648
7312-083		BALE	325:06-10	9/07/79	1271	171	13.5	3.9	77	17.3	.29	.40	82	1.74	2.89	27	1034
7312-128		CONE	040:27-28	9/04/79	0	0	13.4	3.6	78	17.0	.28	.34	84	0.00	0.00	33	123
7312-134		CONE	158:41	9/19/79	0	0	12.2	3.0	80	15.3	.23	.39	78	0.00	0.00	34	711
7314-011		CONE	339:01-05	9/13/79	0	0	12.2	4.2	74	16.4	.27	.41	75	0.00	0.00	37	303
7314-012		CONE	167:26	9/20/79	0	0	13.0	5.6	69	18.6	.26	.43	73	0.00	3.20	40	789
7314-012		CONE	171:31	9/20/79	0	0	13.7	6.3	68	20.0	.26	.43	74	0.00	0.00	41	781
7314-012		CONE	169:25	9/20/79	0	0	14.6	6.8	68	21.4	.26	.38	79	0.00	0.00	43	790
7314-044		CONE	341:01-05	9/13/79	0	0	13.3	3.7	78	17.0	.27	.45	71	0.00	0.00	41	297
7601-006		CONE	139:12	9/18/79	0	0	13.2	2.9	82	16.1	.33	.40	76	0.00	0.00	38	540
7602-017		CONE	140:41	9/18/79	0	0	13.5	4.3	75	17.8	.29	.42	74	0.00	0.00	40	527
7603-041		CONE	142:30	9/18/79	0	0	12.0	3.0	79	15.1	.29	.39	77	0.00	0.00	44	548
7606-048		CONE	148:45	9/19/79	0	0	13.3	4.0	76	17.3	.26	.35	83	0.00	0.00	34	662
7606-050		CONE	148:47	9/19/79	0	0	12.4	3.4	78	15.8	.30	.42	74	0.00	0.00	36	649
7606-086		CONE	149:30	9/19/79	0	0	14.3	5.7	71	20.0	.24	.38	79	0.00	0.00	31	669

TABLE III. 1979 SAMPLES WITH HIGH ALPHA (>12%) AND GOOD STORAGE.

SELECTED GENOTYPES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (CONE) SORTED BY IDENTITY AS OF 80/08/11.(N= 62) PAGE 2

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL MLS/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
7610-050		CONE	151:44	9/19/79	0	0	14.2	3.0	82	17.3	.27	.35	83	0.00	0.00	26	626
7610-097		CONE	152:38	9/19/79	0	0	13.7	4.2	76	17.8	.31	.39	78	0.00	0.00	34	636
7610-104		CONE	152:45	9/19/79	0	0	13.7	3.7	78	17.4	.27	.37	80	0.00	0.00	30	633
7611-005		CONE	154:12	9/19/79	0	0	13.8	3.8	78	17.6	.30	.38	79	0.00	0.00	31	629
7611-067		CONE	155:21	9/19/79	0	0	12.7	6.1	67	18.8	.25	.39	77	0.00	0.00	28	727
7611-084		CONE	155:38	9/19/79	0	0	13.2	4.3	75	17.5	.30	.42	74	0.00	0.00	30	698
7611-108		CONE	156:09	9/19/79	0	0	15.4	3.5	81	18.9	.30	.36	82	0.00	0.00	31	724
7611-143		CONE	156:44	9/19/79	0	0	14.6	3.3	81	17.9	.27	.37	80	0.00	0.00	25	695
7611-169		CONE	157:17	9/19/79	0	0	14.7	6.1	70	20.8	.28	.38	78	0.00	0.00	36	731
7611-178		CONE	157:26	9/19/79	0	0	13.1	3.4	79	16.5	.29	.41	75	0.00	0.00	38	705
7612-008		CONE	157:45	9/19/79	0	0	12.4	3.7	77	16.1	.26	.38	79	0.00	0.00	26	694
7612-035		CONE	158:19	9/19/79	0	0	14.6	3.1	82	17.7	.27	.39	77	0.00	0.00	30	725
7613-037		CONE	159:25	9/19/79	0	0	12.8	3.0	81	15.7	.27	.39	77	0.00	0.00	28	718
7613-072		CONE	160:07	9/19/79	0	0	12.0	2.5	82	14.5	.27	.30	90	0.00	0.00	41	730
7614-016		CONE	161:41	9/19/79	0	0	14.2	4.2	77	18.4	.28	.45	71	0.00	0.00	43	756
7614-017		CONE	161:42	9/19/79	0	0	12.3	3.6	77	15.9	.26	.32	87	0.00	0.00	51	747
7614-064		CONE	162:36	9/19/79	0	0	12.3	2.8	81	15.1	.27	.31	88	0.00	0.00	46	753
7614-079		CONE	162:51	9/19/79	0	0	12.6	4.7	72	17.3	.26	.34	85	0.00	0.00	29	755
7614-101		CONE	163:20	9/19/79	0	0	12.9	3.0	81	15.9	.29	.32	87	0.00	0.00	42	736
7614-115		CONE	163:34	9/19/79	0	0	15.4	5.0	75	20.4	.25	.33	86	0.00	0.00	34	754
7615-099		CONE	166:08	9/20/79	0	0	14.7	4.3	77	19.0	.27	.38	79	0.00	0.00	35	791
7617-007		CONE	169:32	9/20/79	0	0	16.3	5.9	73	22.2	.26	.42	74	0.00	0.00	37	795
7618-040		CONE	172:18	9/20/79	0	0	13.1	4.2	75	17.3	.27	.42	75	0.00	0.00	41	809
7618-045		CONE	172:23	9/20/79	0	0	13.8	4.0	77	17.8	.26	.41	75	0.00	0.00	32	786
7618-048		CONE	172:26	9/20/79	0	0	15.7	5.5	74	21.2	.27	.41	76	0.00	0.00	45	782
7618-098		CONE	173:23	9/20/79	0	0	13.6	4.7	74	18.3	.26	.35	83	0.00	0.00	38	793
7618-117		CONE	173:42	9/20/79	0	0	13.6	5.4	71	19.0	.28	.46	70	0.00	0.00	44	771

TABLE IV. 1979 MALES THAT FIT "AROMA" TYPE FOR ALPHA RATIO AND COHUMULONE. alpha ratio about 1, CoH below 25%.

SELECTED GENOTYPES SORTED BY IDENTITY AS OF 80/08/11. (N= 14)

ACCESSION OR NURSERY NUMBER	♂ IDENTIFICATION	LOCATION	HARVEST DATE	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	CRUSH 3 HR HSI	SAFE PERIOD	PERMEA-BILITY	CALC 6 MONTH HSI	CALC % A+B REMAIN	OIL: HUM/ CARY	COH	SERIAL NUMBER
19172M	CATS TAILX19009	024:53-54	6/29/79	36.6	32.6	52	69.2	.25	2.32	1.47	.52	.67	53	0.00	22	1
19183M	FU X 118	027:53-54	6/29/79	36.6	33.9	51	70.5	.25	.48	2.70	.15	.29	93	0.00	25	2
21088M	YUGO 5/9	016:57-58	7/18/79	40.5	27.3	59	67.8	.24	.32	2.80	.45	.53	63	3.05	15	260
21089M	YUGO 5/10	017:57-58	7/12/79	33.3	24.2	57	57.4	.24	.34	3.00	.53	.59	59	.22	14	178
21108M	7006-030M	020:55-56	7/06/79	31.0	42.2	42	73.2	.23	0.00	0.00	0.00	0.00	0	2.82	18	54
21108M	7006-030M	017:53-54	7/16/79	42.9	29.0	59	71.8	.25	0.00	0.00	0.00	0.00	0	0.00	23	215
21110M	7007-018M	054:13-14	7/09/79	38.4	29.3	56	67.7	.24	0.00	0.00	0.00	0.00	0	3.21	21	87
21110M	7007-018M	010:55-56	7/06/79	46.1	31.9	59	78.0	.24	.29	5.70	.61	.50	67	3.24	23	57
21136M	7006-323M	049:13-14	7/17/79	32.4	38.3	45	70.7	.23	0.00	0.00	0.00	0.00	0	3.35	18	240
64035M		002:57-58	7/05/79	41.6	28.9	59	70.5	.24	.32	5.30	.78	.66	53	3.65	20	18
7003-068M		054:11-12	7/07/79	44.7	30.4	59	75.0	.24	.32	3.30	.90	.88	40	1.60	20	109
7006-084M		040:13-14	7/12/79	41.9	35.4	54	77.3	.23	.40	1.83	.63	.74	48	2.00	14	157
7007-252M		032:15-16	7/11/79	42.7	30.2	58	72.8	.23	.40	2.85	.90	.90	38	1.51	20	151
7007-278M		034:15-16	7/12/79	46.3	33.4	58	79.8	.22	.29	3.50	.75	.74	48	2.01	18	155

TABLE V. 1979 POTENTIAL "AROMA" TYPES: ALPHA RATIO 40-60, COHUMULONE <30.

SELECTED GENOTYPES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (CONE) SORTED BY IDENTITY AS OF 80/08/11.(N= 49) PAGE 1

ACCESSION OR NURSERY NUMBER	♀ IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL MLS/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
I47-17		CONE	049:19-20	9/12/79	0	0	7.1	5.8	54	12.9	.23	.61	57	0.00	0.00	25	233
21014	HALLERTAU MF	BALE	326:01-05	8/15/79	299	16	5.4	5.5	49	10.9	.25	.74	46	.78	3.22	19	37
21015	TETTNANGER	BALE	248:01-02	8/20/79	160	8	5.5	5.0	52	10.5	.25	.62	65	1.07	3.12	22	829
21043	WYE CHALLENGER	BALE	328:01-05	8/29/79	928	69	7.5	5.3	58	12.8	.27	.46	63	1.67	2.91	25	185
21044	WYE NORTHDOWN	BALE	216:01-04	8/23/79	462	43	9.5	6.5	59	16.0	.27	.53	64	2.79	2.44	24	1090
21044	WYE NORTHDOWN	BALE	248:09-10	8/20/79	768	77	10.1	6.5	60	16.6	.25	.59	58	2.79	2.59	24	869
21081	DUNAV	BALE	305:06-10	9/07/79	811	48	6.0	3.9	60	9.9	.36	.48	77	1.32	0.00	27	827
21084	YUGO IV/2	CONE	037:49-50	8/31/79	0	0	5.3	5.5	48	10.8	.25	.61	56	0.00	0.00	15	116
21085	YUGO VII/23	CONE	039:49-50	8/31/79	0	0	5.2	5.7	47	10.9	.23	.70	50	0.00	0.00	20	94
21086	YUGO VIII/27	BALE	040:49-50	9/15/79	1152	57	5.0	4.6	52	9.6	.28	.65	51	.96	3.08	17	1044
21086	YUGO VIII/27	CONE	040:49-50	8/31/79	0	0	6.0	5.4	52	11.4	.21	.60	57	0.00	0.00	19	108
21098	6913-068	BALE	309:11-15	9/10/79	2269	157	7.0	5.3	56	12.3	.31	1.07	26	1.15	0.00	22	1085
21098	6913-068	BALE	232:23-27	9/14/79	1672	125	7.5	5.2	59	12.7	.26	1.00	31	2.70	1.26	21	916
21099	6921-006	BALE	310:11-15	8/15/79	1200	102	8.5	7.2	54	15.7	.26	.63	54	2.18	1.54	30	45
21113	LUBELSKA-PULAWY	BALE	328:06-10	8/15/79	166	9	5.5	6.0	47	11.6	.27	.68	52	.87	3.20	23	43
21114	NADWISLANSKA	BALE	329:06-10	8/15/79	128	6	5.0	5.3	48	10.3	.26	.68	60	.89	3.12	23	42
21162	6903-263	CONE	040:51-52	9/14/79	0	0	5.9	6.4	48	12.3	.24	.42	75	0.00	0.00	29	334
21179	HERSBRUCKER-E	BALE	006:01-04	9/04/79	790	42	5.4	5.5	49	10.9	.22	.44	69	.50	0.00	21	930
21179	HERSBRUCKER-E	BALE	230:01-10	9/13/79	768	45	5.9	7.4	44	13.3	.21	.56	57	1.17	3.06	24	915
21180	7003-143	CONE	034:51-52	9/14/79	0	0	6.5	7.5	46	14.0	.23	.66	53	0.00	0.00	26	329
21188	NP2/55 (S. AFR)	CONE	243:01-10	9/18/79	0	0	5.3	3.9	57	9.2	.29	0.00	0	0.00	0.00	30	555
21188	NP2/55 (S. AFR)	BALE	243:01-10	9/18/79	0	0	5.5	4.5	55	10.0	.24	.67	49	1.53	2.00	27	914
48209	FUGGLE H	BALE	203:05	8/24/79	0	0	5.2	3.5	59	8.7	.27	0.00	0	0.00	0.00	27	178
61021	TETTNANG-SWISS	BALE	248:03-04	8/20/79	192	11	5.9	5.6	51	11.5	.26	.66	53	0.00	0.00	20	1096
63018	N 47-35	CONE	012:51-52	9/14/79	0	0	5.5	5.9	48	11.4	.27	1.00	33	0.00	0.00	18	315
64008		CONE	019:51-52	8/31/79	0	0	7.6	5.4	58	13.0	.24	.63	55	0.00	0.00	21	86
64106	WYE 22/56/2	CONE	046:51-52	8/31/79	0	0	7.0	8.0	46	15.0	.26	.72	49	0.00	0.00	25	57
6771-021		BALE	236:12-16	9/18/79	2772	144	5.2	4.1	56	9.3	.25	.90	39	2.50	2.09	29	1025
7003-066		CONE	323:11-15	9/13/79	0	0	5.5	5.6	49	11.1	.23	.41	75	0.00	0.00	28	301
7003-066		BALE	229:12-16	9/17/79	864	62	7.2	7.4	49	14.6	.27	.58	57	1.61	3.07	30	889
7003-075		BALE	230:12-16	9/18/79	1740	120	6.9	6.0	53	12.9	.26	.67	54	1.42	1.44	22	921
7003-075		CONE	324:11-15	9/13/79	0	0	8.2	6.1	57	14.3	.22	.59	58	0.00	0.00	19	296
7003-079		CONE	231:12-16	9/18/79	0	0	6.3	8.8	41	15.1	.29	0.00	0	0.00	0.00	30	558
7003-081		BALE	326:11-15	9/10/79	1555	85	5.5	6.0	48	11.5	.29	.73	47	1.21	1.69	28	1028
7003-081		BALE	233:12-16	9/18/79	2952	173	5.9	6.2	48	12.1	.31	.92	34	1.85	1.52	30	978

concluded:

TABLE V. /1979 POTENTIAL "AROMA" TYPES: ALPHA RATIO 40-60, COHUMULONE <30.

SELECTED GENOTYPES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (CONE) SORTED BY IDENTITY AS OF 80/08/11.(N= 49) PAGE 2

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL ML/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
7003-081		CONE	012:47-48	9/13/79	0	0	7.4	5.5	57	12.9	.24	0.00	0	0.00	0.00	29	359
7003-287		CONE	041:07-08	9/06/79	0	0	10.0	7.2	58	17.1	.25	1.08	29	0.00	0.00	29	166
7003-306		CONE	043:07-08	9/06/79	0	0	6.1	5.9	51	12.0	.28	.80	43	0.00	0.00	24	145
7006-055		CONE	052:07-08	9/06/79	0	0	9.5	8.6	52	18.1	.20	.97	34	0.00	0.00	28	142
7006-370		CONE	025:47-48	9/12/79	0	0	10.0	8.8	53	18.8	.25	.79	44	0.00	0.00	20	214
7007-137		CONE	041:11-12	9/10/79	0	0	5.5	3.7	59	9.2	.25	.58	59	0.00	0.00	30	249
7007-324		CONE	051:11-12	9/10/79	0	0	5.7	5.2	51	10.9	.25	.65	53	0.00	0.00	30	256
7310-029		CONE	048:25-26	8/31/79	0	0	6.3	7.0	47	13.2	.25	.83	42	0.00	0.00	30	138
7314-058		BALE	342:01-05	8/29/79	757	69	9.2	7.3	56	16.5	.25	.61	45	1.53	3.01	30	263
7710-025		CONE	014:25	9/18/79	0	0	7.6	5.9	56	13.5	.24	0.00	0	0.00	0.00	29	421
7710-027		CONE	014:27	9/18/79	0	0	7.4	6.1	54	13.6	.22	.66	53	0.00	0.00	29	429
7714-030		CONE	019:28	9/18/79	0	0	8.6	6.6	56	15.2	.22	0.00	0	0.00	0.00	29	413
7718-017		CONE	023:31	9/18/79	0	0	6.9	5.2	57	12.1	.23	0.00	0	0.00	0.00	25	409
7724-010		CONE	029:16	9/19/79	0	0	5.7	4.3	56	10.1	.28	0.00	0	0.00	0.00	28	567

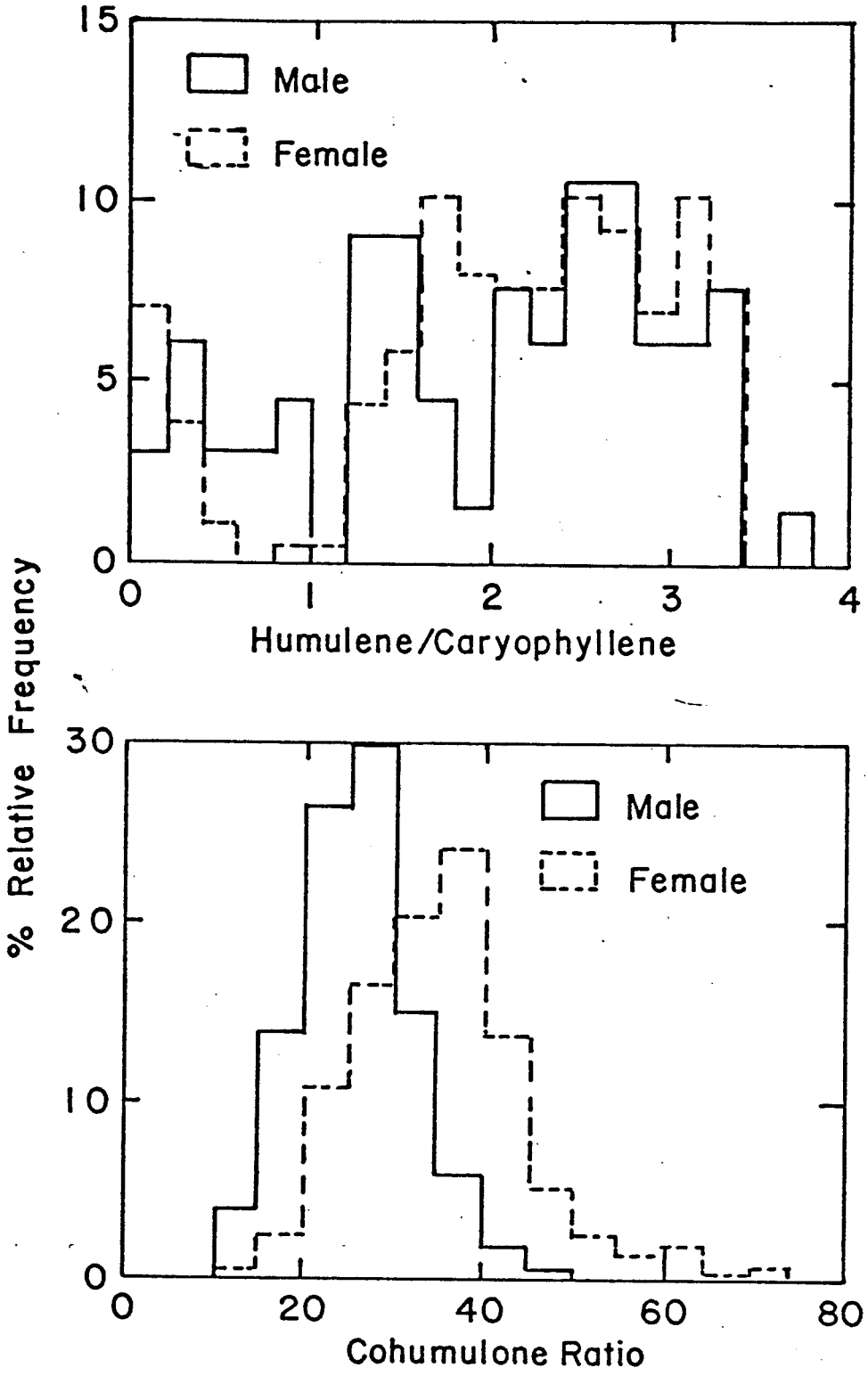


Figure 3. Histograms of humulene/caryophyllene ratio and cohumulone for male and female genotypes.

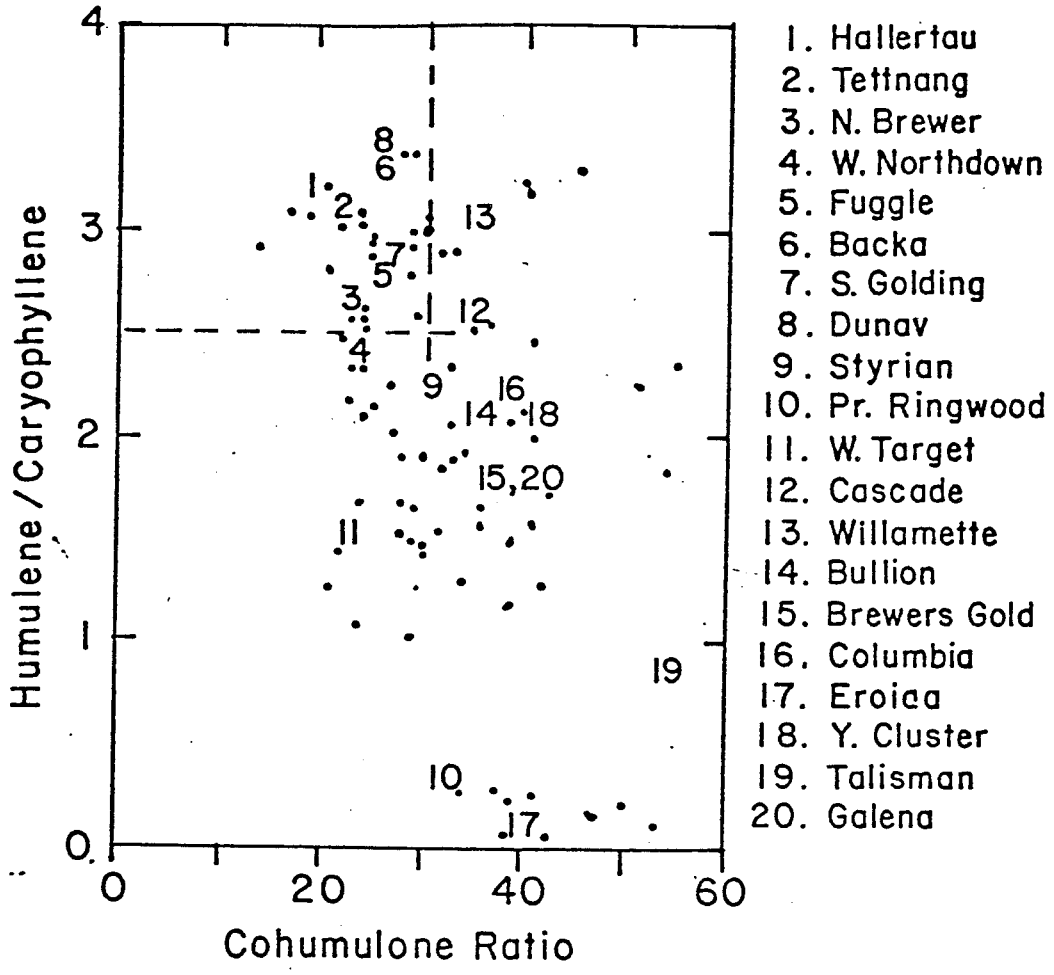


Figure 4. Scatter diagram of humulene/caryophyllene ratio vs cohumulone ratio. Commercial varieties indicated by number. Area in upper left defines cohumulone less than 30 and humulene/caryophyllene more than 2.5.

October 8, 1979

Nickerson & Likens

Hop Oil Composition by Injection of a Lupulin Extract

The oil composition of male lupulin has presented some difficult problems. We have used a solid sampler to insert 1-2 mg lupulin into the injection port of our old chromatograph. This was not a very satisfactory method as it was not possible to duplicate the results. The increased sensitivity and resolution of the H-P gas chromatograph makes it possible to dissolve the resin of oils from lupulin and inject an aliquot directly into the GC.

Sample Preparation

Accurately weigh about 20 mg of lupulin into a 0.1 ml micro reaction vessel. Add 0.1 ml acetone containing 0.1% C_{24} as the internal standard (IS), cap and place in sonicator for 15 min. Centrifuge to get lupulin to bottom.

GLC Analysis

Inject 2 -4 acetone solution.

NOTE: Insert packed with !" Chromosorb P 80-100 mesh (AW-DMCS treated) and glass wool and changed daily.

Column: 30 m glass capillary coated with Carbowax 20 M

Temperature: Isothermal at 60°C for 5 min, temperature programmed to 175°C at 5°/min, held at 175° for 20 min, programmed to 190° at 10°/min and held for 12 min.

Split ratio: about 1:100

Attenuation: 2^3

Results:

I. Replicated Analyses

A. Injections from same sample, 21.3 mg 1978 Bullion (Oct. 5, 1979)

	Injection								
	2nd		3rd		4th				
Compound	RT	%	RT	%	RT	%	Mean	S.D.	% cv
Myrcene	9.29	239.7	9.28	232.7	9.31	222.7	231.7	8.54	3.7
Unknown	16.21	25.2	16.17	20.5	16.19	18.9	21.5	3.27	15.2
Caryophyllene	22.65	40.9	22.65	43.2	22.67	43.6	42.6	1.46	3.4
Humulene	24.62	68.7	24.62	70.5	24.63	70.1	69.8	0.95	1.4
I.S.	58.29	24.2	58.32	22.4	58.32	20.8			

NOTE: The % figure is calculated from the internal standard

$$\% = \frac{\text{Area Y}}{(\text{Area IS})(\text{Amt IS})} \times \frac{100}{\text{wt. lupulin}}$$

The unknown does not appear in hop oil and may be a deterioration product formed during the injection.

B. Injections from different Bullion samples, % is relative to IS and weight.

	21.3 mg (vial#4)		23.3 mg (vial#5)				
Compound	RT	%	RT	%	Mean	SD	%cv
Myrcene	9.28	232.7	9.25	218.2	225.4	10.25	4.6
Unknown	16.17	20.5	16.15	19.8	20.2	0.49	2.5
Caryophyllene	22.65	43.2	22.62	39.7	41.5	2.48	6.0
Humulene	24.62	70.5	24.59	63.21	66.8	5.16	7.7
I.S.	58.32	22.4	58.13	18.8			
Analysis Date	Oct. 5		Oct. 8				

C. Comparison with hop oil sample, % Area relative to IS

Compound	21.3 mg	23.3 mg	2% Hop Oil
Myrcene	47.4	50.8	51.8
Unknown	4.0	4.6	7.0
Caryophyllene	9.3	9.2	6.9
Humulene	14.9	14.7	12.4
I.S.	4.4	4.4	9.6

D. Comparison of caryophyllene/humulene ratios, Bullion

	C/H
Lupulin (21.3 mg)	0.595
"	0.613
"	0.622
Lupulin (23.3 mg)	0.628
Hop Oil	0.558

II. Analyses of Fuggle and male lupulin

Under these GLC conditions, farnesene comes out just before humulene.

	Fuggle (1978)	60023M (1979)	64035M (1979)
Myrcene	180.3	---	---
caryophyllene	47.2	40.5	55.5
farnesene	23.3	---	---
humulene	130.9	25.8	202.5
I.S.	33.6	340.5	78.9
C/H	0.361	1.570	0.274

III. Calculations of Volatiles

If the internal standard is 0.1% of the solution, and know the %I.S. in the volatiles analyzed, one can estimate the amount of volatiles in the sample.

% in sample = (0.1/ % I.S. in sample)/ (wt in mg) x 100

	Estimated % volatiles in sample
Bullion, lupulin	9.8
"	10.6
"	9.8
Bullion, hop oil (1978)	52.2, 53.9
Fuggle, lupulin	7.3
60023M, lupulin	1.2
64035M, lupulin	2.6

Department of Agricultural Chemistry
Oregon State University
Corvallis, Oregon 97331 (503) 754-3791

March 6, 1980

C. E. Zimmermann
USDA SEA
Irrigated Ag. Research and
Extention Center
Box 30
Prosser, Washington 99350

Dear Chuck,

Here are the results of the GLC and cohumulone ratio determination on your samples:

✓ = we have at Corvallis.

Kirin Rating	Sample	Cohumulone (HPLC)	% Humulene in total oil	% Humulene in oil-(myrcene)	Humulene caryophyllene	µl humulene gm α-acid
1	W 404-33	(31)	19.96	39.1	2.04	35
	W 406-57 ✓	44	1.91	4.3	0.50	3
	W 407-67	46	1.03	3.0	0.15	3
	W 410-151	40	11.22	21.2	1.98	23
3	W412-152	(38)	25.63	47.4	2.96	23
	W 415-90	26	5.93	29.0	2.36	14
	W 419-23 ✓	32	15.60	34.5	1.77	29
2	W 421-38 ✓	(30)	22.71	32.1	2.13	36
	W 421-50 ✓	(38)	14.77	26.7	1.83	19

I hope that you had more than coffee at your party.

Gail (its been a long day)

Gail Nickerson

The Stroh Brewery Company
Detroit, Michigan 48226

Date: 9-7-79

MEMO

TO: C.Zimmermann, c.c. A.Haunold

FROM: M.Meilgaard

SUBJECT: Bates Hop

With sincere apologies for the delay in reporting, two samples of the above were received in late December and analyzed Jan. 8th, 1979 with the following results:

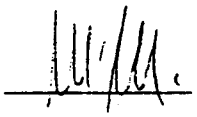
Sample	alpha, as is	alpha, dry matter
Bates, mature	7.0	7.6
Bates, baby	7.07	7.55

The samples were examined by hand evaluation. In comparison with typical samples of Yakima Cluster, which were at hand, the Bates samples were found sound and good, but somewhat inferior both in alpha acids and in aroma.

They were put aside in cold storage to await an opportunity for testing in the pilot plant, but as the plant has been fully occupied with high priority projects, such an opportunity did not arise.

Could you please tell us some more about the Bates hop ? It would seem to have no attraction for us unless its price were a good deal lower than that of Yakima Clusters.

We realize, of course, that the above samples may not have been entirely typical. As I said, any information you may have about the Bates hop and its progress to date will be of interest to us.



circulated to Technical Committee

Lab Report. Gail B. Nickerson

1978 Commercial Samples from Idaho : Quality and storage stability

Sample	Storage Cond.	At 8% mc %α	%β	HSI
Galena-Lot 102G #1185 from a 2-acre plot	Cold Storage (Jan)	15.4	8.9	0.25
	Cold Storage (July)	14.6	8.0	0.28
	6 Mo RT (room temperature)	12.4	6.8	0.36
Galena-Lot 130A #1183 1-acre plot	Cold Storage (Jan)	11.6	7.9	0.26
	Cold Storage (July)	10.8	7.0	0.31
	6 Mo RT	10.1	6.4	0.33
Galena-Enrose #1184 from a 9-hill plot	Cold Storage (Jan)	13.1	8.1	0.27
	Cold Storage (July)	12.4	7.1	0.34
	6 Mo RT	11.0	6.4	0.37
Bullion-Enrose Farms- #1181 from a 9-hill plot	Cold Storage (Jan)	10.9	5.3	0.28
	Cold Storage (July)	9.6	4.3	0.39
	6 Mo RT	6.9	2.3	0.58
31-11A-Enrose Farms #1182 from a 9-hill plot	Cold Storage (Jan)	11.2	6.7	0.29
	Cold Storage (July)	9.7	5.3	0.41
	6 Mo RT	7.0	3.0	0.60
33-6-Lot 130B #1180 1 acre planted	Cold Storage (Jan)	3.1	3.3	0.32
	Cold Storage (July)	2.7	2.6	0.37
	6 Mo RT	2.3	2.0	0.44
34-5-Lot 102-345 #1178 4 acres planted	Cold Storage (Jan)	12.2	5.0	0.27
	Cold Storage (July)	11.1	4.2	0.35
	6 Mo RT	8.9	3.0	0.42
43-11 #1179 0.8 acre planted	Cold Storage (Jan)	9.4	5.0	0.31
	Cold Storage (July)	8.2	3.8	0.40
	6 Mo RT	6.5	2.6	0.48

moisture content averaged around 8%

storage analyses completed: Feb. 1, 1979.

Ag Chem Dept.
OSU
Dec. 5, 1979

1979 crop.

Washington Samples -- Temik

Variety	Location	Treatment	At 8% moisture content % α	% β	α/α + β	HSI	Lab. Ser. No.
E2	Yard I, R 3B	Check	6.3	5.0	55	0.23	948
E2	Yard I, R 17B	4.9 lbs Temik	6.3	4.5	59	0.25	945
E2	Yard I, R 15B	6.6 lbs Temik	6.2	4.7	57	0.21	938
E2	Yard I, R 9B	10.0 lbs Temik	6.6	5.2	56	0.23	950
E2	Yard I, R11	14.0 lbs Temik	6.2	5.1	55	0.24	949
L2	Yard I, R3A	Check	5.2	5.1	50	0.19	941
L2	Yard I, R 17A	4.9 lbs Temik	6.4	5.5	54	0.17	942
L2	Yard I, R 15A	6.6 lbs Temik	6.5	5.6	54	0.18	940
L2	Yard I, R 13A	10.0 lbs Temik	6.3	5.4	54	0.22	943
L2	Yard I, R 21A	14.0 lbs Temik	5.7	5.3	52	0.17	944
Cascade	Hogue	Check	4.0	5.9	40	0.23	951
Cascade	Hogue	Temik	4.7	6.9	40	0.23	953
Cascade	Charvet	Check	4.6	5.3	46	0.20	939
Cascade	Charvet	Temik	4.8	5.3	47	0.25	958
Cluster	Puterbaugh	Check	7.8	5.2	60	0.23	955
Cluster	Puterbaugh	Temik	6.4	5.0	56	0.24	952
E2	Patnode	Check	6.4	5.0	56	0.26	961
E2	Patnode	6.6 lbs Temik	7.7	5.2	60	0.24	956
Cluster	Newhouse	Check	7.5	5.2	59	0.23	959
Cluster	Newhouse	Temik	5.6	5.0	53	0.24	960

Idaho Samples -- Temik

Variety	Location	Treatment	At 8% moisture content % α	% β	α/α + β	HSI	Lab. Ser. No.
Cascade	Id Golding	Check	5.0	5.3	49	0.30	963
Cascade	Id Golding	7 lb Temik	4.9	5.6	47	0.30 *(21.9%mc)	968
Cascade	Id Golding	14 lb Temik	4.1	5.4	43	0.33 *(28%mc)	967
Galena	Enrose	Check	14.6	9.0	62	0.25	964
Galena	Enrose	7 lb Temik	14.0	8.9	61	0.25	962
Galena	Enrose	14 lb Temik	14.0	9.2	60	0.25	965
Talisman	Enrose	Check	8.7	4.6	65	0.30	966
(virus free)	Enrose	7 lb Temik	8.7	4.6	65	0.30	970
(virus free)	Enrose	14 lb Temik	8.2	4.4	65	0.29	972
Eroica	Enrose	Check	12.3	4.0	75	0.27	969
(34-5)	Enrose	7 lb Temik	12.0	4.3	74	0.28	971
(34-5)	Enrose	14 lb Temik	13.8	3.8	78	0.25	973

AGRICULTURAL CHEMISTRY DEPT**OREGON STATE UNIVERSITY**AGRICULTURE RESEARCH**SEA**U S DEPT AGRICULTURE**CORVALLIS, OREGON

1979: Males:

1979 LUPULIN ANALYSES AS OF 80/08/01.

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	LOCATION	HARVEST DATE	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	CRUSH 3 HR HSI	SAFE PERIOD	PERMEA-BILITY	CALC 6 MONTH HSI	CALC % A+B REMAIN	OIL: HUM/ CARY	COH	SERIAL NUMBER
19005M	LC-OP	001:14	7/26/79	2.8	64.8	4	67.5	.20	0.00	0.00	0.00	0.00	0	0.00	0	389
19005M	LC-OP	001:53-54	7/12/79	5.0	65.1	7	70.1	.17	0.00	0.00	0.00	0.00	0	0.00	0	174
19005M	LC-OP	045:05-06	7/23/79	5.0	65.5	7	70.4	.20	2.20	0.00	0.00	0.00	0	0.00	0	311
19008M	SEMSCH-OP	001:15	7/26/79	33.0	16.3	67	49.3	.26	0.00	0.00	0.00	0.00	0	0.00	0	395
19008M	SEMSCH-OP	004:53-54	7/27/79	22.8	14.4	61	37.2	.29	0.00	0.00	0.00	0.00	0	0.00	0	417
19009M	FU X FU-OP	001:16	7/26/79	22.8	40.3	36	63.1	.24	0.00	0.00	0.00	0.00	0	0.00	0	382
19009M	FU X FU-OP	005:53-54	7/09/79	20.4	54.6	27	75.0	.22	.39	0.00	0.00	0.00	0	0.00	0	75
19010M	RED V X FU-OP	001:17	7/26/79	7.3	9.4	43	16.7	.30	0.00	0.00	0.00	0.00	0	0.00	0	399
19010M	RED V X FU-OP	006:53-54	7/27/79	12.3	17.1	41	29.5	.27	0.00	0.00	0.00	0.00	0	0.00	0	415
19036M	LC X FU-S	001:18	7/26/79	17.8	53.7	24	71.5	.20	0.00	0.00	0.00	0.00	0	0.00	0	405
19036M	LC X FU-S	007:53-54	7/27/79	20.2	51.8	28	72.0	.20	2.01	1.30	.46	.63	56	0.00	17	412
19037M	FU-OP X FU-OP	008:53-54	7/27/79	13.3	37.9	25	51.2	.21	0.00	0.00	0.00	0.00	0	0.00	0	416
19039M	FU-OP X RED V-O	009:53-54	7/05/79	33.5	33.9	49	67.3	.24	.52	3.90	.45	.47	69	3.02	31	17
19040M		010:53-54	7/09/79	31.5	31.4	50	62.8	.23	.72	3.40	.28	.36	83	0.00	27	71
19041M	EA GR-OP	001:21	7/26/79	21.2	53.7	28	74.9	.21	.54	0.00	0.00	0.00	0	0.00	0	383
19041M	EA GR-OP	011:53-54	7/16/79	17.3	44.4	28	61.7	.20	0.00	0.00	0.00	0.00	0	0.00	0	210
19046M	LC-OP X FU-OP	001:22	7/26/79	5.3	55.6	8	60.9	.18	0.00	0.00	0.00	0.00	0	0.00	0	398
19046M	LC-OP X FU-OP	014:53-54	7/27/79	5.5	55.1	9	60.5	.19	0.00	0.00	0.00	0.00	0	0.00	0	413
19046M	LC-OP X FU-OP	032:05-06	7/19/79	3.4	57.4	5	60.8	.18	2.03	0.00	0.00	0.00	0	0.00	0	264
19058M	EA GR-OP	001:23	7/26/79	23.3	48.6	32	71.9	.22	0.00	0.00	0.00	0.00	0	0.00	0	406
19058M	EA GR-OP	018:53-54	7/27/79	24.4	50.7	32	75.2	.20	2.53	1.18	.60	.75	47	0.00	12	411
19060M	EKG X BAV-S	019:53-54	7/12/79	27.7	44.7	38	72.4	.22	0.00	0.00	0.00	0.00	0	0.00	0	175
19061M	LGR X FU-OP	020:53-54	7/12/79	11.0	53.2	17	64.2	.19	0.00	0.00	0.00	0.00	0	0.00	0	162
19062M	EKG X BAV-S	001:24	7/26/79	30.1	30.6	49	60.6	.23	0.00	0.00	0.00	0.00	0	0.00	0	407
19062M	EKG X BAV-S	021:53-54	7/27/79	26.3	32.7	44	58.9	.25	0.00	0.00	0.00	0.00	0	0.00	0	410
19172M	CATS TAILX19009	024:53-54	6/29/79	36.6	32.6	52	69.2	.25	2.32	1.47	.52	.67	53	0.00	22	1
19173M	STRIESSX73-28	001:27	7/26/79	10.1	54.1	15	64.2	.20	0.00	0.00	0.00	0.00	0	0.00	0	391
19173M	STRIESSX73-28	025:53-54	7/27/79	23.1	45.1	33	68.2	.20	0.00	0.00	0.00	0.00	0	0.00	0	409
19183M	FU X 118	027:53-54	6/29/79	36.6	33.9	51	70.5	.25	.48	2.70	.15	.29	93	0.00	25	2
21009M	6735-002	028:53-54	7/06/79	32.9	26.2	55	59.1	.28	0.00	0.00	0.00	0.00	0	0.00	0	51
21017M	6220-009M	029:53-54	7/09/79	39.0	35.6	52	74.5	.24	.33	2.15	.73	.80	44	0.00	37	78
21018M	6321-001M	030:53-54	7/30/79	17.8	53.1	25	70.8	.20	0.00	0.00	0.00	0.00	0	0.00	0	418
21019M	6322-001M	001:55-56	7/12/79	4.3	12.6	25	16.9	.24	0.00	0.00	0.00	0.00	0	0.00	0	166
21058M	6305-008M	011:57-58	7/23/79	23.1	49.6	31	72.7	.22	0.00	0.00	0.00	0.00	0	0.00	0	351
21059M	6321-010M	012:57-58	7/12/79	14.6	54.6	21	69.2	.17	2.27	0.00	0.00	0.00	0	0.00	0	167
21059M	6321-010M	046:05-06	7/23/79	16.3	63.5	20	79.8	.19	2.23	1.45	.24	.43	73	2.61	21	308
21060M	6321-011M	001:28	7/26/79	14.0	50.0	21	64.0	.19	0.00	0.00	0.00	0.00	0	0.00	0	392

1979 LUPULIN ANALYSES AS OF 80/08/01.

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	LOCATION	HARVEST DATE	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	CRUSH 3 HR HSI	SAFE PERIOD	PERMEA-BILITY	CALC 6 MONTH HSI	CALC % A+B REMAIN	OIL: HUM/ CARY	COH	SERIAL NUMBER
21060M	6321-011M	013:57-58	7/18/79	15.9	52.9	23	68.8	.20	0.00	0.00	0.00	0.00	0	0.00	0	257
21061M	6322-010M	014:57-58	7/23/79	5.8	61.8	8	67.6	.19	1.68	0.00	0.00	0.00	0	0.00	0	334
21061M	6322-010M	047:05-06	7/26/79	13.0	59.3	17	72.3	.19	2.15	1.70	.22	.40	77	0.00	19	402
21064M	6611-002M	023:57-58	7/11/79	9.9	42.2	19	52.1	.26	0.00	0.00	0.00	0.00	0	0.00	0	150
21064M	6611-002M	023:57-58	7/16/79	14.1	49.9	22	64.0	.21	0.00	0.00	0.00	0.00	0	0.00	0	201
21065M	6616-043M	045:01-02	7/17/79	51.1	18.0	73	69.2	.26	.32	3.75	0.00	0.00	0	0.00	36	244
21067M	6616-054M	010:57-58	7/23/79	48.8	29.9	62	78.6	.23	.31	0.00	0.00	0.00	0	2.59	37	345
21069M	6618-037M	046:57-58	7/10/79	41.1	28.0	59	69.1	.28	0.00	0.00	0.00	0.00	0	0.00	0	116
21069M	6618-037M	047:01-02	7/09/79	43.7	28.7	60	72.3	.27	0.00	0.00	0.00	0.00	0	0.00	0	122
21070M	6618-043M	047:57-58	7/20/79	50.6	19.5	72	70.1	.26	.48	0.00	0.00	0.00	0	1.51	29	304
21070M	6618-043M	048:01-02	7/13/79	31.7	14.6	68	46.3	.25	0.00	0.00	0.00	0.00	0	0.00	27	186
21071M	6618-046M	048:57-58	7/24/79	46.8	25.4	64	72.2	.26	0.00	0.00	0.00	0.00	0	0.00	0	361
21071M	6618-046M	049:01-02	7/26/79	46.0	26.5	63	72.5	.26	0.00	0.00	0.00	0.00	0	0.00	0	387
21072M	6620-028M	049:57-58	7/09/79	39.5	34.5	53	73.9	.26	0.00	0.00	0.00	0.00	0	0.00	0	130
21075M	6804-009M	044:03-04	7/20/79	0.0	71.5	0	71.5	.20	0.00	0.00	0.00	0.00	0	0.00	35	289
21076M	6806-115M	020:57-58	7/16/79	32.6	23.0	58	55.6	.26	0.00	0.00	0.00	0.00	0	0.00	0	211
21076M	6806-115M	051:01-02	7/13/79	40.1	28.1	58	68.3	.24	.39	2.20	.70	.77	46	0.00	33	193
21087M	YUGO 3/3	001:30	7/26/79	20.5	10.8	65	31.3	.30	0.00	0.00	0.00	0.00	0	0.00	0	396
21087M	YUGO 3/3	015:57-58	7/05/79	47.2	23.8	66	71.0	.25	.38	5.90	.35	.27	95	2.09	19	32
21088M	YUGO 5/9	016:57-58	7/18/79	40.5	27.3	59	67.8	.24	.32	2.80	.45	.53	63	3.05	15	260
21089M	YUGO 5/10	017:57-58	7/12/79	33.3	24.2	57	57.4	.24	.34	3.00	.53	.59	59	.22	14	178
21090M	YUGO 12/17	018:57-58	7/27/79	30.0	28.6	51	58.6	.24	.67	0.00	0.00	0.00	0	0.00	0	414
21090M	YUGO 12/17	018:57-58	7/30/79	24.3	26.8	47	51.2	.29	0.00	0.00	0.00	0.00	0	0.00	0	424
21108M	7006-030M	017:53-54	7/16/79	42.9	29.0	59	71.8	.25	0.00	0.00	0.00	0.00	0	0.00	23	215
21108M	7006-030M	020:55-56	7/06/79	31.0	42.2	42	73.2	.23	0.00	0.00	0.00	0.00	0	2.82	18	54
21108M	7006-030M	039:13-14	7/17/79	47.1	28.1	62	75.2	.25	0.00	0.00	0.00	0.00	0	2.68	0	239
21109M	7006-094M	008:55-56	7/12/79	51.6	25.0	67	76.5	.23	.32	5.10	.61	.53	63	1.35	17	180
21109M	7006-094M	041:13-14	7/18/79	49.5	22.1	69	71.7	.24	0.00	0.00	0.00	0.00	0	0.00	0	248
21109M	7006-094M	048:03-04	7/06/79	50.5	26.3	65	76.8	.24	.39	0.00	0.00	0.00	0	1.39	16	70
21110M	7007-018M	010:55-56	7/06/79	46.1	31.9	59	78.0	.24	.29	5.70	.61	.50	67	3.24	23	57
21110M	7007-018M	054:13-14	7/09/79	38.4	29.3	56	67.7	.24	0.00	0.00	0.00	0.00	0	3.21	21	87
21111M	7007-335M	012:55-56	7/03/79	28.4	42.7	39	71.1	.23	.61	0.00	0.00	0.00	0	2.86	30	3
21111M	7007-335M	038:15-16	7/06/79	25.8	38.2	40	63.9	.25	0.00	0.00	0.00	0.00	0	0.00	30	62
21119M	7001-050M	021:57-58	7/27/79	0.0	69.6	0	69.6	.18	0.00	0.00	0.00	0.00	0	0.00	0	408
21119M	7001-050M	021:57-58	7/30/79	1.1	67.1	1	68.2	.19	0.00	0.00	0.00	0.00	0	0.00	0	425
21119M	7001-050M	038:05-06	7/24/79	0.0	73.3	0	73.3	.18	0.00	0.00	0.00	0.00	0	0.00	0	367
21129M	6803-090M	022:57-58	7/18/79	36.4	34.1	51	70.5	.24	0.00	0.00	0.00	0.00	0	0.00	0	262

AGRICULTURAL CHEMISTRY DEPT**OREGON STATE UNIVERSITY**AGRICULTURE RESEARCH**SEA**U S DEPT AGRICULTURE**CORVALLIS, OREGON

1979 LUPULIN ANALYSES AS OF 80/08/01.

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	LOCATION	HARVEST DATE	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	CRUSH 3 HR HSI	SAFE PERIOD	PERMEA-BILITY	CALC 6 MONTH HSI	CALC % A+B REMAIN	OIL: HUM/ CARY	COH	SERIAL NUMBER
21130M	6803-021M	030:57-58	7/03/79	16.0	57.5	21	73.4	.20	2.13	1.23	.56	.71	49	2.90	23	4
21131M	6903-023M	031:57-58	7/03/79	45.8	22.1	67	67.9	.27	.42	0.00	0.00	0.00	0	0.00	0	5
21132M	6903-23M	032:57-58	7/24/79	24.1	34.5	41	58.6	.25	.41	0.00	0.00	0.00	0	0.00	0	371
21133M	6906-098M	045:57-58	7/24/79	43.5	29.1	59	72.7	.23	0.00	0.00	0.00	0.00	0	0.00	0	363
21134M	7005-121M	013:55-56	7/24/79	41.0	33.0	55	74.0	.29	0.00	0.00	0.00	0.00	0	0.00	0	362
21134M	7005-121M	036:57-58	7/23/79	45.8	29.7	60	75.5	.26	0.00	0.00	0.00	0.00	0	0.00	0	325
21134M	7005-121M	037:13-14	7/19/79	41.5	28.1	59	69.6	.25	0.00	0.00	0.00	0.00	0	0.00	0	270
21135M	7006-430M	039:59-60	7/06/79	39.4	34.0	53	73.3	.24	2.02	0.00	0.00	0.00	0	0.00	0	58
21135M	7006-430M	052:13-14	7/26/79	43.3	28.5	60	71.8	.24	0.00	0.00	0.00	0.00	0	0.00	0	388
21136M	7006-323M	041:57-58	7/10/79	31.7	44.7	41	76.4	.22	0.00	0.00	0.00	0.00	0	0.00	0	97
21136M	7006-323M	049:13-14	7/17/79	32.4	38.3	45	70.7	.23	0.00	0.00	0.00	0.00	0	3.35	18	240
21137M	7006-340M	043:57-58	7/10/79	26.7	41.3	39	68.0	.25	0.00	0.00	0.00	0.00	0	0.00	0	117
21137M	7006-340M	050:13-14	7/25/79	28.9	41.4	41	70.3	.29	0.00	0.00	0.00	0.00	0	0.00	0	378
51060M		033:05-06	7/20/79	6.5	63.1	9	69.6	.20	0.00	0.00	0.00	0.00	0	0.00	0	286
51114M		001:32	7/26/79	12.1	31.7	27	43.8	.29	0.00	0.00	0.00	0.00	0	0.00	17	393
51114M		005:55-56	7/06/79	14.1	45.3	23	59.4	.24	1.56	2.25	.30	.44	73	0.00	22	53
52040M		049:05-06	7/17/79	8.9	56.1	13	65.0	.20	2.11	.85	.30	.52	65	2.94	23	241
60013M		001:33	7/26/79	38.2	23.6	61	61.8	.28	0.00	0.00	0.00	0.00	0	0.00	0	390
60013M		015:55-56	7/16/79	41.6	25.1	62	66.6	.26	0.00	0.00	0.00	0.00	0	0.00	0	225
60013M		015:55-56	7/18/79	38.2	27.6	58	65.8	.26	0.00	0.00	0.00	0.00	0	0.00	0	258
60013M		015:55-56	7/20/79	45.9	29.5	60	75.4	.24	0.00	0.00	0.00	0.00	0	3.20	30	306
60023M		001:34	7/26/79	35.4	36.5	49	71.8	.22	0.00	0.00	0.00	0.00	0	0.00	0	404
60023M		017:55-56	7/18/79	23.8	36.1	39	59.9	.25	2.17	0.00	0.00	0.00	0	.35	48	259
60026M		001:35	7/26/79	33.4	22.8	59	56.3	.27	0.00	0.00	0.00	0.00	0	0.00	0	400
60026M		018:55-56	7/10/79	41.6	33.4	55	75.1	.25	.36	2.28	.78	.83	42	1.26	52	88
60028M		019:55-56	7/10/79	38.3	34.4	52	72.7	.24	1.97	0.00	0.00	0.00	0	.55	47	84
63011M		022:55-56	7/09/79	8.9	22.5	28	31.4	.24	1.88	0.00	0.00	0.00	0	0.00	0	104
63012M		023:55-56	7/12/79	55.4	24.4	69	79.8	.23	2.27	0.00	0.00	0.00	0	0.00	44	172
63012M		055:01-02	7/11/79	55.6	22.7	70	78.3	.24	.92	0.00	0.00	0.00	0	0.00	43	161
63013M		024:55-56	7/09/79	43.4	31.2	58	74.6	.24	.28	4.28	.88	.80	44	0.00	44	99
63014M		031:03-04	7/11/79	39.9	33.4	54	73.3	.25	0.00	0.00	0.00	0.00	0	0.00	0	149
63015M		001:36	7/26/79	57.1	21.6	72	78.6	.24	.34	6.90	0.00	0.00	0	0.00	18	394
63015M		026:55-56	7/16/79	46.5	25.2	64	71.8	.25	.46	0.00	0.00	0.00	0	2.52	24	220
63016M		027:55-56	7/09/79	48.0	29.1	62	77.1	.23	0.00	0.00	0.00	0.00	0	0.00	0	112
63017M		028:55-56	7/12/79	35.0	32.4	51	67.4	.23	0.00	0.00	0.00	0.00	0	0.00	0	169
64032M		029:55-56	7/06/79	15.4	43.9	26	59.3	.24	1.39	0.00	0.00	0.00	0	0.00	0	42
64033M		030:55-56	7/09/79	20.3	40.9	33	61.2	.30	.57	0.00	0.00	0.00	0	0.00	0	126

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64034M		001:57-58	7/03/79	39.9	24.0	62	63.9	.25	.64	0.00	0.00	0.00	0	3.31	17	6
64035M		002:57-58	7/05/79	41.6	28.9	59	70.5	.24	.32	5.30	.78	.66	53	3.65	20	18
64101M		001:38	7/26/79	22.8	19.4	54	42.2	.32	0.00	0.00	0.00	0.00	0	0.00	0	385
64101M		005:57-58	7/03/79	43.5	26.9	61	70.4	.25	0.00	0.00	0.00	0.00	0	0.00	0	7
64102M		006:57-58	7/06/79	40.3	35.5	53	75.8	.24	.33	3.89	.53	.54	63	2.28	38	55
64103M		007:57-58	7/05/79	36.3	39.3	48	75.6	.21	2.18	1.60	.16	.36	82	0.00	36	19
64104M		036:03-04	7/18/79	30.9	16.6	65	47.5	.28	0.00	0.00	0.00	0.00	0	0.00	0	254
7002-023M		052:11-12	7/21/79	12.1	59.9	16	72.0	.19	1.88	0.00	0.00	0.00	0	0.00	0	324
7002-134M		053:11-12	7/13/79	26.4	44.2	37	70.5	.18	.61	0.00	0.00	0.00	0	0.00	0	191
7003-068M		054:11-12	7/07/79	44.7	30.4	59	75.0	.24	.32	3.30	.90	.88	40	1.60	20	109
7003-107M		055:11-12	7/30/79	18.7	49.0	27	67.7	.21	.30	0.00	0.00	0.00	0	0.00	0	423
7003-133M		031:13-14	7/10/79	20.7	41.8	33	62.5	.22	.45	0.00	0.00	0.00	0	0.00	0	142
7003-166M		032:13-14	7/10/79	7.0	60.3	10	67.3	.21	1.82	0.00	0.00	0.00	0	0.00	0	145
7003-225M		033:13-14	7/10/79	13.0	58.7	18	71.7	.21	2.16	0.00	0.00	0.00	0	0.00	0	133
7003-245M		034:13-14	7/19/79	16.4	61.9	20	78.3	.19	1.03	0.00	0.00	0.00	0	0.00	0	268
7003-256M		035:13-14	7/12/79	8.5	63.5	11	71.9	.20	1.70	0.00	0.00	0.00	0	0.00	0	153
7005-118M		036:13-14	7/13/79	47.6	26.1	64	73.7	.24	.32	0.00	0.00	0.00	0	0.00	0	196
7005-231M		038:13-14	7/10/79	39.6	34.0	53	73.7	.23	1.41	0.00	0.00	0.00	0	0.00	0	146
7006-084M		040:13-14	7/12/79	41.9	35.4	54	77.3	.23	.40	1.83	.63	.74	48	2.00	14	157
7006-163M		042:13-14	7/23/79	32.3	45.2	41	77.4	.23	1.68	0.00	0.00	0.00	0	0.00	0	336
7006-179M		043:13-14	7/08/79	17.7	56.8	23	74.5	.22	.26	0.00	0.00	0.00	0	0.00	0	66
7006-183M		044:13-14	7/10/79	48.7	28.7	62	77.5	.23	.27	0.00	0.00	0.00	0	0.00	0	135
7006-187M		045:13-14	7/09/79	41.5	29.8	58	71.2	.26	.97	0.00	0.00	0.00	0	0.00	0	108
7006-211M		046:13-14	7/10/79	16.3	59.0	21	75.3	.19	1.79	0.00	0.00	0.00	0	0.00	0	138
7006-269M		047:13-14	7/16/79	14.2	57.4	19	71.6	.22	.60	0.00	0.00	0.00	0	0.00	0	206
7006-293M		048:13-14	7/06/79	19.4	59.4	24	78.8	.19	1.73	0.00	0.00	0.00	0	0.00	0	67
7006-422M		051:13-14	7/08/79	29.6	48.0	38	77.6	.21	.34	0.00	0.00	0.00	0	0.00	0	68
7006-473M		053:13-14	7/31/79	39.4	36.5	51	75.9	.23	.43	0.00	0.00	0.00	0	0.00	0	433
7007-021M		055:13-14	7/03/79	35.1	33.7	51	68.9	.24	1.48	0.00	0.00	0.00	0	0.00	0	8
7007-176M		031:15-16	7/23/79	47.5	26.9	63	74.5	.24	.37	0.00	0.00	0.00	0	0.00	0	314
7007-252M		032:15-16	7/11/79	42.7	30.2	58	72.8	.23	.40	2.85	.90	.90	38	1.51	20	151
7007-275M		033:15-16	7/13/79	33.9	39.4	46	73.3	.20	.56	0.00	0.00	0.00	0	0.00	0	194
7007-278M		034:15-16	7/12/79	46.3	33.4	58	79.8	.22	.29	3.50	.75	.74	48	2.01	18	155
7007-304M		035:15-16	7/10/79	31.7	25.8	55	57.5	.26	1.41	0.00	0.00	0.00	0	0.00	0	134
7007-307M		036:15-16	7/03/79	27.6	43.0	39	70.6	.24	1.16	0.00	0.00	0.00	0	0.00	0	9
7007-328M		037:15-16	7/12/79	28.6	37.9	42	66.5	.21	.48	0.00	0.00	0.00	0	0.00	0	168
7007-356M		039:15-16	7/13/79	22.9	43.7	34	66.6	.21	.44	0.00	0.00	0.00	0	0.00	0	185

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7301-081M		031:53-54	7/12/79	45.0	23.2	65	68.1	.25	.84	0.00	0.00	0.00	0	0.00	28	182
7301-191M		032:53-54	7/12/79	48.6	23.8	67	72.4	.24	1.58	0.00	0.00	0.00	0	0.00	26	163
7302-016M		033:53-54	7/09/79	51.3	23.8	68	75.1	.25	.43	0.00	0.00	0.00	0	0.00	24	100
7302-036M		034:53-54	7/05/79	48.8	24.1	66	72.9	.25	.87	0.00	0.00	0.00	0	0.00	24	20
7302-052M		035:53-54	7/09/79	54.0	21.4	71	75.4	.24	2.27	0.00	0.00	0.00	0	.12	22	129
7302-063M		036:53-54	7/09/79	56.0	22.2	71	78.2	.23	1.38	0.00	0.00	0.00	0	0.00	18	95
7302-077M		037:53-54	7/16/79	47.5	24.1	66	71.6	.25	.61	0.00	0.00	0.00	0	2.60	25	227
7302-095M		038:53-54	7/24/79	56.0	17.4	76	73.4	.26	.46	0.00	0.00	0.00	0	0.00	25	374
7302-105M		039:53-54	7/12/79	52.0	21.9	70	73.9	.23	.38	2.70	.35	.45	71	.26	27	176
7302-125M		040:53-54	7/09/79	51.7	23.6	68	75.3	.24	.48	0.00	0.00	0.00	0	0.00	25	105
7302-127M		041:53-54	7/05/79	31.2	23.5	57	54.6	.29	.49	0.00	0.00	0.00	0	0.00	29	21
7302-144M		042:53-54	7/09/79	31.5	18.7	62	50.2	.29	2.58	0.00	0.00	0.00	0	0.00	25	101
7302-153M		043:53-54	7/05/79	52.6	19.7	72	72.4	.25	2.21	0.00	0.00	0.00	0	0.00	23	22
7302-155M		044:53-54	7/03/79	50.6	24.7	67	75.3	.25	2.23	0.00	0.00	0.00	0	0.00	28	10
7302-166M		045:53-54	7/05/79	41.6	22.0	65	63.6	.26	2.57	0.00	0.00	0.00	0	.08	27	23
7302-171M		046:53-54	7/06/79	50.7	23.5	68	74.2	.26	1.02	0.00	0.00	0.00	0	0.00	26	49
7302-174M		047:53-54	7/16/79	48.8	28.5	63	77.2	.24	0.00	0.00	0.00	0.00	0	0.00	31	218
7302-183M		048:53-54	7/10/79	41.2	25.1	62	66.3	.28	2.16	0.00	0.00	0.00	0	.31	20	119
7302-184M		049:53-54	7/09/79	46.8	24.7	65	71.5	.25	.93	0.00	0.00	0.00	0	0.00	18	98
7302-186M		050:53-54	7/18/79	41.5	18.2	69	59.7	.27	.36	0.00	0.00	0.00	0	.59	23	261
7302-188M		051:53-54	7/16/79	52.7	20.4	72	73.2	.25	2.44	0.00	0.00	0.00	0	0.00	18	229
7303-009M		052:53-54	7/20/79	34.2	14.8	69	49.0	.26	.36	0.00	0.00	0.00	0	0.00	30	288
7303-028M		053:53-54	7/06/79	44.2	28.7	60	72.8	.26	.53	0.00	0.00	0.00	0	0.00	28	50
7303-046M		054:53-54	7/09/79	28.8	15.2	65	44.0	.24	.39	0.00	0.00	0.00	0	0.00	22	111
7303-052M		055:53-54	7/09/79	41.4	23.7	63	65.1	.27	.52	0.00	0.00	0.00	0	0.00	30	93
7303-105M		031:55-56	7/20/79	47.9	19.7	70	67.6	.26	.32	6.50	.18	.25	99	.75	21	305
7303-135M		032:55-56	7/12/79	62.9	15.1	80	78.0	.25	.32	5.60	1.03	.85	41	0.00	26	160
7303-138M		033:55-56	7/12/79	56.7	19.0	74	75.6	.24	.33	5.20	.85	.73	49	2.56	29	173
7303-149M		034:55-56	7/20/79	42.6	13.9	75	56.5	.26	.41	0.00	0.00	0.00	0	0.00	25	298
7303-153M		035:55-56	7/20/79	43.0	31.2	57	74.1	.24	1.21	0.00	0.00	0.00	0	0.00	35	285
7303-159M		036:55-56	7/05/79	46.3	23.3	66	69.6	.26	.50	0.00	0.00	0.00	0	0.00	30	24
7303-165M		037:55-56	7/05/79	40.0	22.4	64	62.4	.24	.99	0.00	0.00	0.00	0	.83	0	25
7303-165M		139:04	7/12/79	54.6	21.8	71	76.4	.26	.77	0.00	0.00	0.00	0	0.00	28	164
7303-165M		150:07	7/16/79	49.3	21.8	69	71.1	.25	2.36	0.00	0.00	0.00	0	0.00	29	200
7303-165M		158:38	7/26/79	47.0	19.5	70	66.6	.26	.45	0.00	0.00	0.00	0	0.00	0	403
7304-085M		038:55-56	7/12/79	52.3	15.7	76	68.0	.25	2.50	0.00	0.00	0.00	0	0.00	18	165
7304-092M		039:55-56	7/06/79	48.6	20.8	70	69.3	.27	.36	4.60	.50	.47	69	0.00	29	52

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ACCESSION OR NURSERY NUMBER	IDENTIFICATION	LOCATION	HARVEST DATE	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	CRUSH 3 HR HSI	SAFE PERIOD	PERMEA- BILITY	CALC 6 MONTH HSI	CALC % A+B REMAIN	OIL: HUM/ CARY	COH	SERIAL NUMBER
7304-105M		040:55-56	7/10/79	51.3	22.4	69	73.7	.25	1.20	0.00	0.00	0.00	0	0.00	28	118
7304-123M		041:55-56	7/10/79	56.0	18.4	75	74.4	.24	.32	2.75	0.00	0.00	0	.84	21	91
7304-148M		042:55-56	7/10/79	50.9	19.1	72	70.0	.23	.30	4.60	1.03	.91	38	0.00	33	85
7304-165M		043:55-56	7/09/79	52.7	21.8	70	74.6	.24	2.50	0.00	0.00	0.00	0	.89	22	128
7304-177M		044:55-56	7/09/79	35.8	20.5	63	56.2	.30	1.78	0.00	0.00	0.00	0	0.00	26	121
7304-197M		046:55-56	7/06/79	47.6	22.2	68	69.8	.25	.49	0.00	0.00	0.00	0	0.00	26	56
7305-101M		047:55-56	7/24/79	43.9	23.5	65	67.4	.28	.39	0.00	0.00	0.00	0	0.00	28	370
7306-013M		048:55-56	7/10/79	55.1	18.8	74	74.0	.26	.29	6.70	.03	.25	99	2.34	20	124
7306-117M		049:55-56	7/20/79	52.9	18.7	73	71.7	.27	.94	0.00	0.00	0.00	0	1.37	16	301
7306-138M		050:55-56	7/09/79	49.5	22.2	69	71.7	.23	.89	0.00	0.00	0.00	0	1.44	23	114
7307-024M		051:55-56	7/06/79	51.7	22.8	69	74.6	.24	.30	0.00	0.00	0.00	0	2.71	13	61
7307-024M		051:55-56	7/09/79	48.6	21.3	69	69.9	.25	.32	0.00	0.00	0.00	0	2.75	14	127
7307-035M		052:55-56	7/03/79	51.7	23.7	68	75.4	.25	.31	0.00	0.00	0.00	0	1.57	13	11
7308-009M		053:55-56	7/09/79	54.8	19.8	73	74.6	.27	.35	4.00	.27	.31	89	3.18	22	94
7308-020M		054:55-56	7/09/79	40.8	20.8	66	61.6	.27	.45	0.00	0.00	0.00	0	2.35	24	107
7308-023M		055:55-56	7/09/79	44.9	20.9	68	65.7	.26	.43	0.00	0.00	0.00	0	2.35	22	103
7308-023M		139:05	7/05/79	43.4	24.2	64	67.6	.26	.44	0.00	0.00	0.00	0	0.00	0	38
7308-023M		150:08	7/09/79	47.4	21.2	69	68.5	.26	.37	0.00	0.00	0.00	0	2.57	23	123
7308-023M		158:39	7/21/79	44.1	19.1	69	63.2	.27	.38	0.00	0.00	0.00	0	2.48	21	315
7308-023M		173:46	7/16/79	46.4	25.0	64	71.3	.24	.30	0.00	0.00	0.00	0	0.00	0	224
7308-037M		002:59-60	7/09/79	52.0	22.0	70	73.9	.24	.33	4.00	.40	.42	75	2.42	22	74
7309-004M		003:59-60	7/03/79	53.8	21.5	71	75.3	.26	.33	6.75	.96	.73	48	2.18	22	12
7309-034M		004:59-60	7/05/79	47.1	23.9	66	71.0	.26	.43	0.00	0.00	0.00	0	2.51	17	26
7309-045M		005:59-60	7/03/79	45.3	18.6	70	63.9	.26	.35	6.40	1.35	1.07	30	0.00	23	13
7309-102M		006:59-60	7/05/79	52.9	18.0	74	71.0	.24	.32	4.50	.63	.58	59	2.71	18	27
7310-007M		007:59-60	7/03/79	39.2	24.0	62	63.1	.27	.61	0.00	0.00	0.00	0	1.84	26	14
7311-012M		008:59-60	7/05/79	34.8	19.9	63	54.7	.28	.70	0.00	0.00	0.00	0	0.00	30	28
7311-020M		009:59-60	7/16/79	53.1	21.3	71	74.5	.25	.32	7.10	1.00	.74	48	1.58	32	203
7311-046M		010:59-60	7/10/79	43.8	16.6	72	60.4	.26	.73	0.00	0.00	0.00	0	0.00	27	86
7311-087M		011:59-60	7/09/79	44.4	23.4	65	67.8	.26	.39	0.00	0.00	0.00	0	0.00	28	77
7311-114M		012:59-60	7/09/79	40.2	18.0	69	58.2	.27	.45	0.00	0.00	0.00	0	0.00	22	79
7311-122M		013:59-60	7/20/79	57.5	18.4	75	75.9	.27	.32	6.70	.78	.58	59	1.41	33	307
7311-135M		014:59-60	7/16/79	33.5	13.5	71	47.0	.37	.42	0.00	0.00	0.00	0	0.00	34	214
7311-141M		015:59-60	7/10/79	48.6	22.7	68	71.3	.24	.40	0.00	0.00	0.00	0	0.00	0	110
7311-141M		139:06	7/12/79	53.5	22.4	70	75.9	.24	.37	4.95	.46	.42	75	0.00	28	177
7311-141M		150:09	7/25/79	42.9	21.6	66	64.4	.29	.38	0.00	0.00	0.00	0	0.00	0	377
7311-141M		158:40	7/19/79	54.8	23.3	70	78.1	.25	.29	6.85	.59	.42	75	1.25	30	281

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7311-141M		173:47	7/18/79	53.5	23.3	69	76.8	.25	.31	0.00	0.00	0.00	0	0.00	0	253
7311-142M		016:59-60	7/06/79	47.6	23.6	66	71.1	.27	.34	0.00	0.00	0.00	0	0.00	25	48
7312-017M		017:59-60	7/05/79	44.3	21.2	67	65.5	.30	.42	0.00	0.00	0.00	0	0.00	23	29
7312-028M		018:59-60	7/10/79	54.6	20.0	73	74.6	.24	.43	0.00	0.00	0.00	0	0.00	27	83
7312-029M		019:59-60	7/12/79	50.8	22.4	69	73.2	.25	.38	0.00	0.00	0.00	0	1.74	25	159
7312-033M		020:59-60	7/09/79	39.0	25.3	60	64.3	.27	.39	6.20	.93	.74	48	3.18	26	80
7312-043M		021:59-60	7/09/79	45.1	22.6	66	67.7	.27	.39	0.00	0.00	0.00	0	0.00	27	76
7312-079M		022:59-60	7/09/79	50.3	24.3	67	74.6	.26	.47	0.00	0.00	0.00	0	0.00	26	73
7312-088M		023:59-60	7/09/79	38.8	20.1	65	58.8	.27	0.00	0.00	0.00	0.00	0	0.00	0	81
7312-088M		023:59-60	7/23/79	45.3	23.7	65	69.0	.27	.36	0.00	0.00	0.00	0	2.06	22	349
7312-105M		024:59-60	7/09/79	44.7	25.2	63	69.9	.25	1.83	0.00	0.00	0.00	0	0.00	34	72
7312-126M		025:59-60	7/05/79	37.2	28.2	56	65.4	.28	.32	3.29	.62	.64	54	0.00	36	30
7313-015M		026:59-60	7/16/79	44.6	27.1	62	71.8	.25	.35	0.00	0.00	0.00	0	0.00	27	199
7313-047M		028:59-60	7/06/79	46.0	21.4	68	67.3	.27	.49	0.00	0.00	0.00	0	0.00	26	59
7313-098M		029:59-60	7/09/79	44.4	21.9	66	66.3	.25	.54	0.00	0.00	0.00	0	0.00	25	96
7314-004M		030:59-60	7/05/79	38.4	24.6	60	63.0	.27	.60	0.00	0.00	0.00	0	0.00	28	31
7314-019M		031:59-60	7/23/79	53.3	6.8	88	60.1	.30	.37	3.20	0.00	0.00	0	1.35	26	348
7314-023M		032:59-60	7/03/79	52.5	25.9	66	78.4	.26	.47	0.00	0.00	0.00	0	2.77	28	15
7314-048M		033:59-60	7/06/79	41.6	22.3	65	63.9	.26	.44	0.00	0.00	0.00	0	0.00	29	60
7314-086M		034:59-60	7/03/79	41.3	19.3	68	60.7	.25	.49	0.00	0.00	0.00	0	0.00	32	16
7314-106M		035:59-60	7/10/79	30.8	16.9	64	47.6	.27	2.48	0.00	0.00	0.00	0	1.63	23	92
7314-109M		036:59-60	7/12/79	41.1	15.6	72	56.7	.25	.64	0.00	0.00	0.00	0	0.00	32	181
7315-031M		037:59-60	7/12/79	45.6	21.8	67	67.4	.27	.37	0.00	0.00	0.00	0	0.00	32	158
7315-051M		038:59-60	7/16/79	50.9	23.3	68	74.2	.25	.30	0.00	0.00	0.00	0	0.00	28	219
7501-001M		001:63	7/23/79	0.0	67.3	0	67.3	.20	0.00	0.00	0.00	0.00	0	0.00	0	312
7502-010M		001:79	7/06/79	1.9	64.5	2	66.4	.21	0.00	0.00	0.00	0.00	0	0.00	0	69
7502-015M		001:84	7/24/79	0.0	70.6	0	70.6	.19	0.00	0.00	0.00	0.00	0	0.00	0	369
7502-021M		001:90	7/17/79	2.1	31.3	6	33.3	.26	0.00	0.00	0.00	0.00	0	0.00	0	233
7502-023M		001:92	7/17/79	4.4	55.1	7	59.6	.20	0.00	0.00	0.00	0.00	0	0.00	0	242
7503-003M		002:63	7/25/79	9.3	52.1	15	61.4	.20	0.00	0.00	0.00	0.00	0	0.00	0	381
7503-007M		002:67	7/19/79	.1	54.9	0	55.0	.21	0.00	0.00	0.00	0.00	0	0.00	0	265
7503-016M		002:76	7/23/79	0.0	73.9	0	73.9	.20	0.00	0.00	0.00	0.00	0	0.00	0	321
7503-019M		002:79	7/23/79	0.0	58.5	0	58.5	.19	0.00	0.00	0.00	0.00	0	0.00	0	342
7503-022M		002:82	7/16/79	0.0	64.2	0	64.2	.17	0.00	0.00	0.00	0.00	0	0.00	0	208
7503-028M		002:88	7/18/79	0.0	73.7	0	73.7	.16	0.00	0.00	0.00	0.00	0	0.00	0	252
7503-036M		003:62	7/19/79	0.0	58.1	0	58.1	.19	0.00	0.00	0.00	0.00	0	0.00	0	278
7503-037M		003:63	7/24/79	0.0	70.2	0	70.2	.18	0.00	0.00	0.00	0.00	0	0.00	0	358

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7503-039M		003:65	7/25/79	0.0	73.1	0	73.1	.19	0.00	0.00	0.00	0.00	0	0.00	0	376
7503-045M		003:71	7/19/79	0.0	67.5	0	67.5	.17	0.00	0.00	0.00	0.00	0	0.00	0	280
7503-050M		003:76	7/19/79	.3	72.4	0	72.6	.18	0.00	0.00	0.00	0.00	0	0.00	0	263
7503-057M		003:83	7/16/79	1.6	71.9	2	73.5	.17	0.00	0.00	0.00	0.00	0	0.00	0	198
7503-064M		003:90	7/23/79	0.0	72.5	0	72.5	.20	0.00	0.00	0.00	0.00	0	0.00	0	328
7503-068M		003:94	7/10/79	0.0	62.9	0	62.9	.19	0.00	0.00	0.00	0.00	0	0.00	0	144
7503-069M		004:61	7/25/79	0.0	67.7	0	67.7	.19	0.00	0.00	0.00	0.00	0	0.00	0	380
7503-071M		004:63	7/23/79	0.0	76.4	0	76.4	.19	0.00	0.00	0.00	0.00	0	0.00	0	316
7503-080M		004:72	7/18/79	0.0	65.1	0	65.1	.18	0.00	0.00	0.00	0.00	0	0.00	0	249
7503-084M		004:76	7/24/79	0.0	57.7	0	57.7	.19	0.00	0.00	0.00	0.00	0	0.00	0	359
7503-086M		004:78	7/24/79	0.0	69.9	0	69.9	.18	0.00	0.00	0.00	0.00	0	0.00	0	373
7503-089M		004:81	7/18/79	0.0	75.0	0	75.0	.17	0.00	0.00	0.00	0.00	0	0.00	0	247
7503-094M		004:86	7/18/79	0.0	53.6	0	53.6	.19	0.00	0.00	0.00	0.00	0	0.00	0	245
7503-095M		004:87	7/20/79	0.0	69.0	0	69.0	.19	0.00	0.00	0.00	0.00	0	0.00	0	302
7503-101M		004:93	7/23/79	0.0	57.3	0	57.3	.19	0.00	0.00	0.00	0.00	0	0.00	0	320
7503-107M		005:65	7/20/79	3.8	66.3	5	70.1	.19	0.00	0.00	0.00	0.00	0	0.00	0	290
7503-108M		005:66	7/30/79	0.0	76.8	0	76.8	.17	0.00	0.00	0.00	0.00	0	0.00	0	420
7503-110M		005:68	7/17/79	1.0	63.5	1	64.5	.20	0.00	0.00	0.00	0.00	0	0.00	0	232
7503-125M		005:82	7/24/79	1.0	64.1	1	65.0	.19	0.00	0.00	0.00	0.00	0	0.00	0	360
7503-125M		005:83	8/01/79	0.0	55.7	0	55.7	.22	0.00	0.00	0.00	0.00	0	0.00	0	430
7503-127M		005:85	7/25/79	0.0	68.5	0	68.5	.18	0.00	0.00	0.00	0.00	0	0.00	0	375
7503-128M		005:86	7/23/79	0.0	67.9	0	67.9	.20	0.00	0.00	0.00	0.00	0	0.00	0	327
7503-129M		005:87	7/24/79	0.0	74.0	0	74.0	.18	0.00	0.00	0.00	0.00	0	0.00	0	355
7503-136M		005:94	8/17/79	1.1	57.2	1	58.3	.20	0.00	0.00	0.00	0.00	0	0.00	0	440
7503-140M		006:64	7/23/79	0.0	69.1	0	69.1	.19	0.00	0.00	0.00	0.00	0	0.00	0	330
7503-146M		006:70	7/25/79	0.0	74.4	0	74.4	.18	0.00	0.00	0.00	0.00	0	0.00	0	379
7503-149M		006:73	7/23/79	0.0	70.6	0	70.6	.17	0.00	0.00	0.00	0.00	0	0.00	0	344
7503-167M		006:91	7/19/79	.2	60.8	0	61.0	.20	0.00	0.00	0.00	0.00	0	0.00	0	271
7503-170M		006:94	7/23/79	0.0	71.2	0	71.2	.17	0.00	0.00	0.00	0.00	0	0.00	0	341
7503-172M		007:62	7/10/79	0.0	62.0	0	62.0	.20	0.00	0.00	0.00	0.00	0	0.00	0	136
7601-002M		139:08	7/12/79	45.3	23.6	65	68.9	.27	0.00	0.00	0.00	0.00	0	0.00	0	154
7601-051M		140:04	7/09/79	24.1	26.9	47	51.0	.27	0.00	0.00	0.00	0.00	0	0.00	0	120
7602-002M		140:26	7/24/79	39.5	29.1	57	68.6	.26	0.00	0.00	0.00	0.00	0	0.00	0	356
7602-008M		140:32	7/12/79	12.1	13.8	46	26.0	.29	0.00	0.00	0.00	0.00	0	0.00	0	152
7602-022M		140:46	8/01/79	41.1	22.5	64	63.6	.28	0.00	0.00	0.00	0.00	0	0.00	0	428
7602-046M		141:17	7/05/79	32.4	30.2	51	62.6	.26	0.00	0.00	0.00	0.00	0	0.00	0	47
7602-050M		141:21	7/05/79	20.0	25.7	43	45.8	.27	0.00	0.00	0.00	0.00	0	0.00	0	36

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ACCESSION OR NURSERY NUMBER	IDENTIFICATION	LOCATION	HARVEST DATE	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	CRUSH 3 HR HSI	SAFE PERIOD	PERMEA-BILITY	CALC 6 MONTH HSI	CALC % A+B REMAIN	OIL: HUM/CARY	COH	SERIAL NUMBER
7603-027M		142:16	7/08/79	38.3	23.7	61	61.9	.29	0.00	0.00	0.00	0.00	0	0.00	0	64
7603-027M		142:16	7/20/79	40.0	24.0	62	64.0	.27	0.00	0.00	0.00	0.00	0	0.00	0	287
7603-036M		142:25	8/01/79	49.1	18.8	72	67.9	.25	.38	0.00	0.00	0.00	0	0.00	23	427
7603-038M		142:27	7/13/79	47.3	22.5	67	69.8	.24	0.00	0.00	0.00	0.00	0	0.00	0	189
7603-042M		142:31	7/06/79	31.5	20.2	60	51.7	.28	0.00	0.00	0.00	0.00	0	0.00	0	63
7603-052M		142:41	7/21/79	40.0	25.9	60	65.9	.26	0.00	0.00	0.00	0.00	0	0.00	0	309
7603-053M		142:42	7/16/79	34.2	28.4	54	62.6	.26	0.00	0.00	0.00	0.00	0	0.00	0	222
7604-006M		143:13	7/10/79	34.0	29.2	53	63.3	.25	0.00	0.00	0.00	0.00	0	0.00	0	147
7604-008M		143:15	7/24/79	35.7	28.6	55	64.3	.29	0.00	0.00	0.00	0.00	0	0.00	0	372
7604-014M		143:21	7/23/79	31.3	23.0	57	54.3	.31	0.00	0.00	0.00	0.00	0	0.00	0	317
7604-015M		143:22	7/31/79	28.8	21.8	56	50.6	.29	0.00	0.00	0.00	0.00	0	0.00	0	434
7604-016M		143:23	7/23/79	33.4	22.7	59	56.1	.25	0.00	0.00	0.00	0.00	0	0.00	0	337
7604-045M		143:52	7/09/79	18.3	26.1	41	44.4	.25	0.00	0.00	0.00	0.00	0	0.00	0	106
7604-048M		144:02	7/19/79	34.5	33.3	50	67.9	.26	0.00	0.00	0.00	0.00	0	0.00	0	284
7604-050M		144:04	8/17/79	44.9	25.4	63	70.2	.25	0.00	0.00	0.00	0.00	0	0.00	0	441
7604-055M		144:09	7/24/79	43.4	26.1	62	69.5	.28	0.00	0.00	0.00	0.00	0	0.00	0	368
7604-057M		144:11	7/31/79	39.5	17.2	69	56.7	.29	0.00	0.00	0.00	0.00	0	0.00	0	431
7605-011M		144:36	7/20/79	45.5	22.0	67	67.5	.27	0.00	0.00	0.00	0.00	0	0.00	0	296
7605-014M		144:39	7/12/79	43.5	27.3	61	70.8	.25	0.00	0.00	0.00	0.00	0	0.00	0	183
7605-016M		144:41	7/19/79	36.4	23.8	60	60.2	.29	0.00	0.00	0.00	0.00	0	0.00	0	273
7605-017M		144:42	7/12/79	32.4	19.7	62	52.1	.35	0.00	0.00	0.00	0.00	0	0.00	0	156
7605-018M		144:43	7/24/79	32.7	26.2	55	58.9	.30	0.00	0.00	0.00	0.00	0	0.00	0	366
7605-034M		145:06	7/21/79	21.4	27.1	44	48.6	.27	0.00	0.00	0.00	0.00	0	0.00	0	333
7605-037M		145:09	7/26/79	30.4	28.7	51	59.1	.27	0.00	0.00	0.00	0.00	0	0.00	0	384
7605-044M		145:16	7/17/79	55.4	21.8	71	77.1	.25	.40	0.00	0.00	0.00	0	0.00	34	243
7605-067M		145:39	7/16/79	45.8	24.8	64	70.6	.26	0.00	0.00	0.00	0.00	0	0.00	0	223
7605-069M		145:41	8/06/79	52.8	23.5	69	76.3	.26	0.00	0.00	0.00	0.00	0	0.00	0	437
7605-076M		145:48	7/20/79	37.0	27.2	57	64.2	.27	0.00	0.00	0.00	0.00	0	0.00	0	303
7605-087M		146:06	7/10/79	41.6	26.5	61	68.0	.26	0.00	0.00	0.00	0.00	0	0.00	0	140
7605-091M		146:10	7/16/79	41.0	23.8	63	64.8	.25	0.00	0.00	0.00	0.00	0	0.00	0	202
7605-114M		146:33	7/13/79	28.0	18.1	60	46.1	.26	0.00	0.00	0.00	0.00	0	0.00	0	187
7605-125M		146:44	7/18/79	47.8	24.3	66	72.1	.25	0.00	0.00	0.00	0.00	0	0.00	0	250
7605-146M		147:12	7/05/79	18.3	20.7	46	39.0	.35	0.00	0.00	0.00	0.00	0	0.00	0	46
7605-150M		147:16	7/17/79	43.6	26.1	62	69.8	.25	0.00	0.00	0.00	0.00	0	0.00	0	238
7605-162M		147:28	7/13/79	36.5	30.5	54	67.0	.23	0.00	0.00	0.00	0.00	0	0.00	0	184
7605-174M		147:40	7/16/79	41.4	23.0	64	64.3	.27	0.00	0.00	0.00	0.00	0	0.00	0	204
7606-014M		148:11	7/23/79	21.9	21.3	50	43.2	.30	0.00	0.00	0.00	0.00	0	0.00	0	335

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ACCESSION OR NURSERY NUMBER	IDENTIFICATION	LOCATION	HARVEST DATE	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	CRUSH 3 HR HSI	SAFE PERIOD	PERMEA-BILITY	CALC 6 MONTH HSI	CALC % A+B REMAIN	OIL: HUM/ CARY	COH	SERIAL NUMBER
7606-028M		148:25	7/16/79	26.3	18.8	58	45.2	.35	0.00	0.00	0.00	0.00	0	0.00	0	226
7606-081M		149:25	7/17/79	38.0	22.4	62	60.3	.27	0.00	0.00	0.00	0.00	0	0.00	0	234
7608-007M		150:30	7/05/79	27.3	40.8	40	68.1	.26	0.00	0.00	0.00	0.00	0	0.00	0	37
7609-005M		150:39	7/24/79	42.1	32.8	56	74.9	.22	0.00	0.00	0.00	0.00	0	0.00	0	357
7609-010M		150:44	7/16/79	36.5	29.8	55	66.3	.27	0.00	0.00	0.00	0.00	0	0.00	0	207
7610-018M		151:12	7/09/79	43.1	34.3	55	77.4	.23	0.00	0.00	0.00	0.00	0	0.00	0	131
7610-021M		151:15	7/09/79	47.4	21.8	68	69.1	.26	0.00	0.00	0.00	0.00	0	0.00	0	82
7610-024M		151:18	7/30/79	43.4	12.6	77	56.0	.30	.47	0.00	0.00	0.00	0	0.00	0	426
7610-041M		151:35	7/30/79	34.4	21.2	61	55.6	.30	0.00	0.00	0.00	0.00	0	0.00	0	419
7610-061M		152:02	7/09/79	48.5	26.3	64	74.7	.25	0.00	0.00	0.00	0.00	0	0.00	0	125
7610-075M		152:16	7/09/79	44.2	13.8	76	58.0	.28	1.35	0.00	0.00	0.00	0	0.00	0	115
7610-081M		152:22	7/30/79	41.9	19.6	68	61.5	.26	0.00	0.00	0.00	0.00	0	0.00	0	421
7610-091M		152:32	7/26/79	27.5	18.8	59	46.3	.31	0.00	0.00	0.00	0.00	0	0.00	0	386
7610-112M		152:53	7/16/79	52.0	20.4	71	72.4	.26	.40	0.00	0.00	0.00	0	0.00	31	213
7610-129M		153:17	7/16/79	33.9	18.0	65	51.9	.27	0.00	0.00	0.00	0.00	0	0.00	0	228
7611-016M		154:23	7/20/79	44.7	21.9	67	66.6	.27	0.00	0.00	0.00	0.00	0	0.00	0	292
7611-031M		154:38	7/10/79	31.8	23.2	57	55.0	.25	0.00	0.00	0.00	0.00	0	0.00	0	141
7611-034M		154:41	7/23/79	33.7	20.7	61	54.4	.27	0.00	0.00	0.00	0.00	0	0.00	0	353
7611-035M		154:42	7/16/79	34.5	24.0	58	58.5	.26	0.00	0.00	0.00	0.00	0	0.00	0	230
7611-052M		155:06	7/19/79	23.2	15.7	59	38.9	.29	0.00	0.00	0.00	0.00	0	0.00	0	276
7611-055M		155:09	7/21/79	35.0	16.8	67	51.8	.26	0.00	0.00	0.00	0.00	0	0.00	0	343
7611-086M		155:40	7/23/79	34.4	25.9	57	60.3	.28	0.00	0.00	0.00	0.00	0	0.00	0	352
7611-102M		156:03	7/30/79	53.6	21.3	71	74.9	.25	.37	0.00	0.00	0.00	0	0.00	30	422
7611-107M		156:08	7/19/79	38.4	23.9	61	62.3	.26	0.00	0.00	0.00	0.00	0	0.00	0	267
7611-120M		156:21	7/05/79	38.9	34.2	53	73.0	.26	0.00	0.00	0.00	0.00	0	0.00	0	41
7611-146M		156:47	7/08/79	30.8	23.9	56	54.7	.26	0.00	0.00	0.00	0.00	0	0.00	0	65
7611-151M		156:52	7/23/79	39.1	14.3	73	53.4	.29	.47	0.00	0.00	0.00	0	0.00	0	340
7611-152M		156:53	7/19/79	39.7	21.1	65	60.8	.28	0.00	0.00	0.00	0.00	0	0.00	0	274
7611-165M		157:13	7/19/79	43.9	24.6	64	68.5	.26	0.00	0.00	0.00	0.00	0	0.00	0	282
7611-179M		157:27	7/23/79	18.7	21.5	46	40.1	.37	0.00	0.00	0.00	0.00	0	0.00	0	347
7612-004M		157:41	7/19/79	56.6	22.1	71	78.8	.25	.37	0.00	0.00	0.00	0	0.00	25	283
7612-007M		157:44	7/13/79	30.0	24.1	55	54.0	.25	0.00	0.00	0.00	0.00	0	0.00	0	195
7612-014M		157:51	7/10/79	36.3	16.9	68	53.2	.26	0.00	0.00	0.00	0.00	0	0.00	0	139
7613-003M		158:44	7/20/79	46.6	20.7	69	67.4	.27	0.00	0.00	0.00	0.00	0	0.00	0	300
7613-004M		158:45	7/19/79	49.2	26.1	65	75.3	.24	0.00	0.00	0.00	0.00	0	0.00	0	279
7613-011M		158:52	7/21/79	48.0	21.3	69	69.3	.27	0.00	0.00	0.00	0.00	0	0.00	0	319
7613-017M		159:05	8/01/79	50.0	22.6	68	72.5	.25	0.00	0.00	0.00	0.00	0	0.00	0	429

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ACCESSION OR NURSERY NUMBER	IDENTIFICATION	LOCATION	HARVEST DATE	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	CRUSH 3 HR HSI	SAFE PERIOD	PERMEA- BILITY	CALC 6 MONTH HSI	CALC % A+B REMAIN	OIL: HUM/ CARY	COH	SERIAL NUMBER
7613-018M		159:06	7/10/79	49.8	22.9	68	72.7	.26	0.00	0.00	0.00	0.00	0	0.00	0	137
7613-020M		159:08	7/17/79	30.4	36.9	45	67.3	.26	0.00	0.00	0.00	0.00	0	0.00	0	237
7613-024M		159:12	8/06/79	47.9	21.2	69	69.1	.25	0.00	0.00	0.00	0.00	0	0.00	0	438
7613-025M		159:13	7/31/79	56.8	13.7	80	70.5	.25	.33	0.00	0.00	0.00	0	0.00	24	435
7613-042M		159:30	7/23/79	59.0	17.0	77	75.9	.27	.40	0.00	0.00	0.00	0	.77	21	310
7613-053M		159:41	7/23/79	35.4	17.1	67	52.5	.27	0.00	0.00	0.00	0.00	0	0.00	0	323
7613-058M		159:46	7/19/79	48.0	20.8	69	68.8	.26	0.00	0.00	0.00	0.00	0	0.00	0	266
7613-065M		159:53	7/19/79	41.2	24.5	62	65.8	.30	0.00	0.00	0.00	0.00	0	0.00	0	272
7613-077M		160:12	7/16/79	47.6	20.2	70	67.8	.27	.52	0.00	0.00	0.00	0	0.00	0	205
7613-084M		160:19	7/09/79	42.7	21.8	66	64.5	.26	0.00	0.00	0.00	0.00	0	0.00	0	89
7613-089M		160:24	7/13/79	50.7	18.3	73	69.0	.25	.38	0.00	0.00	0.00	0	0.00	39	190
7613-104M		160:39	7/23/79	57.7	17.9	76	75.6	.24	.69	0.00	0.00	0.00	0	0.00	0	326
7613-105M		160:40	7/23/79	55.7	19.4	74	75.1	.16	.42	0.00	0.00	0.00	0	0.00	0	339
7613-128M		161:10	7/12/79	55.3	21.1	72	76.4	.24	.51	0.00	0.00	0.00	0	0.00	0	179
7613-131M		161:13	7/16/79	41.5	23.4	63	64.9	.26	0.00	0.00	0.00	0.00	0	0.00	0	216
7613-132M		161:14	7/23/79	50.6	19.1	72	69.7	.25	.41	0.00	0.00	0.00	0	0.00	0	331
7613-135M		161:17	7/31/79	20.9	19.7	51	40.6	.31	0.00	0.00	0.00	0.00	0	0.00	0	432
7614-005M		161:30	7/18/79	47.1	18.3	71	65.4	.28	.68	0.00	0.00	0.00	0	0.00	0	256
7614-011M		161:36	7/16/79	23.3	20.5	53	43.8	.25	0.00	0.00	0.00	0.00	0	0.00	0	209
7614-012M		161:37	7/23/79	46.1	16.8	73	62.9	.27	.50	0.00	0.00	0.00	0	0.00	0	338
7614-025M		161:50	7/20/79	51.1	24.7	67	75.8	.26	0.00	0.00	0.00	0.00	0	0.00	0	295
7614-026M		161:51	7/19/79	54.9	23.5	70	78.4	.25	.65	0.00	0.00	0.00	0	0.00	0	269
7614-030M		162:02	7/16/79	50.7	22.7	69	73.4	.26	0.00	0.00	0.00	0.00	0	0.00	0	231
7614-032M		162:04	7/26/79	41.6	23.9	63	65.5	.27	0.00	0.00	0.00	0.00	0	0.00	0	401
7614-034M		162:06	7/19/79	44.8	29.5	60	74.3	.24	0.00	0.00	0.00	0.00	0	0.00	0	277
7614-037M		162:09	7/09/79	37.4	21.5	63	58.9	.28	0.00	0.00	0.00	0.00	0	0.00	0	90
7614-047M		162:19	7/18/79	52.1	16.8	75	68.8	.24	.38	0.00	0.00	0.00	0	0.00	22	255
7614-051M		162:23	7/17/79	40.7	22.1	64	62.8	.26	0.00	0.00	0.00	0.00	0	0.00	0	235
7614-052M		162:24	7/16/79	53.8	22.3	70	76.2	.26	.42	0.00	0.00	0.00	0	0.00	0	212
7614-060M		162:32	7/18/79	54.8	21.4	71	76.2	.25	.39	0.00	0.00	0.00	0	0.00	33	251
7614-069M		162:41	7/21/79	16.0	13.5	54	29.5	.40	0.00	0.00	0.00	0.00	0	0.00	0	329
7614-098M		163:17	7/20/79	41.3	21.3	66	62.5	.27	0.00	0.00	0.00	0.00	0	0.00	0	293
7614-104M		163:23	7/17/79	48.6	19.5	71	68.1	.30	.46	0.00	0.00	0.00	0	0.00	0	236
7614-108M		163:27	7/20/79	59.6	17.2	77	76.8	.24	.79	0.00	0.00	0.00	0	0.00	0	297
7614-121M		163:40	7/21/79	50.0	19.9	71	69.8	.27	.69	0.00	0.00	0.00	0	0.00	0	322
7614-131M		163:50	7/09/79	47.8	23.3	67	71.1	.25	0.00	0.00	0.00	0.00	0	0.00	0	102
7614-135M		164:01	7/09/79	39.6	23.6	62	63.2	.25	0.00	0.00	0.00	0.00	0	0.00	0	113

1979 LUPULIN ANALYSES AS OF 80/08/01.

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	LOCATION	HARVEST DATE	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	CRUSH 3 HR HSI	SAFE PERIOD	PERMEA-BILITY	CALC 6 MONTH HSI	CALC % A+B REMAIN	OIL: HUM/ CARY	COH	SERIAL NUMBER
7614-143M		164:09	7/20/79	52.9	22.5	70	75.4	.25	.93	0.00	0.00	0.00	0	0.00	0	299
7615-048M		165:10	7/23/79	45.0	23.7	65	68.7	.26	0.00	0.00	0.00	0.00	0	0.00	0	332
7615-081M		165:43	7/16/79	34.2	28.2	54	62.4	.27	0.00	0.00	0.00	0.00	0	0.00	0	221
7615-082M		165:44	7/13/79	55.5	17.4	76	72.9	.24	.63	0.00	0.00	0.00	0	0.00	0	192
7615-087M		165:49	8/06/79	44.0	30.4	59	74.4	.28	0.00	0.00	0.00	0.00	0	0.00	0	436
7615-094M		166:03	7/23/79	45.5	21.1	68	66.6	.26	0.00	0.00	0.00	0.00	0	0.00	0	354
7615-119M		166:28	7/16/79	41.8	29.6	58	71.5	.25	0.00	0.00	0.00	0.00	0	0.00	0	217
7615-125M		166:34	7/21/79	43.3	22.3	65	65.6	.29	0.00	0.00	0.00	0.00	0	0.00	0	318
7615-143M		166:52	7/23/79	36.6	16.0	69	52.6	.29	0.00	0.00	0.00	0.00	0	0.00	0	313
7615-146M		167:02	8/06/79	53.7	17.9	74	71.6	.26	.33	0.00	0.00	0.00	0	0.00	19	439
7615-147M		167:03	7/13/79	42.5	17.8	70	60.3	.25	1.05	0.00	0.00	0.00	0	0.00	0	188
7615-154M		167:10	7/26/79	53.7	20.7	72	74.3	.24	.33	0.00	0.00	0.00	0	0.00	19	397
7615-159M		167:15	7/20/79	44.8	30.8	59	75.7	.24	0.00	0.00	0.00	0.00	0	0.00	0	294
7615-161M		167:17	7/10/79	57.9	19.5	74	77.4	.25	.63	0.00	0.00	0.00	0	0.00	0	132
7616-010M		167:36	7/24/79	17.0	28.5	37	45.5	.29	0.00	0.00	0.00	0.00	0	0.00	0	364
7616-034M		168:07	7/05/79	28.9	26.8	51	55.7	.27	0.00	0.00	0.00	0.00	0	0.00	0	40
7616-043M		168:16	7/23/79	43.4	22.9	65	66.2	.25	0.00	0.00	0.00	0.00	0	0.00	0	346
7616-069M		168:42	7/12/79	23.0	40.5	36	63.5	.22	0.00	0.00	0.00	0.00	0	0.00	0	170
7617-036M		170:08	7/05/79	35.5	31.6	52	67.1	.28	0.00	0.00	0.00	0.00	0	0.00	0	35
7617-037M		170:09	7/05/79	48.7	29.6	62	78.3	.24	0.00	0.00	0.00	0.00	0	0.00	0	39
7617-042M		170:14	7/18/79	16.6	28.8	36	45.3	.26	0.00	0.00	0.00	0.00	0	0.00	0	246
7617-049M		170:21	7/05/79	37.3	37.1	50	74.4	.22	0.00	0.00	0.00	0.00	0	0.00	0	33
7617-060M		170:32	7/10/79	35.2	24.9	58	60.1	.28	0.00	0.00	0.00	0.00	0	0.00	0	143
7617-070M		170:42	7/05/79	39.8	34.3	53	74.1	.24	0.00	0.00	0.00	0.00	0	0.00	0	45
7617-108M		171:27	7/05/79	31.6	32.4	49	64.0	.27	0.00	0.00	0.00	0.00	0	0.00	0	34
7618-009M		171:40	7/24/79	32.9	19.3	63	52.2	.28	0.00	0.00	0.00	0.00	0	0.00	0	365
7618-010M		171:41	7/19/79	38.8	32.7	54	71.5	.25	0.00	0.00	0.00	0.00	0	0.00	0	275
7618-041M		172:19	7/23/79	38.3	18.3	67	56.6	.26	0.00	0.00	0.00	0.00	0	0.00	0	350
7618-052M		172:30	7/16/79	35.1	28.3	55	63.3	.26	0.00	0.00	0.00	0.00	0	0.00	0	197
7618-054M		172:32	7/10/79	29.8	23.9	55	53.6	.26	0.00	0.00	0.00	0.00	0	0.00	0	148
7618-067M		172:45	7/05/79	36.4	29.0	55	65.3	.27	0.00	0.00	0.00	0.00	0	0.00	0	44
7618-082M		173:07	7/05/79	26.9	29.7	47	56.6	.28	0.00	0.00	0.00	0.00	0	0.00	0	43
7618-083M		173:08	7/20/79	44.6	22.9	66	67.5	.26	0.00	0.00	0.00	0.00	0	0.00	0	291

TABLE 1979 LUPULIN SAMPLES WITH ALPHA RATIO >40 AND <60 AND ALPHA+BETA >60%. (n=83)

1979 Males: α ratio 40-60
α+β >60%

LUPULIN ANALYSES AS OF 79/10/31.
SORTED BY IDENTITY

NURSERY OR ACCESSION NUMBER	LOCATION	HARVEST DATE	% ALPHA	% BETA	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	CRUSH 3 HRS HSI	SAFE PERIOD (HRS)	PERM	6 MONTH HSI	CALC % A+B REMAIN	COF	SERIAL NUMBER
19039M	009:53-54	7/05/79	33.5	33.9	49	67.3	.24	0.00	0.00	0.00	0.00	0	0	17
19040M	010:53-54	7/09/79	31.5	31.4	50	62.8	.23	.72	0.00	0.00	0.00	0	0	71
19062M	001:24	7/26/79	30.1	30.6	49	60.6	.23	0.00	0.00	0.00	0.00	0	0	407
19172M	024:53-54	6/29/79	36.6	32.6	52	69.2	.25	2.32	0.00	0.00	0.00	0	0	1
19183M	027:53-54	6/29/79	36.6	33.9	51	70.5	.25	.48	0.00	0.00	0.00	0	0	2
21017M	029:53-54	7/09/79	39.0	35.6	52	74.5	.24	.33	0.00	0.00	0.00	0	0	78
21069M	046:57-58	7/10/79	41.1	28.0	59	69.1	.28	0.00	0.00	0.00	0.00	0	0	116
21069M	047:01-02	7/09/79	43.7	28.7	60	72.3	.27	0.00	0.00	0.00	0.00	0	0	122
21072M	049:57-58	7/09/79	39.5	34.5	53	73.9	.26	0.00	0.00	0.00	0.00	0	0	130
21076M	051:01-02	7/13/79	40.1	28.1	58	68.3	.24	.39	0.00	0.00	0.00	0	0	193
21088M	016:57-58	7/18/79	40.5	27.3	59	67.8	.24	.32	0.00	0.00	0.00	0	0	260
21108M	017:53-54	7/16/79	42.9	29.0	59	71.8	.25	0.00	0.00	0.00	0.00	0	0	215
21108M	020:55-56	7/06/79	31.0	42.2	42	73.2	.23	0.00	0.00	0.00	0.00	0	0	54
21110M	054:13-14	7/09/79	38.4	29.3	56	67.7	.24	0.00	0.00	0.00	0.00	0	0	87
21110M	010:55-56	7/06/79	46.1	31.9	59	78.0	.24	.29	0.00	0.00	0.00	0	0	57
21111M	038:15-16	7/06/79	25.8	38.2	40	63.9	.25	0.00	0.00	0.00	0.00	0	0	62
21129M	022:57-58	7/18/79	36.4	34.1	51	70.5	.24	0.00	0.00	0.00	0.00	0	0	262
21133M	045:57-58	7/24/79	43.5	29.1	59	72.7	.23	0.00	0.00	0.00	0.00	0	0	363
21134M	013:55-56	7/24/79	41.0	33.0	55	74.0	.29	0.00	0.00	0.00	0.00	0	0	362
21134M	037:13-14	7/19/79	41.5	28.1	59	69.6	.25	0.00	0.00	0.00	0.00	0	0	270
21134M	036:57-58	7/23/79	45.8	29.7	60	75.5	.26	0.00	0.00	0.00	0.00	0	0	325
21135M	052:13-14	7/26/79	43.3	28.5	60	71.8	.24	0.00	0.00	0.00	0.00	0	0	388
21135M	039:59-60	7/06/79	39.4	34.0	53	73.3	.24	2.02	0.00	0.00	0.00	0	0	58
21136M	049:13-14	7/17/79	32.4	38.3	45	70.7	.23	0.00	0.00	0.00	0.00	0	0	240
21136M	041:57-58	7/10/79	31.7	44.7	41	76.4	.22	0.00	0.00	0.00	0.00	0	0	97
21137M	050:13-14	7/25/79	28.9	41.4	41	70.3	.29	0.00	0.00	0.00	0.00	0	0	378
60013M	015:55-56	7/18/79	38.2	27.6	58	65.8	.26	0.00	0.00	0.00	0.00	0	0	258
60013M	015:55-56	7/20/79	45.9	29.5	60	75.4	.24	0.00	0.00	0.00	0.00	0	0	306
60023M	001:34	7/26/79	35.4	36.5	49	71.8	.22	0.00	0.00	0.00	0.00	0	0	404
60026M	018:55-56	7/10/79	41.6	33.4	55	75.1	.25	.36	0.00	0.00	0.00	0	0	88
60028M	019:55-56	7/10/79	38.3	34.4	52	72.7	.24	1.97	0.00	0.00	0.00	0	0	84
63013M	024:55-56	7/09/79	43.4	31.2	58	74.6	.24	.28	0.00	0.00	0.00	0	0	99
63014M	031:03-04	7/11/79	39.9	33.4	54	73.3	.25	0.00	0.00	0.00	0.00	0	0	149
63017M	028:55-56	7/12/79	35.0	32.4	51	67.4	.23	0.00	0.00	0.00	0.00	0	0	169
64035M	002:57-58	7/05/79	41.6	28.9	59	70.5	.24	.32	0.00	0.00	0.00	0	0	18

TABLE 1979 LUPULIN SAMPLES WITH ALPHA RATIO >40 AND <60 AND ALPHA+BETA >60%.
LUPULIN ANALYSES AS OF 79/10/31.
SORTED BY IDENTITY

NURSERY OR ACCESSION NUMBER	LOCATION	HARVEST DATE	% ALPHA	% BETA	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	CRUSH 3 HRS HSI	SAFE PERIOD (HRS)	PERM	6 MONTH HSI	CALC % A+B REMAIN	COF	SERIAL NUMBER
64102M	006:57-58	7/06/79	40.3	35.5	53	75.8	.24	.33	0.00	0.00	0.00	0	0	55
64103M	007:57-58	7/05/79	36.3	39.3	48	75.6	.21	0.00	0.00	0.00	0.00	0	0	19
7003-068M	054:11-12	7/07/79	44.7	30.4	59	75.0	.24	.32	0.00	0.00	0.00	0	0	109
7005-231M	038:13-14	7/10/79	39.6	34.0	53	73.7	.23	1.41	0.00	0.00	0.00	0	0	146
7006-084M	040:13-14	7/12/79	41.9	35.4	54	77.3	.23	.40	0.00	0.00	0.00	0	0	157
7006-163M	042:13-14	7/23/79	32.3	45.2	41	77.4	.23	1.68	0.00	0.00	0.00	0	0	336
7006-187M	045:13-14	7/09/79	41.5	29.8	58	71.2	.26	.97	0.00	0.00	0.00	0	0	108
7006-473M	053:13-14	7/31/79	39.4	36.5	51	75.9	.23	.43	0.00	0.00	0.00	0	0	433
7007-021M	055:13-14	7/03/79	35.1	33.7	51	68.9	.24	1.48	0.00	0.00	0.00	0	0	8
7007-252M	032:15-16	7/11/79	42.7	30.2	58	72.8	.23	.40	0.00	0.00	0.00	0	0	151
7007-275M	033:15-16	7/13/79	33.9	39.4	46	73.3	.20	.56	0.00	0.00	0.00	0	0	194
7007-278M	034:15-16	7/12/79	46.3	33.4	58	79.8	.22	.29	0.00	0.00	0.00	0	0	155
7007-328M	037:15-16	7/12/79	28.6	37.9	42	66.5	.21	.48	0.00	0.00	0.00	0	0	168
7303-028M	053:53-54	7/06/79	44.2	28.7	60	72.8	.26	.53	0.00	0.00	0.00	0	0	50
7303-153M	035:55-56	7/20/79	43.0	31.2	57	74.1	.24	1.21	0.00	0.00	0.00	0	0	285
7312-033M	020:59-60	7/09/79	39.0	25.3	60	64.3	.27	.39	0.00	0.00	0.00	0	0	80
7312-126M	025:59-60	7/05/79	37.2	28.2	56	65.4	.28	.32	0.00	0.00	0.00	0	0	30
7314-004M	030:59-60	7/05/79	38.4	24.6	60	63.0	.27	.60	0.00	0.00	0.00	0	0	31
7602-002M	140:26	7/24/79	39.5	29.1	57	68.6	.26	0.00	0.00	0.00	0.00	0	0	356
7602-046M	141:17	7/05/79	32.4	30.2	51	62.6	.26	0.00	0.00	0.00	0.00	0	0	47
7603-052M	142:41	7/21/79	40.0	25.9	60	65.9	.26	0.00	0.00	0.00	0.00	0	0	309
7603-053M	142:42	7/16/79	34.2	28.4	54	62.6	.26	0.00	0.00	0.00	0.00	0	0	222
7604-006M	143:13	7/10/79	34.0	29.2	53	63.3	.25	0.00	0.00	0.00	0.00	0	0	147
7604-008M	143:15	7/24/79	35.7	28.6	55	64.3	.29	0.00	0.00	0.00	0.00	0	0	372
7604-048M	144:02	7/19/79	34.5	33.3	50	67.9	.26	0.00	0.00	0.00	0.00	0	0	284
7605-016M	144:41	7/19/79	36.4	23.8	60	60.2	.29	0.00	0.00	0.00	0.00	0	0	273
7605-076M	145:48	7/20/79	37.0	27.2	57	64.2	.27	0.00	0.00	0.00	0.00	0	0	303
7605-162M	147:28	7/13/79	36.5	30.5	54	67.0	.23	0.00	0.00	0.00	0.00	0	0	184
7608-007M	150:30	7/05/79	27.3	40.8	40	68.1	.26	0.00	0.00	0.00	0.00	0	0	37
7609-005M	150:39	7/24/79	42.1	32.8	56	74.9	.22	0.00	0.00	0.00	0.00	0	0	357
7609-010M	150:44	7/16/79	36.5	29.8	55	66.3	.27	0.00	0.00	0.00	0.00	0	0	207
7610-018M	151:12	7/09/79	43.1	34.3	55	77.4	.23	0.00	0.00	0.00	0.00	0	0	131
7611-086M	155:40	7/23/79	34.4	25.9	57	60.3	.28	0.00	0.00	0.00	0.00	0	0	352
7611-120M	156:21	7/05/79	38.9	34.2	53	73.0	.26	0.00	0.00	0.00	0.00	0	0	41
7613-020M	159:08	7/17/79	30.4	36.9	45	67.3	.26	0.00	0.00	0.00	0.00	0	0	237

TABLE 1979 LUPULIN SAMPLES WITH ALPHA RATIO >40 AND <60 AND ALPHA+BETA >60%.
LUPULIN ANALYSES AS OF 79/10/31.
SORTED BY IDENTITY

NURSERY OR ACCESSION NUMBER	LOCATION	HARVEST DATE	% ALPHA	% BETA	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	CRUSH 3 HRS HSI	SAFE PERIOD (HRS)	PERM	CALC 6 MONTH HSI	CALC % A+B REMAIN	COF	SERIAL NUMBER
7614-034M	162:06	7/19/79	44.8	29.5	60	74.3	.24	0.00	0.00	0.00	0.00	0	0	277
7615-081M	165:43	7/16/79	34.2	28.2	54	62.4	.27	0.00	0.00	0.00	0.00	0	0	221
7615-087M	165:49	8/06/79	44.0	30.4	59	74.4	.28	0.00	0.00	0.00	0.00	0	0	436
7615-119M	166:28	7/16/79	41.8	29.6	58	71.5	.25	0.00	0.00	0.00	0.00	0	0	217
7615-159M	167:15	7/20/79	44.8	30.8	59	75.7	.24	0.00	0.00	0.00	0.00	0	0	294
7617-036M	170:08	7/05/79	35.5	31.6	52	67.1	.28	0.00	0.00	0.00	0.00	0	0	35
7617-049M	170:21	7/05/79	37.3	37.1	50	74.4	.22	0.00	0.00	0.00	0.00	0	0	33
7617-060M	170:32	7/10/79	35.2	24.9	58	60.1	.28	0.00	0.00	0.00	0.00	0	0	143
7617-070M	170:42	7/05/79	39.8	34.3	53	74.1	.24	0.00	0.00	0.00	0.00	0	0	45
7617-108M	171:27	7/05/79	31.6	32.4	49	64.0	.27	0.00	0.00	0.00	0.00	0	0	34
7618-010M	171:41	7/19/79	38.8	32.7	54	71.5	.25	0.00	0.00	0.00	0.00	0	0	275
7618-052M	172:30	7/16/79	35.1	28.3	55	63.3	.26	0.00	0.00	0.00	0.00	0	0	197
7618-067M	172:45	7/05/79	36.4	29.0	55	65.3	.27	0.00	0.00	0.00	0.00	0	0	44

TABLE 1979 LUPULIN SAMPLES WITH ALPHA RATIO BETWEEN 45 AND 55. (n=60)

1979 Males: a ratio: 45-55 LUPULIN ANALYSES AS OF 79/10/31. SORTED BY IDENTITY

NURSERY OR ACCESSION NUMBER	LOCATION	HARVEST DATE	% ALPHA	% BETA	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	CRUSH 3 HRS HSI	SAFE PERIOD (HRS)	PERM	CALC 6 MONTH HSI	CALC % A+B REMAIN	COF	SERIAL NUMBER
19039M	009:53-54	7/05/79	33.5	33.9	49	67.3	.24	0.00	0.00	0.00	0.00	0	0	17
19040M	010:53-54	7/09/79	31.5	31.4	50	62.8	.23	.72	0.00	0.00	0.00	0	0	71
19062M	001:24	7/26/79	30.1	30.6	49	60.6	.23	0.00	0.00	0.00	0.00	0	0	407
19172M	024:53-54	6/29/79	36.6	32.6	52	69.2	.25	2.32	0.00	0.00	0.00	0	0	1
19183M	027:53-54	6/29/79	36.6	33.9	51	70.5	.25	.48	0.00	0.00	0.00	0	0	2
21009M	028:53-54	7/06/79	32.9	26.2	55	59.1	.28	0.00	0.00	0.00	0.00	0	0	51
21017M	029:53-54	7/09/79	39.0	35.6	52	74.5	.24	.33	0.00	0.00	0.00	0	0	78
21072M	049:57-58	7/09/79	39.5	34.5	53	73.9	.26	0.00	0.00	0.00	0.00	0	0	130
21090M	018:57-58	7/30/79	24.3	26.8	47	51.2	.29	0.00	0.00	0.00	0.00	0	0	424
21090M	018:57-58	7/27/79	30.0	28.6	51	58.6	.24	.67	0.00	0.00	0.00	0	0	414
21129M	022:57-58	7/18/79	36.4	34.1	51	70.5	.24	0.00	0.00	0.00	0.00	0	0	262
21134M	013:55-56	7/24/79	41.0	33.0	55	74.0	.29	0.00	0.00	0.00	0.00	0	0	362
21135M	039:59-60	7/06/79	39.4	34.0	53	73.3	.24	2.02	0.00	0.00	0.00	0	0	58
21136M	049:13-14	7/17/79	32.4	38.3	45	70.7	.23	0.00	0.00	0.00	0.00	0	0	240
60023M	001:34	7/26/79	35.4	36.5	49	71.8	.22	0.00	0.00	0.00	0.00	0	0	404
60026M	018:55-56	7/10/79	41.6	33.4	55	75.1	.25	.36	0.00	0.00	0.00	0	0	88
60028M	019:55-56	7/10/79	38.3	34.4	52	72.7	.24	1.97	0.00	0.00	0.00	0	0	84
63014M	031:03-04	7/11/79	39.9	33.4	54	73.3	.25	0.00	0.00	0.00	0.00	0	0	149
63017M	028:55-56	7/12/79	35.0	32.4	51	67.4	.23	0.00	0.00	0.00	0.00	0	0	169
64101M	001:38	7/26/79	22.8	19.4	54	42.2	.32	0.00	0.00	0.00	0.00	0	0	385
64102M	006:57-58	7/06/79	40.3	35.5	53	75.8	.24	.33	0.00	0.00	0.00	0	0	55
64103M	007:57-58	7/05/79	36.3	39.3	48	75.6	.21	0.00	0.00	0.00	0.00	0	0	19
7005-231M	038:13-14	7/10/79	39.6	34.0	53	73.7	.23	1.41	0.00	0.00	0.00	0	0	146
7006-084M	040:13-14	7/12/79	41.9	35.4	54	77.3	.23	.40	0.00	0.00	0.00	0	0	157
7006-473M	053:13-14	7/31/79	39.4	36.5	51	75.9	.23	.43	0.00	0.00	0.00	0	0	433
7007-021M	055:13-14	7/03/79	35.1	33.7	51	68.9	.24	1.48	0.00	0.00	0.00	0	0	8
7007-275M	033:15-16	7/13/79	33.9	39.4	46	73.3	.20	.56	0.00	0.00	0.00	0	0	194
7007-304M	035:15-16	7/10/79	31.7	25.8	55	57.5	.26	1.41	0.00	0.00	0.00	0	0	134
7601-051M	140:04	7/09/79	24.1	26.9	47	51.0	.27	0.00	0.00	0.00	0.00	0	0	120
7602-008M	140:32	7/12/79	12.1	13.8	46	26.0	.29	0.00	0.00	0.00	0.00	0	0	152
7602-046M	141:17	7/05/79	32.4	30.2	51	62.6	.26	0.00	0.00	0.00	0.00	0	0	47
7603-053M	142:42	7/16/79	34.2	28.4	54	62.6	.26	0.00	0.00	0.00	0.00	0	0	222
7604-006M	143:13	7/10/79	34.0	29.2	53	63.3	.25	0.00	0.00	0.00	0.00	0	0	147
7604-008M	143:15	7/24/79	35.7	28.6	55	64.3	.29	0.00	0.00	0.00	0.00	0	0	372
7604-048M	144:02	7/19/79	34.5	33.3	50	67.9	.26	0.00	0.00	0.00	0.00	0	0	284

TABLE 1979 LUPULIN SAMPLES WITH ALPHA RATIO BETWEEN 45 AND 55. ♂

LUPULIN ANALYSES AS OF 79/10/31.

SORTED BY IDENTITY

NURSERY OR ACCESSION NUMBER	LOCATION	HARVEST DATE	% ALPHA	% BETA	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	CRUSH 3 HRS HSI	SAFE PERIOD (HRS)	PERM	6 MONTH CALC HSI	CALC % A+B REMAIN	COF	SERIAL NUMBER
7605-018M	144:43	7/24/79	32.7	26.2	55	58.9	.30	0.00	0.00	0.00	0.00	0	0	366
7605-037M	145:09	7/26/79	30.4	28.7	51	59.1	.27	0.00	0.00	0.00	0.00	0	0	384
7605-146M	147:12	7/05/79	18.3	20.7	46	39.0	.35	0.00	0.00	0.00	0.00	0	0	46
7605-162M	147:28	7/13/79	36.5	30.5	54	67.0	.23	0.00	0.00	0.00	0.00	0	0	184
7606-014M	148:11	7/23/79	21.9	21.3	50	43.2	.30	0.00	0.00	0.00	0.00	0	0	335
7609-010M	150:44	7/16/79	36.5	29.8	55	66.3	.27	0.00	0.00	0.00	0.00	0	0	207
7610-018M	151:12	7/09/79	43.1	34.3	55	77.4	.23	0.00	0.00	0.00	0.00	0	0	131
7611-120M	156:21	7/05/79	38.9	34.2	53	73.0	.26	0.00	0.00	0.00	0.00	0	0	41
7611-179M	157:27	7/23/79	18.7	21.5	46	40.1	.37	0.00	0.00	0.00	0.00	0	0	347
7612-007M	157:44	7/13/79	30.0	24.1	55	54.0	.25	0.00	0.00	0.00	0.00	0	0	195
7613-020M	159:08	7/17/79	30.4	36.9	45	67.3	.26	0.00	0.00	0.00	0.00	0	0	237
7613-135M	161:17	7/31/79	20.9	19.7	51	40.6	.31	0.00	0.00	0.00	0.00	0	0	432
7614-011M	161:36	7/16/79	23.3	20.5	53	43.8	.25	0.00	0.00	0.00	0.00	0	0	209
7614-069M	162:41	7/21/79	16.0	13.5	54	29.5	.40	0.00	0.00	0.00	0.00	0	0	329
7615-081M	165:43	7/16/79	34.2	28.2	54	62.4	.27	0.00	0.00	0.00	0.00	0	0	221
7616-034M	168:07	7/05/79	28.9	26.8	51	55.7	.27	0.00	0.00	0.00	0.00	0	0	40
7617-036M	170:08	7/05/79	35.5	31.6	52	67.1	.28	0.00	0.00	0.00	0.00	0	0	35
7617-049M	170:21	7/05/79	37.3	37.1	50	74.4	.22	0.00	0.00	0.00	0.00	0	0	33
7617-070M	170:42	7/05/79	39.8	34.3	53	74.1	.24	0.00	0.00	0.00	0.00	0	0	45
7617-108M	171:27	7/05/79	31.6	32.4	49	64.0	.27	0.00	0.00	0.00	0.00	0	0	34
7618-010M	171:41	7/19/79	38.8	32.7	54	71.5	.25	0.00	0.00	0.00	0.00	0	0	275
7618-052M	172:30	7/16/79	35.1	28.3	55	63.3	.26	0.00	0.00	0.00	0.00	0	0	197
7618-054M	172:32	7/10/79	29.8	23.9	55	53.6	.26	0.00	0.00	0.00	0.00	0	0	148
7618-067M	172:45	7/05/79	36.4	29.0	55	65.3	.27	0.00	0.00	0.00	0.00	0	0	44
7618-082M	173:07	7/05/79	26.9	29.7	47	56.6	.28	0.00	0.00	0.00	0.00	0	0	43

1979 LUPULIN ANALYSES WITH COHUMULONE DATA

1979 β: sorted by CoH

SELECTED GENOTYPES SORTED BY COH AS OF 80/10/23. (N= 150)

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	LOCATION	HARVEST DATE	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	CRUSH 3 HR HSI	SAFE PERIOD	PERMEA-BILITY	CALC 6 MONTH HSI	CALC % A+B REMAIN	OIL: HUM/CARY	COH	SERIAL NUMBER
19058M	EA GR-OP	018:53-54	7/27/79	24.4	50.7	32	75.2	.20	2.53	1.18	.60	.75	47	0.00	12	411
7307-024M		051:55-56	7/06/79	51.7	22.8	69	74.6	.24	.30	0.00	0.00	0.00	0	2.71	13	61
7307-035M		052:55-56	7/03/79	51.7	23.7	68	75.4	.25	.31	0.00	0.00	0.00	0	1.57	13	11
21089M	YUGO 5/10	017:57-58	7/12/79	33.3	24.2	57	57.4	.24	.34	3.00	.53	.59	59	.22	14	178
7006-084M		040:13-14	7/12/79	41.9	35.4	54	77.3	.23	.40	1.83	.63	.74	48	2.00	14	157
7307-024M		051:55-56	7/09/79	48.6	21.3	69	69.9	.25	.32	0.00	0.00	0.00	0	2.75	14	127
21088M	YUGO 5/9	016:57-58	7/18/79	40.5	27.3	59	67.8	.24	.32	2.80	.45	.53	63	3.05	15	260
7306-117M		049:55-56	7/20/79	52.9	18.7	73	71.7	.27	.94	0.00	0.00	0.00	0	1.37	16	301
21109M	7006-094M	048:03-04	7/06/79	50.5	26.3	65	76.8	.24	.39	0.00	0.00	0.00	0	1.39	16	70
7309-034M		004:59-60	7/05/79	47.1	23.9	66	71.0	.26	.43	0.00	0.00	0.00	0	2.51	17	26
51114M		001:32	7/26/79	12.1	31.7	27	43.8	.29	0.00	0.00	0.00	0.00	0	0.00	17	393
21109M	7006-094M	008:55-56	7/12/79	51.6	25.0	67	76.5	.23	.32	5.10	.61	.53	63	1.35	17	180
19036M	LC X FU-S	007:53-54	7/27/79	20.2	51.8	28	72.0	.20	2.01	1.30	.46	.63	56	0.00	17	412
64034M		001:57-58	7/03/79	39.9	24.0	62	63.9	.25	.64	0.00	0.00	0.00	0	3.31	17	6
21108M	7006-030M	020:55-56	7/06/79	31.0	42.2	42	73.2	.23	0.00	0.00	0.00	0.00	0	2.82	18	54
7302-184M		049:53-54	7/09/79	46.8	24.7	65	71.5	.25	.93	0.00	0.00	0.00	0	0.00	18	98
7302-063M		036:53-54	7/09/79	56.0	22.2	71	78.2	.23	1.38	0.00	0.00	0.00	0	0.00	18	95
7302-188M		051:53-54	7/16/79	52.7	20.4	72	73.2	.25	2.44	0.00	0.00	0.00	0	0.00	18	229
63015M		001:36	7/26/79	57.1	21.6	72	78.6	.24	.34	6.90	0.00	0.00	0	0.00	18	394
21136M	7006-323M	049:13-14	7/17/79	32.4	38.3	45	70.7	.23	0.00	0.00	0.00	0.00	0	3.35	18	240
7304-085M		038:55-56	7/12/79	52.3	15.7	76	68.0	.25	2.50	0.00	0.00	0.00	0	0.00	18	165
7007-278M		034:15-16	7/12/79	46.3	33.4	58	79.8	.22	.29	3.50	.75	.74	48	2.01	18	155
7309-102M		006:59-60	7/05/79	52.9	18.0	74	71.0	.24	.32	4.50	.63	.58	59	2.71	18	27
7615-146M		167:02	8/06/79	53.7	17.9	74	71.6	.26	.33	0.00	0.00	0.00	0	0.00	19	439
7615-154M		167:10	7/26/79	53.7	20.7	72	74.3	.24	.33	0.00	0.00	0.00	0	0.00	19	397
21061M	6322-010M	047:05-06	7/26/79	13.0	59.3	17	72.3	.19	2.15	1.70	.22	.40	77	0.00	19	402
21087M	YUGO 3/3	015:57-58	7/05/79	47.2	23.8	66	71.0	.25	.38	5.90	.35	.27	95	2.09	19	32
7306-013M		048:55-56	7/10/79	55.1	18.8	74	74.0	.26	.29	6.70	.03	.25	99	2.34	20	124
7302-183M		048:53-54	7/10/79	41.2	25.1	62	66.3	.28	2.16	0.00	0.00	0.00	0	.31	20	119
7003-068M		054:11-12	7/07/79	44.7	30.4	59	75.0	.24	.32	3.30	.90	.88	40	1.60	20	109
7007-252M		032:15-16	7/11/79	42.7	30.2	58	72.8	.23	.40	2.85	.90	.90	38	1.51	20	151
64035M		002:57-58	7/05/79	41.6	28.9	59	70.5	.24	.32	5.30	.78	.66	53	3.65	20	18
7303-105M		031:55-56	7/20/79	47.9	19.7	70	67.6	.26	.32	6.50	.18	.25	99	.75	21	305
7304-123M		041:55-56	7/10/79	56.0	18.4	75	74.4	.24	.32	2.75	0.00	0.00	0	.84	21	91
7308-023M		158:39	7/21/79	44.1	19.1	69	63.2	.27	.38	0.00	0.00	0.00	0	2.48	21	315

1979 LUPULIN ANALYSES WITH COHUMULONE DATA

SELECTED GENOTYPES SORTED BY COH AS OF 80/10/23. (N= 150)

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	LOCATION	HARVEST DATE	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	CRUSH 3 HR HSI	SAFE PERIOD	PERMEA- BILITY	CALC 6 MONTH HSI	CALC % A+B REMAIN	OIL: HUM/ CARY	COH	SERIAL NUMBER
7613-042M		159:30	7/23/79	59.0	17.0	77	75.9	.27	.40	0.00	0.00	0.00	0	.77	21	310
21059M	6321-010M	046:05-06	7/23/79	16.3	63.5	20	79.8	.19	2.23	1.45	.24	.43	73	2.61	21	308
21110M	7007-018M	054:13-14	7/09/79	38.4	29.3	56	67.7	.24	0.00	0.00	0.00	0.00	0	3.21	21	87
51114M		005:55-56	7/06/79	14.1	45.3	23	59.4	.24	1.56	2.25	.30	.44	73	0.00	22	53
7302-052M		035:53-54	7/09/79	54.0	21.4	71	75.4	.24	2.27	0.00	0.00	0.00	0	.12	22	129
7312-088M		023:59-60	7/23/79	45.3	23.7	65	69.0	.27	.36	0.00	0.00	0.00	0	2.06	22	349
7304-165M		043:55-56	7/09/79	52.7	21.8	70	74.6	.24	2.50	0.00	0.00	0.00	0	.89	22	128
7614-047M		162:19	7/18/79	52.1	16.8	75	68.8	.24	.38	0.00	0.00	0.00	0	0.00	22	255
7308-037M		002:59-60	7/09/79	52.0	22.0	70	73.9	.24	.33	4.00	.40	.42	75	2.42	22	74
7303-046M		054:53-54	7/09/79	28.8	15.2	65	44.0	.24	.39	0.00	0.00	0.00	0	0.00	22	111
7308-023M		055:55-56	7/09/79	44.9	20.9	68	65.7	.26	.43	0.00	0.00	0.00	0	2.35	22	103
7308-009M		053:55-56	7/09/79	54.8	19.8	73	74.6	.27	.35	4.00	.27	.31	89	3.18	22	94
7311-114M		012:59-60	7/09/79	40.2	18.0	69	58.2	.27	.45	0.00	0.00	0.00	0	0.00	22	79
7309-004M		003:59-60	7/03/79	53.8	21.5	71	75.3	.26	.33	6.75	.96	.73	48	2.18	22	12
19172M	CATS TAILX19009	024:53-54	6/29/79	36.6	32.6	52	69.2	.25	2.32	1.47	.52	.67	53	0.00	22	1
7312-017M		017:59-60	7/05/79	44.3	21.2	67	65.5	.30	.42	0.00	0.00	0.00	0	0.00	23	29
21110M	7007-018M	010:55-56	7/06/79	46.1	31.9	59	78.0	.24	.29	5.70	.61	.50	67	3.24	23	57
7302-153M		043:53-54	7/05/79	52.6	19.7	72	72.4	.25	2.21	0.00	0.00	0.00	0	0.00	23	22
7308-023M		150:08	7/09/79	47.4	21.2	69	68.5	.26	.37	0.00	0.00	0.00	0	2.57	23	123
7603-036M		142:25	8/01/79	49.1	18.8	72	67.9	.25	.38	0.00	0.00	0.00	0	0.00	23	427
7306-138M		050:55-56	7/09/79	49.5	22.2	69	71.7	.23	.89	0.00	0.00	0.00	0	1.44	23	114
21108M	7006-030M	017:53-54	7/16/79	42.9	29.0	59	71.8	.25	0.00	0.00	0.00	0.00	0	0.00	23	215
52040M		049:05-06	7/17/79	8.9	56.1	13	65.0	.20	2.11	.85	.30	.52	65	2.94	23	241
7302-186M		050:53-54	7/18/79	41.5	18.2	69	59.7	.27	.36	0.00	0.00	0.00	0	.59	23	261
7309-045M		005:59-60	7/03/79	45.3	18.6	70	63.9	.26	.35	6.40	1.35	1.07	30	0.00	23	13
7314-106M		035:59-60	7/10/79	30.8	16.9	64	47.6	.27	2.48	0.00	0.00	0.00	0	1.63	23	92
21130M	6803-021M	030:57-58	7/03/79	16.0	57.5	21	73.4	.20	2.13	1.23	.56	.71	49	2.90	23	4
63015M		026:55-56	7/16/79	46.5	25.2	64	71.8	.25	.46	0.00	0.00	0.00	0	2.52	24	220
7308-020M		054:55-56	7/09/79	40.8	20.8	66	61.6	.27	.45	0.00	0.00	0.00	0	2.35	24	107
7613-025M		159:13	7/31/79	56.8	13.7	80	70.5	.25	.33	0.00	0.00	0.00	0	0.00	24	435
7302-016M		033:53-54	7/09/79	51.3	23.8	68	75.1	.25	.43	0.00	0.00	0.00	0	0.00	24	100
7302-036M		034:53-54	7/05/79	48.8	24.1	66	72.9	.25	.87	0.00	0.00	0.00	0	0.00	24	20
7612-004M		157:41	7/19/79	56.6	22.1	71	78.8	.25	.37	0.00	0.00	0.00	0	0.00	25	283
7302-095M		038:53-54	7/24/79	56.0	17.4	76	73.4	.26	.46	0.00	0.00	0.00	0	0.00	25	374
7312-029M		019:59-60	7/12/79	50.8	22.4	69	73.2	.25	.38	0.00	0.00	0.00	0	1.74	25	159

1979 LUPULIN ANALYSES WITH COHUMULONE DATA

SELECTED GENOTYPES SORTED BY COH AS OF 80/10/23. (N= 150) PAGE 3

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	LOCATION	HARVEST DATE	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	CRUSH 3 HR HSI	SAFE PERIOD	PERMEA- BILITY	CALC 6 MONTH HSI	CALC % A+B REMAIN	OIL: HUM/ CARY	COH	SERIAL NUMBER
7303-149M		034:55-56	7/20/79	42.6	13.9	75	56.5	.26	.41	0.00	0.00	0.00	0	0.00	25	298
7302-077M		037:53-54	7/16/79	47.5	24.1	66	71.6	.25	.61	0.00	0.00	0.00	0	2.60	25	227
7302-144M		042:53-54	7/09/79	31.5	18.7	62	50.2	.29	2.58	0.00	0.00	0.00	0	0.00	25	101
7302-125M		040:53-54	7/09/79	51.7	23.6	68	75.3	.24	.48	0.00	0.00	0.00	0	0.00	25	105
7313-098M		029:59-60	7/09/79	44.4	21.9	66	66.3	.25	.54	0.00	0.00	0.00	0	0.00	25	96
7311-142M		016:59-60	7/06/79	47.6	23.6	66	71.1	.27	.34	0.00	0.00	0.00	0	0.00	25	48
19183M	FU X 118	027:53-54	6/29/79	36.6	33.9	51	70.5	.25	.48	2.70	.15	.29	93	0.00	25	2
7312-079M		022:59-60	7/09/79	50.3	24.3	67	74.6	.26	.47	0.00	0.00	0.00	0	0.00	26	73
7314-019M		031:59-60	7/23/79	53.3	6.8	88	60.1	.30	.37	3.20	0.00	0.00	0	1.35	26	348
7312-033M		020:59-60	7/09/79	39.0	25.3	60	64.3	.27	.39	6.20	.93	.74	48	3.18	26	80
7304-177M		044:55-56	7/09/79	35.8	20.5	63	56.2	.30	1.78	0.00	0.00	0.00	0	0.00	26	121
7302-171M		046:53-54	7/06/79	50.7	23.5	68	74.2	.26	1.02	0.00	0.00	0.00	0	0.00	26	49
7303-135M		032:55-56	7/12/79	62.9	15.1	80	78.0	.25	.32	5.60	1.03	.85	41	0.00	26	160
7313-047M		028:59-60	7/06/79	46.0	21.4	68	67.3	.27	.49	0.00	0.00	0.00	0	0.00	26	59
7301-191M		032:53-54	7/12/79	48.6	23.8	67	72.4	.24	1.58	0.00	0.00	0.00	0	0.00	26	163
7304-197M		046:55-56	7/06/79	47.6	22.2	68	69.8	.25	.49	0.00	0.00	0.00	0	0.00	26	56
7310-007M		007:59-60	7/03/79	39.2	24.0	62	63.1	.27	.61	0.00	0.00	0.00	0	1.84	26	14
7312-043M		021:59-60	7/09/79	45.1	22.6	66	67.7	.27	.39	0.00	0.00	0.00	0	0.00	27	76
21070M	6618-043M	048:01-02	7/13/79	31.7	14.6	68	46.3	.25	0.00	0.00	0.00	0.00	0	0.00	27	186
7313-015M		026:59-60	7/16/79	44.6	27.1	62	71.8	.25	.35	0.00	0.00	0.00	0	0.00	27	199
19040M		010:53-54	7/09/79	31.5	31.4	50	62.8	.23	.72	3.40	.28	.36	83	0.00	27	71
7302-105M		039:53-54	7/12/79	52.0	21.9	70	73.9	.23	.38	2.70	.35	.45	71	.26	27	176
7312-028M		018:59-60	7/10/79	54.6	20.0	73	74.6	.24	.43	0.00	0.00	0.00	0	0.00	27	83
7311-046M		010:59-60	7/10/79	43.8	16.6	72	60.4	.26	.73	0.00	0.00	0.00	0	0.00	27	86
7302-166M		045:53-54	7/05/79	41.6	22.0	65	63.6	.26	2.57	0.00	0.00	0.00	0	.08	27	23
7305-101M		047:55-56	7/24/79	43.9	23.5	65	67.4	.28	.39	0.00	0.00	0.00	0	0.00	28	370
7304-105M		040:55-56	7/10/79	51.3	22.4	69	73.7	.25	1.20	0.00	0.00	0.00	0	0.00	28	118
7314-004M		030:59-60	7/05/79	38.4	24.6	60	63.0	.27	.60	0.00	0.00	0.00	0	0.00	28	31
7311-087M		011:59-60	7/09/79	44.4	23.4	65	67.8	.26	.39	0.00	0.00	0.00	0	0.00	28	77
7314-023M		032:59-60	7/03/79	52.5	25.9	66	78.4	.26	.47	0.00	0.00	0.00	0	2.77	28	15
7303-165M		139:04	7/12/79	54.6	21.8	71	76.4	.26	.77	0.00	0.00	0.00	0	0.00	28	164
7315-051M		038:59-60	7/16/79	50.9	23.3	68	74.2	.25	.30	0.00	0.00	0.00	0	0.00	28	219
7311-141M		139:06	7/12/79	53.5	22.4	70	75.9	.24	.37	4.95	.46	.42	75	0.00	28	177
7301-081M		031:53-54	7/12/79	45.0	23.2	65	68.1	.25	.84	0.00	0.00	0.00	0	0.00	28	182
7303-028M		053:53-54	7/06/79	44.2	28.7	60	72.8	.26	.53	0.00	0.00	0.00	0	0.00	28	50

1979 LUPULIN ANALYSES WITH COHUMULONE DATA

SELECTED GENOTYPES SORTED BY COH AS OF 80/10/23. (N= 150) PAGE 4

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	LOCATION	HARVEST DATE	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	CRUSH 3 HR HSI	SAFE PERIOD	PERMEA-BILITY	CALC 6 MONTH HSI	CALC % A+B REMAIN	OIL: HUM/ CARY	COH	SERIAL NUMBER
7302-155M		044:53-54	7/03/79	50.6	24.7	67	75.3	.25	2.23	0.00	0.00	0.00	0	0.00	28	10
7303-138M		033:55-56	7/12/79	56.7	19.0	74	75.6	.24	.33	5.20	.85	.73	49	2.56	29	173
7304-092M		039:55-56	7/06/79	48.6	20.8	70	69.3	.27	.36	4.60	.50	.47	69	0.00	29	52
21070M	6618-043M	047:57-58	7/20/79	50.6	19.5	72	70.1	.26	.48	0.00	0.00	0.00	0	1.51	29	304
7303-165M		150:07	7/16/79	49.3	21.8	69	71.1	.25	2.36	0.00	0.00	0.00	0	0.00	29	200
7314-048M		033:59-60	7/06/79	41.6	22.3	65	63.9	.26	.44	0.00	0.00	0.00	0	0.00	29	60
7302-127M		041:53-54	7/05/79	31.2	23.5	57	54.6	.29	.49	0.00	0.00	0.00	0	0.00	29	21
60013M		015:55-56	7/20/79	45.9	29.5	60	75.4	.24	0.00	0.00	0.00	0.00	0	3.20	30	306
7303-009M		052:53-54	7/20/79	34.2	14.8	69	49.0	.26	.36	0.00	0.00	0.00	0	0.00	30	288
7303-159M		036:55-56	7/05/79	46.3	23.3	66	69.6	.26	.50	0.00	0.00	0.00	0	0.00	30	24
7611-102M		156:03	7/30/79	53.6	21.3	71	74.9	.25	.37	0.00	0.00	0.00	0	0.00	30	422
7311-141M		158:40	7/19/79	54.8	23.3	70	78.1	.25	.29	6.85	.59	.42	75	1.25	30	281
7303-052M		055:53-54	7/09/79	41.4	23.7	63	65.1	.27	.52	0.00	0.00	0.00	0	0.00	30	93
7311-012M		008:59-60	7/05/79	34.8	19.9	63	54.7	.28	.70	0.00	0.00	0.00	0	0.00	30	28
21111M	7007-335M	038:15-16	7/06/79	25.8	38.2	40	63.9	.25	0.00	0.00	0.00	0.00	0	0.00	30	62
21111M	7007-335M	012:55-56	7/03/79	28.4	42.7	39	71.1	.23	.61	0.00	0.00	0.00	0	2.86	30	3
7610-112M		152:53	7/16/79	52.0	20.4	71	72.4	.26	.40	0.00	0.00	0.00	0	0.00	31	213
7302-174M		047:53-54	7/16/79	48.8	28.5	63	77.2	.24	0.00	0.00	0.00	0.00	0	0.00	31	218
19039M	FU-OP X RED V-0	009:53-54	7/05/79	33.5	33.9	49	67.3	.24	.52	3.90	.45	.47	69	3.02	31	17
7314-109M		036:59-60	7/12/79	41.1	15.6	72	56.7	.25	.64	0.00	0.00	0.00	0	0.00	32	181
7315-031M		037:59-60	7/12/79	45.6	21.8	67	67.4	.27	.37	0.00	0.00	0.00	0	0.00	32	158
7311-020M		009:59-60	7/16/79	53.1	21.3	71	74.5	.25	.32	7.10	1.00	.74	48	1.58	32	203
7314-086M		034:59-60	7/03/79	41.3	19.3	68	60.7	.25	.49	0.00	0.00	0.00	0	0.00	32	16
7614-060M		162:32	7/18/79	54.8	21.4	71	76.2	.25	.39	0.00	0.00	0.00	0	0.00	33	251
21076M	6806-115M	051:01-02	7/13/79	40.1	28.1	58	68.3	.24	.39	2.20	.70	.77	46	0.00	33	193
7311-122M		013:59-60	7/20/79	57.5	18.4	75	75.9	.27	.32	6.70	.78	.58	59	1.41	33	307
7304-148M		042:55-56	7/10/79	50.9	19.1	72	70.0	.23	.30	4.60	1.03	.91	38	0.00	33	85
7311-135M		014:59-60	7/16/79	33.5	13.5	71	47.0	.37	.42	0.00	0.00	0.00	0	0.00	34	214
7605-044M		145:16	7/17/79	55.4	21.8	71	77.1	.25	.40	0.00	0.00	0.00	0	0.00	34	243
7312-105M		024:59-60	7/09/79	44.7	25.2	63	69.9	.25	1.83	0.00	0.00	0.00	0	0.00	34	72
21075M	6804-009M	044:03-04	7/20/79	0.0	71.5	0	71.5	.20	0.00	0.00	0.00	0.00	0	0.00	35	289
7303-153M		035:55-56	7/20/79	43.0	31.2	57	74.1	.24	1.21	0.00	0.00	0.00	0	0.00	35	285
7312-126M		025:59-60	7/05/79	37.2	28.2	56	65.4	.28	.32	3.29	.62	.64	54	0.00	36	30
21065M	6616-043M	045:01-02	7/17/79	51.1	18.0	73	69.2	.26	.32	3.75	0.00	0.00	0	0.00	36	244
64103M		007:57-58	7/05/79	36.3	39.3	48	75.6	.21	2.18	1.60	.16	.36	82	0.00	36	19

1979 LUPULIN ANALYSES WITH COHUMULONE DATA

SELECTED GENOTYPES SORTED BY COH AS OF 80/10/23. (N= 150)

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	LOCATION	HARVEST DATE	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	CRUSH 3 HR HSI	SAFE PERIOD	PERMEA-BILITY	CALC 6 MONTH HSI	CALC % A+B REMAIN	OIL: HUM/ CARY	COH	SERIAL NUMBER
21067M	6616-054M	010:57-58	7/23/79	48.8	29.9	62	78.6	.23	.31	0.00	0.00	0.00	0	2.59	37	345
21017M	6220-009M	029:53-54	7/09/79	39.0	35.6	52	74.5	.24	.33	2.15	.73	.80	44	0.00	37	78
64102M		006:57-58	7/06/79	40.3	35.5	53	75.8	.24	.33	3.89	.53	.54	63	2.28	38	55
7613-089M		160:24	7/13/79	50.7	18.3	73	69.0	.25	.38	0.00	0.00	0.00	0	0.00	39	190
63012M		055:01-02	7/11/79	55.6	22.7	70	78.3	.24	.92	0.00	0.00	0.00	0	0.00	43	161
63012M		023:55-56	7/12/79	55.4	24.4	69	79.8	.23	2.27	0.00	0.00	0.00	0	0.00	44	172
63013M		024:55-56	7/09/79	43.4	31.2	58	74.6	.24	.28	4.28	.88	.80	44	0.00	44	99
60028M		019:55-56	7/10/79	38.3	34.4	52	72.7	.24	1.97	0.00	0.00	0.00	0	.55	47	84
60023M		017:55-56	7/18/79	23.8	36.1	39	59.9	.25	2.17	0.00	0.00	0.00	0	.35	48	259
60026M		018:55-56	7/10/79	41.6	33.4	55	75.1	.25	.36	2.28	.78	.83	42	1.26	52	88

1979 LUPULIN WITH ALPHA RATIO GREATER THAN 70

1979 β: α>70

SELECTED GENOTYPES SORTED BY IDENTITY AS OF 80/10/23. (N= 68)

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	LOCATION	HARVEST DATE	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	CRUSH 3 HR HSI	SAFE PERIOD	PERMEA-BILITY	CALC 6 MONTH HSI	CALC % A+B REMAIN	OIL: HUM/ CARY	COH	SERIAL NUMBER
21065M	6616-043M	045:01-02	7/17/79	51.1	18.0	73	69.2	.26	.32	3.75	0.00	0.00	0	0.00	36	244
21070M	6618-043M	047:57-58	7/20/79	50.6	19.5	72	70.1	.26	.48	0.00	0.00	0.00	0	1.51	29	304
63012M		055:01-02	7/11/79	55.6	22.7	70	78.3	.24	.92	0.00	0.00	0.00	0	0.00	43	161
63015M		001:36	7/26/79	57.1	21.6	72	78.6	.24	.34	6.90	0.00	0.00	0	0.00	18	394
7302-052M		035:53-54	7/09/79	54.0	21.4	71	75.4	.24	2.27	0.00	0.00	0.00	0	.12	22	129
7302-063M		036:53-54	7/09/79	56.0	22.2	71	78.2	.23	1.38	0.00	0.00	0.00	0	0.00	18	95
7302-095M		038:53-54	7/24/79	56.0	17.4	76	73.4	.26	.46	0.00	0.00	0.00	0	0.00	25	374
7302-105M		039:53-54	7/12/79	52.0	21.9	70	73.9	.23	.38	2.70	.35	.45	71	.26	27	176
7302-153M		043:53-54	7/05/79	52.6	19.7	72	72.4	.25	2.21	0.00	0.00	0.00	0	0.00	23	22
7302-188M		051:53-54	7/16/79	52.7	20.4	72	73.2	.25	2.44	0.00	0.00	0.00	0	0.00	18	229
7303-105M		031:55-56	7/20/79	47.9	19.7	70	67.6	.26	.32	6.50	.18	.25	99	.75	21	305
7303-135M		032:55-56	7/12/79	62.9	15.1	80	78.0	.25	.32	5.60	1.03	.85	41	0.00	26	160
7303-138M		033:55-56	7/12/79	56.7	19.0	74	75.6	.24	.33	5.20	.85	.73	49	2.56	29	173
7303-149M		034:55-56	7/20/79	42.6	13.9	75	56.5	.26	.41	0.00	0.00	0.00	0	0.00	25	298
7303-165M		158:38	7/26/79	47.0	19.5	70	66.6	.26	.45	0.00	0.00	0.00	0	0.00	0	403
7303-165M		139:04	7/12/79	54.6	21.8	71	76.4	.26	.77	0.00	0.00	0.00	0	0.00	28	164
7304-085M		038:55-56	7/12/79	52.3	15.7	76	68.0	.25	2.50	0.00	0.00	0.00	0	0.00	18	165
7304-092M		039:55-56	7/06/79	48.6	20.8	70	69.3	.27	.36	4.60	.50	.47	69	0.00	29	52
7304-123M		041:55-56	7/10/79	56.0	18.4	75	74.4	.24	.32	2.75	0.00	0.00	0	.84	21	91
7304-148M		042:55-56	7/10/79	50.9	19.1	72	70.0	.23	.30	4.60	1.03	.91	38	0.00	33	85
7304-165M		043:55-56	7/09/79	52.7	21.8	70	74.6	.24	2.50	0.00	0.00	0.00	0	.89	22	128
7306-013M		048:55-56	7/10/79	55.1	18.8	74	74.0	.26	.29	6.70	.03	.25	99	2.34	20	124
7306-117M		049:55-56	7/20/79	52.9	18.7	73	71.7	.27	.94	0.00	0.00	0.00	0	1.37	16	301
7308-009M		053:55-56	7/09/79	54.8	19.8	73	74.6	.27	.35	4.00	.27	.31	89	3.18	22	94
7308-037M		002:59-60	7/09/79	52.0	22.0	70	73.9	.24	.33	4.00	.40	.42	75	2.42	22	74
7309-004M		003:59-60	7/03/79	53.8	21.5	71	75.3	.26	.33	6.75	.96	.73	48	2.18	22	12
7309-045M		005:59-60	7/03/79	45.3	18.6	70	63.9	.26	.35	6.40	1.35	1.07	30	0.00	23	13
7309-102M		006:59-60	7/05/79	52.9	18.0	74	71.0	.24	.32	4.50	.63	.58	59	2.71	18	27
7311-020M		009:59-60	7/16/79	53.1	21.3	71	74.5	.25	.32	7.10	1.00	.74	48	1.58	32	203
7311-046M		010:59-60	7/10/79	43.8	16.6	72	60.4	.26	.73	0.00	0.00	0.00	0	0.00	27	86
7311-122M		013:59-60	7/20/79	57.5	18.4	75	75.9	.27	.32	6.70	.78	.58	59	1.41	33	307
7311-135M		014:59-60	7/16/79	33.5	13.5	71	47.0	.37	.42	0.00	0.00	0.00	0	0.00	34	214
7311-141M		158:40	7/19/79	54.8	23.3	70	78.1	.25	.29	6.85	.59	.42	75	1.25	30	281
7311-141M		139:06	7/12/79	53.5	22.4	70	75.9	.24	.37	4.95	.46	.42	75	0.00	28	177
7312-028M		018:59-60	7/10/79	54.6	20.0	73	74.6	.24	.43	0.00	0.00	0.00	0	0.00	27	83

1979 LUPULIN WITH ALPHA RATIO GREATER THAN 70

SELECTED GENOTYPES SORTED BY IDENTITY AS OF 80/10/23. (N= 68)

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	LOCATION	HARVEST DATE	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	CRUSH 3 HR HSI	SAFE PERIOD	PERMEA- BILITY	CALC 6 MONTH HSI	CALC % A+B REMAIN	OIL: HUM/ CARY	COH	SERIAL NUMBER
7314-019M		031:59-60	7/23/79	53.3	6.8	88	60.1	.30	.37	3.20	0.00	0.00	0	1.35	26	348
7314-109M		036:59-60	7/12/79	41.1	15.6	72	56.7	.25	.64	0.00	0.00	0.00	0	0.00	32	181
7603-036M		142:25	8/01/79	49.1	18.8	72	67.9	.25	.38	0.00	0.00	0.00	0	0.00	23	427
7605-044M		145:16	7/17/79	55.4	21.8	71	77.1	.25	.40	0.00	0.00	0.00	0	0.00	34	243
7610-024M		151:18	7/30/79	43.4	12.6	77	56.0	.30	.47	0.00	0.00	0.00	0	0.00	0	426
7610-075M		152:16	7/09/79	44.2	13.8	76	58.0	.28	1.35	0.00	0.00	0.00	0	0.00	0	115
7610-112M		152:53	7/16/79	52.0	20.4	71	72.4	.26	.40	0.00	0.00	0.00	0	0.00	31	213
7611-102M		156:03	7/30/79	53.6	21.3	71	74.9	.25	.37	0.00	0.00	0.00	0	0.00	30	422
7611-151M		156:52	7/23/79	39.1	14.3	73	53.4	.29	.47	0.00	0.00	0.00	0	0.00	0	340
7612-004M		157:41	7/19/79	56.6	22.1	71	78.8	.25	.37	0.00	0.00	0.00	0	0.00	25	283
7613-025M		159:13	7/31/79	56.8	13.7	80	70.5	.25	.33	0.00	0.00	0.00	0	0.00	24	435
7613-042M		159:30	7/23/79	59.0	17.0	77	75.9	.27	.40	0.00	0.00	0.00	0	.77	21	310
7613-077M		160:12	7/16/79	47.6	20.2	70	67.8	.27	.52	0.00	0.00	0.00	0	0.00	0	205
7613-089M		160:24	7/13/79	50.7	18.3	73	69.0	.25	.38	0.00	0.00	0.00	0	0.00	39	190
7613-104M		160:39	7/23/79	57.7	17.9	76	75.6	.24	.69	0.00	0.00	0.00	0	0.00	0	326
7613-105M		160:40	7/23/79	55.7	19.4	74	75.1	.16	.42	0.00	0.00	0.00	0	0.00	0	339
7613-128M		161:10	7/12/79	55.3	21.1	72	76.4	.24	.51	0.00	0.00	0.00	0	0.00	0	179
7613-132M		161:14	7/23/79	50.6	19.1	72	69.7	.25	.41	0.00	0.00	0.00	0	0.00	0	331
7614-005M		161:30	7/18/79	47.1	18.3	71	65.4	.28	.68	0.00	0.00	0.00	0	0.00	0	256
7614-012M		161:37	7/23/79	46.1	16.8	73	62.9	.27	.50	0.00	0.00	0.00	0	0.00	0	338
7614-026M		161:51	7/19/79	54.9	23.5	70	78.4	.25	.65	0.00	0.00	0.00	0	0.00	0	269
7614-047M		162:19	7/18/79	52.1	16.8	75	68.8	.24	.38	0.00	0.00	0.00	0	0.00	22	255
7614-052M		162:24	7/16/79	53.8	22.3	70	76.2	.26	.42	0.00	0.00	0.00	0	0.00	0	212
7614-060M		162:32	7/18/79	54.8	21.4	71	76.2	.25	.39	0.00	0.00	0.00	0	0.00	33	251
7614-104M		163:23	7/17/79	48.6	19.5	71	68.1	.30	.46	0.00	0.00	0.00	0	0.00	0	236
7614-108M		163:27	7/20/79	59.6	17.2	77	76.8	.24	.79	0.00	0.00	0.00	0	0.00	0	297
7614-121M		163:40	7/21/79	50.0	19.9	71	69.8	.27	.69	0.00	0.00	0.00	0	0.00	0	322
7614-143M		164:09	7/20/79	52.9	22.5	70	75.4	.25	.93	0.00	0.00	0.00	0	0.00	0	299
7615-082M		165:44	7/13/79	55.5	17.4	76	72.9	.24	.63	0.00	0.00	0.00	0	0.00	0	192
7615-146M		167:02	8/06/79	53.7	17.9	74	71.6	.26	.33	0.00	0.00	0.00	0	0.00	19	439
7615-147M		167:03	7/13/79	42.5	17.8	70	60.3	.25	1.05	0.00	0.00	0.00	0	0.00	0	188
7615-154M		167:10	7/26/79	53.7	20.7	72	74.3	.24	.33	0.00	0.00	0.00	0	0.00	19	397
7615-161M		167:17	7/10/79	57.9	19.5	74	77.4	.25	.63	0.00	0.00	0.00	0	0.00	0	132

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1979 BALE AND 5-CONE ANALYSES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (5-CONE) AS OF 80/10/09.

9 1979: Bales

Main yard E.

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL MLS/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
19001	BREWERS GOLD	BALE	001:01-04	9/11/79	1881	186	9.9	4.5	68	14.4	.30	1.04	29	2.76	0.00	0	989
19209	FUGGLE	BALE	003:01-02	8/10/79	789	37	4.7	2.6	64	7.3	.27	.43	71	.44	0.00	0	36
19209	FUGGLE	BALE	003:03-04	8/22/79	682	34	5.0	2.5	67	7.5	.25	.47	69	.75	2.83	26	872
21011	L 16	BALE	005:01-04	9/04/79	1948	123	6.4	4.3	59	10.7	.26	.38	81	.25	1.80	42	1069
21014	HALLERTAU MF	BALE	007:01-02	8/10/79	363	15	4.4	4.0	52	8.4	.23	.58	62	.76	3.22	21	27
21014	HALLERTAU MF	BALE	007:04	8/21/79	384	18	4.8	3.7	56	8.4	.22	.54	63	.39	0.00	0	1123
21015	TETTNANGER	BALE	008:01-02	8/10/79	149	6	4.3	2.8	60	7.1	.30	0.00	0	0.00	0.00	0	28
21016	FUGGLE N VF	BALE	009:01-02	8/10/79	1728	90	5.3	2.9	64	8.2	.28	.41	75	0.00	0.00	0	35
21016	FUGGLE N VF	BALE	009:03-04	8/21/79	981	49	5.1	2.9	63	7.9	.24	.46	71	1.14	0.00	0	857
21039	GOLDEN STAR	BALE	015:01-04	9/11/79	1386	60	4.4	3.8	53	8.1	.29	.50	66	.57	2.33	55	1084
21043	WYE CHALLENGER	BALE	018:05-08	8/27/79	885	59	6.7	4.0	62	10.7	.27	.49	73	1.14	0.00	0	1117
21044	WYE NORTHDOWN	BALE	019:05-08	8/27/79	384	29	7.7	5.0	60	12.6	.27	.57	64	2.37	0.00	0	1109
21045	SEREBRIANKA	BALE	011:09-12	8/27/79	142	4	3.1	3.1	50	6.2	.34	.65	52	.57	3.09	24	1115
21047	SVALOF 85	BALE	010:09-12	7/30/79	213	9	4.7	2.2	68	6.9	.26	0.00	0	0.00	0.00	0	18
21049	STYRIAN	BALE	020:05-06	8/10/79	1429	78	5.5	2.8	66	8.3	.27	.31	85	.85	0.00	0	29
21049	STYRIAN	BALE	020:07-09	8/21/79	1450	70	4.9	2.7	64	7.5	.26	.48	72	.85	0.00	0	852
21050	AHIL	BALE	001:09-12	8/27/79	1164	120	10.3	3.8	73	14.1	.25	.74	41	1.67	0.00	0	821
21051	APOLON	BALE	004:09-12	8/27/79	684	64	9.5	3.6	72	13.1	.28	.66	53	1.39	2.17	23	1095
21052	ATLAS	BALE	002:09-12	8/27/79	846	69	8.2	3.3	71	11.6	.33	1.02	30	1.36	2.03	39	878
21053	AURORA	BALE	003:09-12	8/27/79	933	94	10.1	3.8	72	13.9	.28	.40	75	1.25	0.00	0	1112
21056	BULLION 10A VF	BALE	013:09-12	8/27/79	2389	241	10.1	5.2	65	15.3	.30	.83	40	2.31	0.00	0	1105
21057	LATE CL. SEEDL.	BALE	036:49-50	9/15/79	1279	63	5.0	4.8	50	9.8	.38	.39	92	.73	3.17	41	1047
21077	SAAZER	BALE	021:05-08	7/30/79	199	6	3.4	3.6	48	7.0	.23	0.00	0	0.00	0.00	0	17
21078	RECORD	BALE	021:09-12	9/11/79	1002	91	9.2	5.9	60	15.0	.28	.62	56	2.37	0.00	0	997
21079	BLUE N. BREWER	BALE	009:09-12	7/30/79	80	2	3.1	1.1	73	4.3	.26	0.00	0	0.00	0.00	0	21
21080	BACKA	BALE	008:09-12	8/09/79	833	29	3.6	5.6	38	9.1	.20	.51	71	.60	0.00	0	1073
21081	DUNAV	BALE	005:09-10	8/27/79	1386	97	7.1	3.6	66	10.7	.29	.45	73	.96	2.55	0	1103
21081	DUNAV	BALE	005:09-12	9/11/79	684	51	7.5	3.6	67	11.1	.29	.51	70	1.49	3.15	0	1024
21082	NEOPLANTA	BALE	006:09-10	8/27/79	2480	246	9.9	3.6	73	13.6	.28	.42	71	1.10	0.00	0	1113
21082	NEOPLANTA	BALE	006:09-12	9/11/79	1791	164	9.2	3.7	71	12.9	.26	.55	58	1.96	0.00	0	993
21083	VOJVODINA	BALE	007:09-10	8/27/79	2132	179	8.4	3.3	71	11.7	.26	.32	80	.62	0.00	0	187
21083	VOJVODINA	BALE	007:09-12	9/11/79	1723	148	8.6	3.5	71	12.1	.27	.45	74	1.28	0.00	0	1001
21084	YUGO IV/2	BALE	037:49-50	9/15/79	1087	48	4.5	4.6	49	9.0	.32	.65	59	.80	3.04	19	1077
21085	YUGO VII/23	BALE	039:49-50	9/15/79	1039	42	4.1	4.8	46	8.9	.29	.68	58	1.00	2.91	14	1080
21086	YUGO VIII/27	BALE	040:49-50	9/15/79	1152	57	5.0	4.6	52	9.6	.28	.65	51	.96	3.08	17	1044
21092	CASCADE VF	BALE	014:09-12	9/04/79	2058	113	5.5	4.9	52	10.4	.28	.94	33	0.00	0.00	37	926
21093	N. BREWER VF	BALE	012:09-12	8/27/79	924	89	9.7	3.4	74	13.1	.30	.50	68	2.15	0.00	0	1122

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1979 BALE AND 5-CONE ANALYSES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (5-CONE) AS OF 80/10/09.

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL ML/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
21112	WYE TARGET VF	BALE	016:09-10	8/27/79	1845	242	13.2	4.9	72	18.1	.27	.62	46	1.29	0.00	0	186
21112	WYE TARGET VF	BALE	016:09-12	9/11/79	1343	150	11.2	4.3	72	15.5	.31	.70	51	2.06	0.00	0	994
21113	LUBELSKA-PULAWY	BALE	018:09-12	7/30/79	341	13	4.1	4.2	49	8.2	.22	.53	65	.57	0.00	0	22
21114	NADWISLANSKA	BALE	019:09-12	8/27/79	213	7	3.4	3.0	53	6.4	.32	.98	46	.32	0.00	0	1091
21116	BREWERS GOLD VF	BALE	015:09-12	9/11/79	2190	225	10.3	4.2	71	14.5	.34	1.03	28	2.48	1.53	28	1023
21167	HYBRID 2 INDIA	BALE	014:01-04	9/11/79	1916	163	8.5	4.4	65	13.0	.28	.46	72	.38	0.00	0	1097
21179	HERSBRUCKER-E	BALE	006:01-04	9/04/79	790	42	5.4	5.5	49	10.9	.22	.44	69	.50	0.00	21	930
21193	7005-194	BALE	051:07-08	9/04/79	1023	142	14.0	4.8	74	18.8	.22	.32	85	1.42	0.00	24	923
21194	7006-311	BALE	043:09-10	9/04/79	934	94	10.1	8.6	53	18.7	.29	.54	64	1.85	0.00	0	979
48209	FUGGLE H	BALE	010:01-02	8/10/79	1098	56	5.1	2.5	67	7.6	.26	.37	78	.73	0.00	0	24
48209	FUGGLE H	BALE	010:03-04	8/21/79	1141	58	5.2	2.8	65	7.9	.33	.45	76	1.21	0.00	0	825
56001	HALLERTAU	BALE	011:01-04	8/21/79	515	20	4.0	4.5	47	8.5	.25	.63	56	.87	3.29	0	1119
56002	BACKA	BALE	012:01-04	9/04/79	955	33	3.6	5.5	39	9.1	.25	.42	78	.62	3.25	25	910
56013	CASCADE	BALE	013:01-04	9/04/79	1722	92	5.4	4.3	55	9.6	.31	.85	42	0.00	0.00	33	903
60020	NM 2-4	BALE	025:49-50	9/15/79	200	5	2.7	4.9	35	7.6	.33	.60	56	.25	.20	50	1020
60024	COLO 1-2	BALE	027:49-50	9/15/79	200	7	3.7	2.5	60	6.2	.25	.69	52	.27	1.67	51	931
60027	COLO 2-2	BALE	029:49-50	9/15/79	981	18	1.8	3.2	36	5.0	.31	.86	43	.41	1.20	60	1051
60035	COLO 7-2	BALE	004:51-52	9/15/79	875	17	2.0	2.1	49	4.1	.26	.68	53	.38	.10	53	1046
60037	WYO 2-1	BALE	005:51-52	9/15/79	896	47	5.3	3.8	57	9.1	.26	.36	88	.58	1.73	45	1072
60038	WYO 3-1	BALE	006:51-52	9/15/79	448	7	1.6	2.8	36	4.4	.32	.83	42	.35	.03	66	1067
60042	SHINSHUWASE	BALE	016:01-04	9/11/79	1109	52	4.7	4.0	54	8.7	.26	.56	61	.73	2.29	53	1040
61019	YUGO GOLDING	BALE	017:01-04	8/21/79	933	51	5.5	2.8	66	8.3	.21	.49	67	.91	0.00	0	823
61019	YUGO GOLDING	BALE	017:01-04	8/21/79	0	0	5.6	2.7	67	8.3	.25	.40	76	.73	2.74	0	1108
61020	SAV GOLDING	BALE	018:01-04	8/21/79	720	36	5.1	2.6	66	7.7	.30	.44	77	.89	0.00	0	1114
61021	TETTNANG-SWISS	BALE	019:01-04	8/21/79	270	4	1.7	5.1	25	6.8	.25	.57	71	.73	3.19	0	1125
62013	COMET	BALE	020:01-04	9/11/79	1792	189	10.6	3.9	73	14.4	.30	.83	39	2.18	0.00	0	984
62051	JANUS	BALE	021:01-04	7/30/79	212	7	3.8	2.0	65	5.8	.25	0.00	0	0.00	0.00	0	19
62052	DENSITY	BALE	001:05-08	8/27/79	1653	89	5.4	2.4	68	7.8	.22	.43	88	.41	0.00	0	1129
62053	DEFENDER	BALE	002:05-08	8/21/79	268	9	3.7	1.3	73	5.0	.21	.49	65	.64	2.33	23	868
64100	BULLION	BALE	003:05-08	8/27/79	1472	133	9.1	4.8	65	13.9	.29	.96	26	1.95	0.00	0	188
64107	N. BREWER	BALE	004:05-08	8/21/79	654	61	9.4	3.8	71	13.2	.23	.47	71	1.96	0.00	0	863
65009	BG X 19058M	BALE	028:51-52	9/15/79	2079	217	10.5	7.5	58	18.0	.29	.99	33	3.40	0.00	0	1065
65101	TALISMAN	BALE	005:05-08	9/11/79	2106	128	6.1	3.0	66	9.1	.25	.56	63	.64	.86	54	1015
65102	YAKIMA CL (L1)	BALE	006:05-08	9/04/79	1066	61	5.7	3.4	63	9.1	.26	.39	85	.58	2.12	41	906
66050	ALLIANCE	BALE	012:05-08	8/21/79	1013	64	6.4	2.2	74	8.6	.27	.37	83	.76	0.00	0	1126
66051	PROGRESS	BALE	009:05-08	8/21/79	1331	109	8.2	2.7	75	10.9	.26	.36	85	.71	3.26	0	1124
66052	PRIDE RINGWOOD	BALE	010:05-08	9/11/79	2394	195	8.2	5.6	59	13.8	.28	.56	57	1.02	0.00	0	985

1979 BALE AND 5-CONE ANALYSES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (5-CONE) AS OF 80/10/09.

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL MLS/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
66054	CALICROSS	BALE	014:05-08	9/11/79	1229	72	5.9	4.4	57	10.2	.26	.37	81	.64	0.00	39	996
66055	FIRST CHOICE	BALE	015:05-08	9/11/79	1187	56	4.8	4.5	51	9.3	.28	.48	72	.89	.45	42	871
66056	SMOOTHCONE	BALE	016:05-08	9/11/79	1520	106	7.0	3.6	66	10.6	.27	.50	67	.96	3.27	46	1045
68051	BRAMLING CROSS	BALE	011:05-08	8/27/79	1008	54	5.5	3.0	64	8.5	.31	.49	76	.89	1.76	0	1127
68052	PETHAM GOLDING	BALE	017:05-08	8/27/79	1593	110	6.9	1.8	79	8.8	.30	.56	61	.98	1.76	0	1116
7002-024		BALE	031:07-08	9/04/79	1919	120	6.3	3.4	64	9.7	.31	.60	59	1.50	2.56	26	1086
7003-154	Myd. W. ↓	BALE	038:07-08	9/04/79	2950	246	8.4	7.6	52	15.9	.23	.47	65	1.09	.12	39	925
48209	FUGGLE H	BALE	126:15-18	8/21/79	0	0	5.5	3.4	62	8.8	.26	.45	69	.94	0.00	0	1128
19001	Smith Yd ↓ BREWERS GOLD	BALE	209:01-10	9/12/79	1775	171	9.6	5.6	63	15.3	.28	.89	38	2.93	0.00	0	976
21014	HALLERTAU MF	BALE	247:01-02	8/10/79	363	20	5.7	5.4	50	11.1	.24	.88	30	0.00	0.00	0	34
21015	TETTNANGER	BALE	248:01-02	8/20/79	160	8	5.5	5.0	52	10.5	.25	.62	65	1.07	3.12	22	829
21016	FUGGLE N VF	BALE	204:01-02	8/10/79	960	58	6.1	3.4	64	9.5	.27	.51	71	1.35	0.00	0	25
21016	FUGGLE N VF	BALE	204:03-05	8/20/79	635	41	6.5	3.4	65	9.9	.26	.48	71	1.32	2.82	25	854
21040	COLUMBIA	BALE	226:01-10	9/13/79	2670	230	8.6	4.6	65	13.3	.24	.47	67	1.60	0.00	0	839
21041	WILLAMETTE	BALE	227:01-10	9/13/79	2052	107	5.3	4.0	57	9.2	.28	.56	63	1.49	0.00	35	991
21042	6769-002	BALE	226:23-27	9/17/79	2525	117	4.7	4.2	52	8.9	.28	.85	41	1.34	2.41	41	870
21043	WYE CHALLENGER	BALE	215:01-04	8/23/79	1525	118	7.8	5.8	57	13.5	.29	.50	62	.91	2.88	0	1049
21043	WYE CHALLENGER	BALE	247:09-10	8/28/79	871	66	7.6	5.6	57	13.2	.29	.52	67	1.85	0.00	0	1060
21043	WYE CHALLENGER	BALE	215:01-10	9/12/79	1416	111	7.8	5.5	58	13.3	.27	.56	63	1.57	0.00	0	1061
21044	WYE NORTHDOWN	BALE	248:09-10	8/20/79	768	77	10.1	6.5	60	16.6	.25	.59	58	2.79	2.59	24	869
21044	WYE NORTHDOWN	BALE	216:01-04	8/23/79	462	43	9.5	6.5	59	16.0	.27	.53	64	2.79	2.44	24	1090
21049	STYRIAN	BALE	214:01-02	8/10/79	0	0	4.8	3.0	61	7.9	.28	.50	76	1.29	2.92	31	23
21049	STYRIAN	BALE	214:03-05	8/20/79	0	0	6.1	3.5	63	9.6	.25	.53	61	1.57	0.00	0	817
21049	STYRIAN	BALE	247:11-13	8/28/79	702	33	4.8	3.0	61	7.7	.32	.64	62	1.45	0.00	0	982
21049	STYRIAN	BALE	214:06-10	8/28/79	1002	59	5.9	3.8	61	9.7	.28	.61	50	1.43	0.00	0	1031
21050	AHIL	BALE	218:01-05	8/28/79	1339	158	11.8	5.6	67	17.4	.25	.76	43	2.29	1.81	0	834
21050	AHIL	BALE	218:01-10	9/12/79	1979	208	10.5	5.3	66	15.8	.31	.84	39	2.82	1.77	0	1087
21050	AHIL	BALE	249:09-10	9/12/79	917	98	10.7	5.1	67	15.8	.27	.76	46	2.85	1.68	24	1088
21053	AURORA	BALE	219:01-04	8/20/79	1424	178	12.5	5.3	70	17.8	.23	.34	77	1.46	0.00	20	815
21053	AURORA	BALE	219:05-10	8/28/79	1840	225	12.3	5.2	70	17.5	.27	.60	54	1.71	2.45	22	877
21053	AURORA	BALE	246:11-13	9/12/79	995	119	12.0	4.8	71	16.8	.26	.56	62	2.14	0.00	0	1052
21054	6806-067	BALE	210:01-05	8/23/79	1392	141	10.1	4.6	69	14.7	.30	.76	43	1.92	1.18	39	881
21055	6806-080	BALE	212:01-05	8/20/79	657	91	13.9	5.3	72	19.2	.27	.44	72	2.01	1.64	43	860
21056	BULLION 10A VF	BALE	206:03-07	8/28/79	1500	191	12.8	6.7	65	19.5	.27	.66	51	2.42	1.65	37	1027
21056	BULLION 10A VF	BALE	206:01-10	9/12/79	2359	260	11.0	6.7	62	17.7	.27	.76	42	2.50	0.00	0	928
21077	SAAZER	BALE	228:01-02	8/10/79	128	6	4.9	4.6	51	9.5	.28	0.00	0	0.00	2.58	27	30
21078	RECORD	BALE	224:01-03	8/23/79	1525	107	7.1	8.0	47	15.0	.26	.56	61	1.85	0.00	0	1041

1979 BALE AND 5-CONE ANALYSES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (5-CONE) AS OF 80/10/09.

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL NLS/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
21078	RECORD	BALE	224:01-10	9/12/79	1557	146	9.4	7.0	57	16.4	.23	.75	46	3.20	0.00	0	1032
21080	BACKA	BALE	220:01-10	9/12/79	879	36	4.1	7.3	36	11.4	.25	.54	62	.89	3.27	26	1043
21081	DUNAV	BALE	221:01-02	8/20/79	2538	163	6.5	4.1	61	10.6	.25	.44	79	1.50	0.00	0	1011
21081	DUNAV	BALE	221:03-08	8/28/79	1988	151	7.6	4.0	65	11.7	.28	.47	74	1.42	3.38	27	847
21082	NEOPLANTA	BALE	222:01-05	8/28/79	2538	211	8.3	4.2	66	12.5	.26	.38	70	1.29	2.43	38	849
21082	NEOPLANTA	BALE	222:01-10	9/12/79	1988	182	9.2	4.6	66	13.8	.27	.63	50	2.18	0.00	0	987
21083	VOJVODINA	BALE	223:01-05	8/28/79	3387	317	9.4	4.0	70	13.3	.28	.40	77	1.04	0.00	0	1037
21083	VOJVODINA	BALE	223:01-10	9/12/79	1792	161	9.0	4.1	68	13.1	.27	.43	79	1.35	0.00	0	1099
21091	6771-019	BALE	237:23-27	8/28/79	1728	63	3.7	5.8	38	9.5	.24	.83	30	1.45	2.52	25	261
21091	6771-019	BALE	237:28-32	9/14/79	1433	56	3.9	6.0	39	9.9	.25	.84	43	2.00	0.00	0	1050
21092	CASCADE VF	BALE	202:02	9/11/79	0	0	6.0	7.2	45	13.2	.23	0.00	0	0.00	0.00	0	272
21092	CASCADE VF	BALE	202:06	9/11/79	0	0	6.1	6.6	47	12.7	.21	0.00	0	0.00	0.00	0	267
21092	CASCADE VF	BALE	202:01	9/11/79	0	0	5.9	6.8	46	12.7	.22	0.00	0	0.00	0.00	0	276
21092	CASCADE VF	BALE	202:04	9/11/79	0	0	5.4	6.9	43	12.3	.25	0.00	0	0.00	0.00	0	268
21092	CASCADE VF	BALE	202:02	9/11/79	0	0	6.2	6.6	48	12.9	.23	0.00	0	0.00	0.00	0	274
21092	CASCADE VF	BALE	202:05	9/11/79	0	0	5.5	6.9	44	12.3	.23	0.00	0	0.00	0.00	0	270
21092	CASCADE VF	BALE	202:01	9/11/79	0	0	5.7	6.6	46	12.3	.24	0.00	0	0.00	0.00	0	277
21092	CASCADE VF	BALE	202:05	9/11/79	0	0	5.2	6.2	45	11.4	.23	0.00	0	0.00	0.00	0	269
21092	CASCADE VF	BALE	202:03	9/11/79	0	0	5.7	6.7	45	12.4	.22	0.00	0	0.00	0.00	0	273
21092	CASCADE VF	BALE	202:03	9/11/79	0	0	5.8	6.8	45	12.6	.22	0.00	0	0.00	0.00	0	271
21092	CASCADE VF	BALE	202:04	9/11/79	0	0	5.8	6.9	45	12.6	.22	0.00	0	0.00	0.00	0	275
21092	CASCADE VF	BALE	202:01-10	9/12/79	1802	103	5.7	5.8	49	11.5	.26	.91	36	1.35	2.68	36	1022
21094	6903-112	BALE	235:01-10	9/13/79	1305	113	8.7	7.3	54	16.0	.22	.48	84	.94	1.71	35	1019
21095	6903-259	BALE	236:01-10	9/13/79	1695	109	6.5	6.9	48	13.3	.23	.35	78	.76	1.84	0	1003
21098	6913-068	BALE	232:23-27	9/14/79	1672	125	7.5	5.2	59	12.7	.26	1.00	31	2.70	1.26	21	916
21099	6921-006	BALE	240:23-27	8/23/79	922	85	9.3	7.4	55	16.7	.28	.67	51	2.67	0.00	0	1120
21112	WYE TARGET VF	BALE	217:01-04	8/20/79	1394	180	13.0	5.3	70	18.2	.24	.54	54	1.50	1.62	33	814
21112	WYE TARGET VF	BALE	217:01-10	9/12/79	1536	139	9.1	4.3	67	13.4	.35	.98	32	.82	0.00	0	1059
21116	BREWERS GOLD VF	BALE	213:01-10	9/12/79	2287	232	10.2	6.3	61	16.4	.28	.96	33	3.04	0.00	0	1053
21167	HYBRID 2 INDIA	BALE	229:01-10	9/17/79	2432	216	8.9	6.4	58	15.4	.25	.49	59	1.15	.27	34	895
21179	HERSBRUCKER-E	BALE	230:01-10	9/13/79	768	45	5.9	7.4	44	13.3	.21	.56	57	1.17	3.06	24	915
21180	7003-143	BALE	242:12-16	9/13/79	2751	265	9.7	8.3	53	17.9	.26	.67	50	2.39	2.08	33	1014
21181	7003-243	BALE	204:17-21	9/13/79	2133	156	7.3	7.7	48	15.0	.30	.85	40	1.64	1.98	41	1000
21182	GALENA, I43-16	BALE	239:01-02	8/10/79	533	54	10.3	8.2	55	18.5	.25	.40	74	.96	1.85	35	32
21182	GALENA, I43-16	BALE	239:03-05	8/20/79	981	93	9.6	6.8	58	16.3	.24	.37	86	1.00	0.00	0	1107
21187	S. BREWER	BALE	242:01-10	9/18/79	0	0	9.6	5.0	65	14.6	.25	.34	83	2.87	1.70	36	1074
21188	NP2/55 (S. AFR)	BALE	243:01-10	9/18/79	0	0	5.5	4.5	55	10.0	.24	.67	49	1.53	2.00	27	914

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ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL MLS/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
21193	7005-194	BALE	237:01-05	8/28/79	2058	275	13.4	5.2	72	18.6	.26	.44	70	1.15	2.15	25	879
21193	7005-194	BALE	237:01-10	9/13/79	2031	279	13.8	5.3	72	19.1	.26	.48	65	2.39	0.00	0	1009
21194	7006-311	BALE	238:01-05	8/28/79	1757	213	12.2	6.9	63	19.0	.31	1.05	26	1.85	2.04	24	833
21195	7006-408	BALE	210:28-32	9/14/79	1408	192	13.7	6.2	68	19.8	.29	.56	65	3.18	2.65	32	902
21198	7003-038	BALE	227:12-16	9/18/79	2662	245	9.2	8.7	51	17.9	.24	.67	49	2.28	.26	37	924
21199	7004-003	BALE	212:17-21	9/13/79	3114	290	9.3	5.2	64	14.5	.27	.75	47	2.87	2.26	42	1021
21200	7004-075	BALE	221:17-21	9/17/79	1783	210	11.8	4.7	71	16.5	.27	.80	42	2.67	1.29	40	850
21201	7005-070	BALE	238:17-21	8/28/79	2261	227	10.1	8.9	53	19.0	.27	.67	46	2.04	1.85	33	262
48209	FUGGLE H	BALE	201:01-02	8/10/79	0	0	5.4	3.2	62	8.7	.31	.57	65	1.28	0.00	0	33
48209	FUGGLE H	BALE	201:03-05	8/20/79	0	0	5.5	3.1	63	8.6	.27	.56	64	1.59	2.81	32	866
48209	FUGGLE H	BALE	203:06-10	8/23/79	843	43	5.2	3.3	61	8.5	.31	.69	56	1.49	0.00	0	1121
48209	FUGGLE H	BALE	201:08	8/24/79	0	0	5.4	3.1	63	8.5	.30	0.00	0	0.00	0.00	0	174
48209	FUGGLE H	BALE	203:04	8/24/79	0	0	5.2	3.1	62	8.3	.28	0.00	0	0.00	0.00	0	175
48209	FUGGLE H	BALE	203:02	8/24/79	0	0	4.8	2.7	64	7.4	.30	0.00	0	0.00	0.00	0	183
48209	FUGGLE H	BALE	203:01	8/24/79	0	0	5.6	3.0	64	8.6	.28	0.00	0	0.00	0.00	0	179
48209	FUGGLE H	BALE	203:03	8/24/79	0	0	4.7	2.8	63	7.5	.31	0.00	0	0.00	0.00	0	184
48209	FUGGLE H	BALE	203:05	8/24/79	0	0	6.4	3.2	66	9.6	.27	0.00	0	0.00	0.00	0	177
48209	FUGGLE H	BALE	203:02	8/24/79	0	0	5.5	3.0	64	8.4	.26	0.00	0	0.00	0.00	0	181
48209	FUGGLE H	BALE	203:04	8/24/79	0	0	5.9	3.1	65	9.0	.29	0.00	0	0.00	0.00	0	176
48209	FUGGLE H	BALE	203:03	8/24/79	0	0	4.5	2.9	60	7.4	.29	0.00	0	0.00	0.00	0	180
48209	FUGGLE H	BALE	203:05	8/24/79	0	0	5.2	3.5	59	8.7	.27	0.00	0	0.00	0.00	27	178
48209	FUGGLE H	BALE	203:01	8/24/79	0	0	4.6	3.1	59	7.6	.28	0.00	0	0.00	0.00	0	182
56013	CASCADE	BALE	211:01-05	8/28/79	1898	119	6.3	6.0	51	12.3	.26	.89	34	1.35	2.69	35	880
56013	CASCADE	BALE	208:02-06	8/28/79	2491	146	5.9	6.1	48	12.0	.24	.75	42	1.22	0.00	0	859
61019	YUGO GOLDING	BALE	246:03-04	8/10/79	942	52	5.6	3.1	64	8.7	.28	.49	75	1.22	2.92	28	26
61020	SAV GOLDING	BALE	247:03-04	8/10/79	827	45	5.5	3.1	63	8.6	.31	.47	77	1.17	2.83	27	31
61021	TETTNANG-SWISS	BALE	248:03-04	8/20/79	192	11	5.9	5.6	51	11.5	.26	.66	53	0.00	0.00	20	1096
62051	JANUS	BALE	244:05-06	7/30/79	64	3	5.2	3.1	62	8.2	.25	0.00	0	0.00	0.00	0	20
62052	DENSITY	BALE	245:05-06	9/12/79	888	58	6.6	4.7	58	11.3	.24	.48	69	.49	2.62	35	1038
62052	DENSITY	BALE	232:01-10	9/13/79	1058	58	5.6	3.7	60	9.2	.20	.43	72	.51	2.50	0	1002
62053	DEFENDER	BALE	233:01-10	9/13/79	160	7	4.4	2.5	63	6.9	.27	.62	59	.98	0.00	0	1004
64100	BULLION	BALE	205:07-10	8/28/79	1781	207	11.6	7.3	61	19.0	.26	.62	53	2.26	1.60	41	835
64100	BULLION	BALE	205:01	9/08/79	0	0	8.8	6.0	59	14.8	.24	0.00	0	0.00	0.00	0	393
64100	BULLION	BALE	205:04	9/08/79	0	0	9.4	6.7	58	16.1	.23	0.00	0	0.00	0.00	0	394
64100	BULLION	BALE	205:05	9/10/79	0	0	11.2	6.6	62	17.8	.24	0.00	0	0.00	0.00	0	280
64100	BULLION	BALE	205:06	9/10/79	0	0	12.3	7.0	63	19.3	.23	0.00	0	0.00	0.00	0	396
64100	BULLION	BALE	205:03	9/10/79	0	0	11.4	6.6	63	18.0	.24	0.00	0	0.00	0.00	0	278

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ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL MLS/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
64100	BULLION	BALE	205:02	9/10/79	0	0	10.8	7.2	60	18.1	.22	0.00	0	0.00	0.00	0	392
64100	BULLION	BALE	205:05	9/10/79	0	0	12.0	6.6	64	18.5	.21	0.00	0	0.00	0.00	0	282
64100	BULLION	BALE	205:04	9/10/79	0	0	11.2	6.5	63	17.7	.22	0.00	0	0.00	0.00	0	395
64100	BULLION	BALE	205:02	9/10/79	0	0	10.2	7.0	59	17.2	.23	0.00	0	0.00	0.00	0	279
64100	BULLION	BALE	205:03	9/10/79	0	0	11.8	6.8	63	18.6	.23	0.00	0	0.00	0.00	0	281
64100	BULLION	BALE	205:04	9/10/79	0	0	12.0	6.6	64	18.6	.22	0.00	0	0.00	0.00	0	283
64107	N. BREWER	BALE	247:05-06	8/20/79	555	64	11.6	5.3	68	16.9	.24	.41	71	2.35	2.60	24	816
64107	N. BREWER	BALE	225:01-05	8/23/79	697	75	10.9	4.9	68	15.8	.26	.43	73	1.72	0.00	0	876
64107	N. BREWER	BALE	225:01-10	9/12/79	768	83	10.9	5.2	67	16.1	.28	.50	63	2.56	0.00	0	981
65009	BG X 19058M	BALE	228:23-27	9/17/79	1694	188	11.1	8.5	56	19.6	.26	1.31	17	3.00	1.66	39	846
66050	ALLIANCE	BALE	244:07-08	8/20/79	1066	62	5.9	2.3	72	8.1	.27	.42	74	1.21	2.96	26	856
66050	ALLIANCE	BALE	231:01-05	8/20/79	1152	69	6.0	2.3	72	8.4	.24	.40	76	.92	0.00	0	858
66051	PROGRESS	BALE	234:01-10	9/18/79	469	31	6.6	3.1	67	9.8	.30	.58	64	1.17	0.00	0	1068
66051	PROGRESS	BALE	245:07-08	9/82/07	1088	66	6.1	2.6	70	8.7	.26	.47	69	.94	3.36	27	851
66052	PRIDE RINGWOOD	BALE	246:07-08	9/18/79	1813	125	6.9	8.1	46	15.0	.29	.73	46	1.40	0.00	34	1094
66054	CALICROSS	BALE	248:07-08	9/18/79	1262	100	7.9	7.0	53	14.9	.23	0.00	0	1.39	2.76	0	977
66056	SMOOTHCONE	BALE	244:09-10	9/17/79	704	55	7.9	4.4	64	12.3	.26	.49	72	1.53	0.00	0	1111
6761-016		BALE	205:23-27	9/17/79	2256	142	6.3	3.2	66	9.6	.27	.64	52	1.39	2.59	40	884
6771-021		BALE	236:12-16	9/18/79	2772	144	5.2	4.1	56	9.3	.25	.90	39	2.50	2.09	29	1025
68052	PETHAM GOLDING	BALE	246:09-10	9/12/79	938	72	7.8	2.4	76	10.2	.28	.57	59	1.35	0.00	0	1013
7003-003		BALE	212:12-16	9/17/79	1621	100	6.2	7.6	44	13.8	.27	.91	37	1.82	0.00	44	1042
7003-015		BALE	213:12-16	9/17/79	1382	129	9.4	4.8	66	14.2	.26	.44	74	1.14	0.00	0	865
7003-032		BALE	222:12-16	9/17/79	1397	103	7.4	4.0	64	11.4	.26	.58	56	1.07	2.25	34	900
7003-066		BALE	229:12-16	9/17/79	864	62	7.2	7.4	49	14.6	.27	.58	57	1.61	3.07	30	889
7003-075		BALE	230:12-16	9/18/79	1740	120	6.9	6.0	53	12.9	.26	.67	54	1.42	1.44	22	921
7003-081		BALE	233:12-16	9/18/79	2952	173	5.9	6.2	48	12.1	.31	.92	34	1.85	1.52	30	978
7003-176		BALE	202:17-20	9/13/79	1570	124	8.0	7.5	51	15.4	.27	.72	47	1.81	1.97	0	1012
7003-250		BALE	205:17-21	9/13/79	1732	134	7.8	6.8	53	14.6	.28	1.13	24	2.57	2.31	32	1008
7003-284		BALE	210:17-21	9/13/79	1391	58	4.2	10.8	28	15.0	.23	.96	33	2.43	0.00	0	1016
7005-182		BALE	207:23-27	9/17/79	1049	128	12.3	6.0	67	18.3	.28	.61	57	3.20	2.74	28	893
7005-201		BALE	209:23-27	9/17/79	1401	137	9.8	6.3	60	16.0	.28	.93	36	2.59	0.00	0	1039
7005-205		BALE	210:23-27	9/17/79	998	124	12.5	5.9	68	18.4	.32	.86	36	2.15	1.52	45	1026
7005-232		BALE	211:23-27	9/17/79	1860	208	11.2	5.2	68	16.4	.27	.69	52	2.70	1.58	35	837
7006-370		BALE	242:23-27	9/14/79	1706	168	9.9	9.1	51	19.0	.27	1.07	25	2.73	1.83	26	911
7006-406		BALE	209:28-32	9/14/79	700	73	10.6	5.2	67	15.7	.29	.67	52	2.06	1.75	29	1089
7006-450		BALE	215:28-32	9/17/79	1092	136	12.5	5.4	69	17.8	.28	.81	42	2.54	1.54	26	853
7006-456		BALE	216:28-32	9/14/79	1578	137	8.7	4.4	66	13.1	.28	.50	71	1.93	3.20	35	917

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ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL MLS/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
7007-175		BALE	223:28-32	9/14/79	1758	168	9.6	5.7	62	15.3	.31	.54	68	2.68	3.04	47	1078
7007-206	Wi-Yard	BALE	230:28-32	9/14/79	1045	124	11.9	7.2	62	19.1	.30	.62	59	2.34	2.19	35	1062
I31-11A	BG x OP	BALE	323:21-24	9/14/79	1507	189	12.6	7.3	63	19.9	.24	.56	55	1.97	.23	41	897
I33-6	BG X OP	BALE	324:21-25	9/14/79	1397	106	7.6	4.9	61	12.5	.25	.77	42	2.20	.13	47	919
19001	BREWERS GOLD	BALE	302:01-05	9/07/79	1822	167	9.2	5.9	60	15.1	.30	0.00	0	3.42	1.68	41	891
21003	FUGGLE T	BALE	302:11-15	8/22/79	498	18	3.7	2.1	63	5.8	.31	.61	61	1.07	2.78	28	848
21014	HALLERTAU MF	BALE	326:01-05	8/15/79	299	16	5.4	5.5	49	10.9	.25	.74	46	.78	3.22	19	37
21015	TETTNANGER	BALE	327:01-05	8/15/79	149	8	5.6	5.3	51	10.9	.25	.58	59	.85	0.00	0	47
21016	FUGGLE N VF	BALE	304:01-02	8/15/79	320	19	6.2	3.4	64	9.6	.26	.43	76	1.28	0.00	0	46
21016	FUGGLE N VF	BALE	304:01-05	8/22/79	444	21	5.0	2.7	64	7.6	.34	.54	70	1.09	0.00	0	1018
21040	COLUMBIA	BALE	309:01-05	9/07/79	1382	102	7.4	4.1	64	11.6	.26	.43	75	0.00	2.13	38	990
21041	WILLAMETTE	BALE	310:01-05	9/13/79	1266	66	5.3	3.6	59	8.8	.27	.57	59	1.10	3.05	35	841
21042	6769-002	BALE	304:11-15	9/10/79	2252	79	3.6	4.1	46	7.7	.26	.78	45	1.53	0.00	0	999
21043	WYE CHALLENGER	BALE	328:01-05	8/29/79	928	69	7.5	5.3	58	12.8	.27	.46	63	1.67	2.91	25	185
21049	STYRIAN	BALE	329:01-02	8/15/79	789	39	5.0	2.7	65	7.6	.29	.52	65	1.04	0.00	0	39
21049	STYRIAN	BALE	329:01-05	8/22/79	626	28	4.5	2.6	63	7.1	.31	.55	68	1.09	0.00	0	830
21053	AURORA	BALE	330:01-05	8/29/79	889	93	10.6	4.3	71	14.8	.26	.43	71	1.47	0.00	0	861
21054	6806-067	BALE	317:06-10	8/29/79	1176	105	9.0	4.2	68	13.2	.28	.65	55	1.70	0.00	0	873
21055	6806-080	BALE	316:06-10	8/29/79	853	125	14.7	4.8	75	19.5	.28	.41	77	1.93	0.00	45	845
21056	BULLION 10A VF	BALE	308:01-05	8/29/79	1190	151	12.7	6.6	65	19.3	.22	.57	56	2.17	1.72	36	843
21078	RECORD	BALE	317:01-05	8/29/79	614	62	10.1	5.4	65	15.6	.22	.39	67	1.82	2.80	21	264
21081	DUNAV	BALE	305:06-10	9/07/79	811	48	6.0	3.9	60	9.9	.36	.48	77	1.32	0.00	27	827
21082	NEOPLANTA	BALE	306:06-10	8/29/79	1681	156	9.3	4.5	67	13.8	.24	.44	70	1.53	0.00	0	1048
21083	VOJVODINA	BALE	327:06-10	9/07/79	2048	175	8.6	3.8	69	12.3	.29	.43	71	.96	2.59	29	898
21091	6771-019	BALE	305:11-15	8/29/79	1135	42	3.7	5.1	42	8.8	.24	.81	44	1.89	0.00	0	1033
21092	CASCADE VF	BALE	306:01-05	8/29/79	1613	98	6.1	6.7	47	12.8	.22	.76	41	1.79	2.58	35	844
21093	N. BREWER VF	BALE	313:01-02	8/15/79	938	111	11.9	5.2	69	17.0	.27	.40	76	1.92	2.60	24	40
21094	6903-112	BALE	306:11-15	9/10/79	811	56	7.0	6.6	51	13.6	.23	.41	71	.69	1.38	0	998
21095	6903-259	BALE	307:11-15	9/10/79	700	40	5.9	5.1	53	11.0	.24	.35	85	.71	1.90	34	1071
21098	6913-068	BALE	309:11-15	9/10/79	2269	157	7.0	5.3	56	12.3	.31	1.07	26	1.15	0.00	22	1085
21099	6921-006	BALE	310:11-15	8/15/79	1200	102	8.5	7.2	54	15.7	.26	.63	54	2.18	1.54	30	45
21112	WYE TARGET VF	BALE	303:06-10	9/07/79	1315	147	11.2	4.1	73	15.3	.32	.80	41	1.81	0.00	0	882
21113	LUBELSKA-PULAWY	BALE	328:06-10	8/15/79	166	9	5.5	6.0	47	11.6	.27	.68	52	.87	3.20	23	43
21114	NADWISLANSKA	BALE	329:06-10	8/15/79	128	6	5.0	5.3	48	10.3	.26	.68	60	.89	3.12	23	42
21116	BREWERS GOLD VF	BALE	302:06-10	9/07/79	2423	256	10.6	5.1	67	15.7	.28	.86	38	3.01	1.83	37	901
21167	HYBRID 2 INDIA	BALE	321:01-05	9/14/79	1729	177	10.2	6.6	60	16.8	.27	.46	66	.87	.17	0	1066
21179	HERSBRUCKER-E	BALE	319:01-05	9/07/79	613	27	4.4	5.4	45	9.8	.25	.57	55	.75	0.00	0	890

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ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL ML/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
21180	7003-143	BALE	329:11-15	9/10/79	2466	207	8.4	7.7	52	16.1	.28	.66	50	2.25	2.22	31	1058
21181	7003-243	BALE	302:16-20	9/10/79	2413	145	6.1	7.2	45	13.3	.30	.84	40	1.35	0.00	40	1007
21182	GALENA, I43-16	BALE	301:21-25	8/22/79	816	90	11.0	7.4	59	18.4	.27	.41	84	.73	0.00	0	1104
21183	EROICA, I34-5	BALE	325:21-25	9/13/79	1525	178	11.7	4.7	71	16.4	.30	.75	42	1.03	.06	40	1017
21193	7005-194	BALE	315:16-20	8/31/79	1589	211	13.3	4.9	73	18.2	.26	.44	76	1.53	2.24	27	1101
21195	7006-408	BALE	309:21-25	9/14/79	1485	174	11.8	5.6	67	17.4	.29	.53	70	2.56	0.00	0	907
21200	7004-075	BALE	307:16-20	8/31/79	1271	141	11.2	4.5	71	15.6	.25	.63	53	2.20	0.00	0	862
21201	7005-070	BALE	312:16-20	8/31/79	1120	110	9.8	9.2	51	19.0	.28	.55	62	2.25	0.00	0	1092
21202	6903-107	BALE	314:11-15	9/10/79	2039	98	4.8	5.9	45	10.7	.27	.45	76	.80	3.35	32	1055
48209	FUGGLE H	BALE	303:01-02	8/15/79	533	21	4.1	2.3	64	6.4	.33	.49	83	1.11	0.00	0	41
48209	FUGGLE H	BALE	303:01-05	8/22/79	640	28	4.5	2.6	63	7.0	.33	.59	63	1.10	0.00	0	828
56013	CASCADE	BALE	305:01-05	8/29/79	1979	109	5.5	6.6	45	12.1	.24	.81	40	1.78	2.69	35	1029
62013	COMET	BALE	318:01-05	9/07/79	1339	134	10.1	4.8	67	14.9	.34	.92	33	2.15	.12	42	899
64100	BULLION	BALE	307:01-05	8/29/79	0	0	9.5	6.3	60	15.8	.27	.64	54	2.37	0.00	0	826
64107	N. BREWER	BALE	312:01-05	8/15/79	764	78	10.3	4.4	70	14.7	.26	.43	78	2.01	2.65	23	38
65009	BG X 19058M	BALE	303:11-15	9/10/79	1877	182	9.7	7.2	57	16.9	.35	1.13	25	3.03	0.00	0	1093
66052	PRIDE RINGWOOD	BALE	324:01-05	9/13/79	1630	134	8.2	7.3	52	15.6	.23	.53	58	1.21	.30	32	840
66054	CALICROSS	BALE	325:01-05	9/13/79	2122	153	7.2	6.3	53	13.5	.24	.37	81	1.00	0.00	0	1010
7003-003		BALE	318:11-15	9/10/79	1717	104	6.1	7.7	43	13.8	.27	.63	52	1.47	.09	41	1006
7003-015		BALE	319:11-15	9/10/79	1868	200	10.7	4.7	69	15.4	.23	.38	77	1.14	2.03	27	838
7003-081		BALE	326:11-15	9/10/79	1555	85	5.5	6.0	48	11.5	.29	.73	47	1.21	1.69	28	1028
7003-250		BALE	303:16-20	9/10/79	1574	139	8.9	7.1	55	16.0	.31	.96	31	2.46	2.42	31	986
7003-284		BALE	304:16-20	9/10/79	1689	67	4.0	8.6	31	12.6	.34	1.02	35	2.26	.08	37	995
7005-022		BALE	309:16-20	9/00/79	1348	144	10.7	3.9	73	14.6	.29	.70	53	2.90	2.11	37	1075
7005-040		BALE	310:16-20	9/14/79	1708	132	7.8	4.6	63	12.3	.25	.70	50	1.89	2.33	34	913
7005-149		BALE	311:16-20	9/10/79	2414	222	9.2	3.2	74	12.4	.31	.75	53	1.86	2.74	41	1063
7005-201		BALE	319:16-20	9/10/79	1851	159	8.6	5.2	62	13.8	.33	.86	40	1.88	2.47	36	1005
7005-205		BALE	320:16-20	9/10/79	832	99	11.9	5.1	70	17.0	.30	.77	42	2.51	1.62	45	992
7006-061		BALE	323:16-20	8/31/79	1075	101	9.4	2.6	78	12.1	.28	.42	78	1.09	2.38	30	875
7006-296		BALE	330:16-20	8/29/79	1273	177	14.0	7.2	66	21.1	.23	0.00	0	2.81	1.82	35	265
7006-445		BALE	311:21-25	8/31/79	2252	206	9.2	5.7	61	14.9	.28	.59	61	2.59	2.49	27	983
7006-450		BALE	312:21-25	8/31/79	1045	124	11.9	5.4	68	17.4	.28	.70	50	2.31	0.00	0	1106
7007-175		BALE	317:21-25	8/22/79	793	60	7.7	4.8	61	12.5	.32	.59	70	1.99	3.09	0	1118
7013-130		BALE	321:06-10	9/07/79	1544	122	7.9	5.9	57	13.8	.28	.98	28	2.09	1.23	37	885
7101-096		BALE	309:26-30	9/14/79	1672	70	4.2	3.3	56	7.5	.27	.64	57	1.07	3.05	0	1102
7101-098		BALE	310:29-30	8/22/79	1350	58	4.3	4.2	50	8.6	.32	.72	47	1.15	0.00	0	824
7101-098		BALE	310:28-30	8/31/79	1529	72	4.7	4.0	53	8.7	.29	.85	40	1.71	3.00	30	831

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ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL MLS/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
7101-099		BALE	311:29-30	8/22/79	1216	55	4.5	2.6	63	7.2	.27	.53	67	.89	3.01	22	864
7101-099		BALE	311:26-28	8/31/79	1244	62	5.1	2.9	63	7.9	.28	.65	60	1.47	2.19	0	1100
7101-175		BALE	315:28-30	8/22/79	1692	57	3.4	3.0	53	6.4	.24	.62	60	.89	0.00	0	975
7101-175		BALE	315:26-27	8/31/79	1386	47	3.4	3.4	49	6.8	.29	.84	42	1.14	3.00	28	867
7102-026		BALE	314:06-10	9/07/79	1723	80	4.7	4.5	51	9.1	.31	.95	38	1.03	2.65	39	892
7301-001		BALE	322:26-30	9/06/79	1118	60	5.4	2.7	66	8.1	.31	.43	82	.76	.01	34	1054
7301-003		BALE	323:26-30	9/06/79	1497	95	6.4	3.6	63	10.0	.62	1.12	37	1.77	.48	46	912
7301-034		BALE	324:26-30	9/06/79	1570	179	11.4	3.2	78	14.6	.32	.63	51	.98	.24	47	980
7301-183		BALE	325:26-30	9/06/79	1258	93	7.5	2.3	76	9.7	.42	.83	44	1.18	.04	40	905
7302-029	7302-146	BALE	326:26-30	9/67/9	1171	137	11.7	3.0	79	14.8	.30	.45	78	1.50	.06	42	932
7306-005		BALE	330:26-30	8/31/79	1092	99	9.1	6.1	59	15.2	.30	.63	60	1.89	0.00	0	1110
7306-043		BALE	303:31-35	9/05/79	1254	130	10.4	3.7	73	14.1	.29	.36	90	1.93	2.23	28	918
7306-091		BALE	305:31-35	9/05/79	802	73	9.2	2.9	76	12.1	.25	.43	74	1.67	1.89	28	927
7306-139		BALE	306:31-35	9/05/79	926	99	10.7	4.6	69	15.4	.27	.44	78	1.96	2.54	37	929
7306-148		BALE	307:31-35	9/05/79	1209	108	9.0	6.2	59	15.1	.29	.55	65	2.26	1.81	33	920
7306-182		BALE	308:31-35	9/05/79	1126	126	11.3	6.4	63	17.6	.24	.68	50	2.51	1.93	30	904
7307-023		BALE	309:31-35	9/05/79	1267	127	10.1	4.1	71	14.2	.31	.48	76	.67	2.29	25	1082
7307-051		BALE	310:31-35	8/22/79	640	61	9.7	3.1	75	12.7	.27	.41	75	1.25	3.32	28	818
7311-032		BALE	315:31-35	9/05/79	2159	279	13.0	4.0	76	16.9	.28	.39	85	1.50	1.28	34	922
7311-066		BALE	316:31-35	9/14/79	1152	127	11.1	7.9	58	19.0	.27	.74	48	3.25	1.44	44	1081
7311-068		BALE	317:31-35	9/06/79	2167	222	10.3	6.9	59	17.1	.30	.46	77	1.99	2.04	39	1056
7311-078		BALE	318:31-35	9/06/79	1113	122	11.0	3.3	77	14.3	.29	.39	81	.25	1.76	41	1036
7311-108		BALE	320:31-35	9/06/79	1634	219	13.4	4.4	75	17.9	.28	.55	61	1.67	1.39	45	974
7311-152		BALE	321:31-35	9/06/79	1519	213	14.0	4.9	74	19.0	.28	.47	71	2.01	.22	39	1057
7312-009		BALE	324:31-35	9/06/79	1275	220	17.3	6.6	72	23.9	.34	.48	69	2.87	2.63	38	883
7312-015		BALE	325:31-35	9/06/79	640	76	12.0	4.7	71	16.7	.31	.46	64	1.24	2.60	34	1083
7312-027		BALE	327:31-35	9/06/79	1041	143	13.8	4.2	76	18.0	.28	.46	72	1.92	1.49	29	1035
7312-036		BALE	323:06-10	9/07/79	619	66	10.8	5.9	64	16.6	.34	.37	76	1.56	2.32	38	894
7312-078		BALE	329:31-35	9/06/79	636	70	11.0	6.2	64	17.2	.28	.45	70	2.01	2.22	43	842
7312-083		BALE	325:06-10	9/07/79	1271	171	13.5	3.9	77	17.3	.29	.40	82	1.74	2.89	27	1034
7312-134		BALE	326:06-10	9/14/79	1530	165	10.8	5.0	68	15.8	.25	.33	87	1.38	2.46	38	896
7302-146		BALE	327:26-30	9/06/79	1443	137	9.6	3.4	73	13.0	.38	1.15	25	1.03	3.17	33	1076
7313-029		BALE	332:01-05	8/22/79	1141	129	11.3	4.9	69	16.2	.26	.45	73	1.85	2.68	29	822
7313-032		BALE	333:01-05	9/14/79	2240	264	11.8	5.6	67	17.5	.28	.54	68	2.87	1.35	0	1098
7313-043		BALE	334:01-05	8/29/79	1937	164	8.5	5.1	62	13.5	.29	.37	90	1.47	0.00	0	1030
7313-053		BALE	335:01-05	8/29/79	1160	126	10.9	5.0	68	15.9	.30	.41	73	2.12	1.57	39	260
7313-083		BALE	336:01-05	8/29/79	1424	219	15.4	6.5	70	21.9	.26	.46	64	2.78	1.52	36	266

AGRICULTURAL CHEMISTRY DEPT**OREGON STATE UNIVERSITY**AGRICULTURE RESEARCH**SEA**U S DEPT AGRICULTURE**CORVALLIS, OREGON

1979 BALE AND 5-CONE ANALYSES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (5-CONE) AS OF 80/10/09.

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL ML/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
7313-110		BALE	338:01-05	8/29/79	1540	188	12.3	5.1	70	17.4	.29	.61	58	2.43	2.45	37	836
7314-058		BALE	342:01-05	8/29/79	757	69	9.2	7.3	56	16.5	.25	.61	45	1.53	3.01	30	263
7315-063		BALE	343:01-05	8/29/79	1280	176	13.8	4.4	75	18.2	.27	.76	34	2.14	.13	28	874

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9 1979: cones

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL MLS/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
I14-24A	M.yard. East	CONE	041:19-20	9/12/79	0	0	6.2	4.9	55	11.1	.23	.56	61	0.00	0.00	45	227
I21-17A		CONE	042:19-20	9/12/79	0	0	4.5	8.3	35	12.8	.24	0.00	0	0.00	0.00	0	229
I32-13		CONE	044:19-20	9/12/79	0	0	10.1	3.7	73	13.9	.29	0.00	0	0.00	0.00	0	228
I35-29A	BG X OP	CONE	046:19-20	9/12/79	0	0	6.7	5.1	56	11.8	.24	.65	54	0.00	0.00	36	226
I43-24A		CONE	048:19-20	9/12/79	0	0	6.6	5.9	52	12.5	.27	.92	37	0.00	0.00	42	230
I47-17		CONE	049:19-20	9/12/79	0	0	7.1	5.8	54	12.9	.23	.61	57	0.00	0.00	25	233
I51-8A		CONE	052:19-20	9/12/79	0	0	8.0	3.9	67	11.9	.24	0.00	0	0.00	0.00	0	240
I55-12A		CONE	054:19-20	9/12/79	0	0	5.8	3.0	65	8.7	.26	0.00	0	0.00	0.00	0	236
W004-026		CONE	043:17-18	9/12/79	0	0	5.5	3.5	61	9.0	.26	0.00	0	0.00	0.00	0	190
W101-062		CONE	044:17-18	9/12/79	0	0	4.9	3.8	56	8.7	.35	0.00	0	0.00	0.00	0	193
W203-583		CONE	029:69-70	9/14/79	0	0	5.8	2.1	73	7.9	.24	0.00	0	0.00	0.00	0	331
W401-033		CONE	030:73-74	9/14/79	0	0	9.7	5.1	65	14.8	.26	0.00	0	0.00	0.00	0	375
W402-049		CONE	030:75-76	9/14/79	0	0	12.1	5.7	67	17.8	.23	.66	53	0.00	0.00	48	327
W404-005		CONE	030:77-78	9/14/79	0	0	10.6	3.6	74	14.2	.25	0.00	0	0.00	0.00	0	332
W404-015		CONE	029:77-78	9/14/79	0	0	9.5	4.2	69	13.7	.25	0.00	0	0.00	0.00	0	319
W404-022		CONE	029:81-82	9/14/79	0	0	7.3	4.2	63	11.4	.23	0.00	0	0.00	0.00	0	326
W404-036		CONE	029:89-90	9/13/79	0	0	7.5	3.0	71	10.5	.23	0.00	0	0.00	0.00	0	313
W404-049		CONE	029:91-92	9/14/79	0	0	9.9	4.0	71	13.9	.21	0.00	0	0.00	0.00	0	323
W405-012		CONE	030:79-80	9/14/79	0	0	7.9	4.5	63	12.4	.22	0.00	0	0.00	0.00	0	324
W405-062		CONE	030:81-82	9/14/79	0	0	10.7	5.7	65	16.5	.25	0.00	0	0.00	0.00	43	320
W405-071		CONE	030:85-86	9/14/79	0	0	12.9	4.6	73	17.5	.25	.77	45	0.00	0.00	32	321
W405-083		CONE	030:89-90	9/14/79	0	0	9.2	5.6	62	14.8	.25	0.00	0	0.00	0.00	0	322
W408-022		CONE	031:73-74	9/14/79	0	0	11.6	6.6	63	18.2	.26	0.00	0	0.00	0.00	0	374
W418-006		CONE	031:87-88	9/14/79	0	0	12.6	7.2	63	19.7	.29	0.00	0	0.00	0.00	37	373
W419-023		CONE	031:91-92	9/14/79	0	0	11.2	4.3	72	15.5	.26	0.00	0	0.00	0.00	0	372
19001	BREWERS GOLD	CONE	031:01-02	9/06/79	0	0	10.9	5.1	68	15.9	.25	.93	37	0.00	0.00	0	155
19012		CONE	032:49-50	8/31/79	0	0	3.5	4.0	46	7.6	.28	.87	40	0.00	0.00	0	97
19027		CONE	033:49-50	8/31/79	0	0	.7	2.5	22	3.2	.34	.49	67	0.00	0.00	48	119
19028		CONE	034:49-50	8/31/79	0	0	2.2	6.1	25	8.3	.23	.52	64	0.00	0.00	0	111
19105		CONE	001:49-50	8/29/79	0	0	1.4	7.0	16	8.3	.25	1.38	18	0.00	0.00	30	109
19110		CONE	002:49-50	8/29/79	0	0	6.1	5.6	52	11.7	.22	.29	92	0.00	0.00	55	101
19120		CONE	003:49-50	8/29/79	0	0	8.2	3.2	71	11.3	.26	.48	68	0.00	0.00	27	102
19137		CONE	004:49-50	8/29/79	0	0	6.8	3.0	69	9.8	.31	.48	68	0.00	0.00	29	110
19151		CONE	005:49-50	8/29/79	0	0	2.5	4.3	36	6.9	.25	.84	42	0.00	0.00	0	107
19185		CONE	006:49-50	8/29/79	0	0	4.7	2.5	65	7.2	.25	.39	78	0.00	0.00	37	100
19200		CONE	007:49-50	9/13/79	0	0	3.4	3.5	49	6.9	.29	0.00	0	0.00	0.00	0	366
21001	FR2	CONE	031:49-50	8/31/79	0	0	5.1	3.7	58	8.8	.26	.43	73	0.00	0.00	34	114

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21007	6735-005	CONE	041:49-50	8/31/79	0	0	3.1	2.2	58	5.3	.26	.34	84	0.00	0.00	0	91
21008	6735-001	CONE	042:49-50	8/31/79	0	0	5.8	3.6	61	9.4	.31	0.00	0	0.00	0.00	46	106
21021	6620-013	CONE	044:49-50	8/31/79	0	0	5.7	4.6	55	10.3	.23	1.31	20	0.00	0.00	62	90
21028	6616-003	CONE	023:51-52	8/31/79	0	0	8.2	5.9	58	14.1	.25	.45	71	0.00	0.00	34	51
21028	6616-003	CONE	036:01-02	9/06/79	0	0	8.8	5.3	62	14.1	.27	.59	58	0.00	0.00	34	144
21030	6616-019	CONE	024:51-52	8/31/79	0	0	6.7	6.8	49	13.5	.26	.73	48	0.00	0.00	39	68
21033	6618-010	CONE	029:51-52	8/31/79	0	0	10.1	4.4	69	14.5	.25	.68	51	0.00	0.00	38	50
21033	6618-010	CONE	039:01-02	9/06/79	0	0	9.0	5.3	62	14.3	.23	.87	40	0.00	0.00	0	163
21033	6618-010	CONE	026:51-52	9/14/79	0	0	7.2	4.4	61	11.7	.24	.89	39	0.00	0.00	0	318
21036	6619-013	CONE	040:01-02	9/06/79	0	0	10.5	7.8	57	18.3	.24	.65	54	0.00	0.00	37	150
21040	COLUMBIA	CONE	041:01-02	9/06/79	0	0	8.7	4.8	64	13.5	.24	.53	63	0.00	0.00	37	158
21055	6806-080	CONE	042:01-02	9/06/79	0	0	11.9	3.9	75	15.8	.29	.49	67	0.00	0.00	44	151
21057	LATE CL. SEEDL.	CONE	036:49-50	9/14/79	0	0	6.1	5.4	52	11.5	.23	.37	80	0.00	0.00	42	337
21062	6512-024	CONE	043:51-52	8/31/79	0	0	5.2	2.5	67	7.8	.27	.67	52	0.00	0.00	0	62
21063	6524-001	CONE	044:01-02	8/31/79	0	0	5.2	2.3	68	7.5	.31	.62	56	0.00	0.00	0	67
21063	6524-001	CONE	044:01-02	9/04/79	0	0	5.3	2.1	72	7.4	.28	.69	51	0.00	0.00	31	156
21084	YUGO IV/2	CONE	037:49-50	8/31/79	0	0	5.3	5.5	48	10.8	.25	.61	56	0.00	0.00	15	116
21085	YUGO VII/23	CONE	039:49-50	8/31/79	0	0	5.2	5.7	47	10.9	.23	.70	50	0.00	0.00	20	94
21086	YUGO VIII/27	CONE	040:49-50	8/31/79	0	0	6.0	5.4	52	11.4	.21	.60	57	0.00	0.00	19	108
21094	6903-112	CONE	009:49-50	8/31/79	0	0	4.5	3.9	53	8.4	.22	.33	86	0.00	0.00	0	104
21095	6903-259	CONE	010:49-50	9/13/79	0	0	5.4	5.7	48	11.0	.27	0.00	0	0.00	0.00	36	361
21097	HULLER BITTER	CONE	030:09-12	9/19/79	0	0	6.4	4.6	57	11.0	.24	.45	71	0.00	0.00	31	703
21122	7001-047	CONE	001:61	9/14/79	0	0	1.2	4.4	21	5.6	.36	0.00	0	0.00	0.00	0	390
21123	7001-054	CONE	001:69	9/14/79	0	0	.1	5.1	1	5.1	.30	0.00	0	0.00	0.00	0	386
21138	6701-054	CONE	016:49-50	8/31/79	0	0	1.7	2.3	41	3.9	.33	.32	88	0.00	0.00	0	113
21139	7604-138	CONE	024:49-50	9/13/79	0	0	1.8	4.0	30	5.7	.31	0.00	0	0.00	0.00	0	362
21140	6230-001	CONE	043:49-50	8/31/79	0	0	2.8	4.7	37	7.6	.28	.79	44	0.00	0.00	0	95
21143	6028-001	CONE	050:51-52	8/31/79	0	0	5.6	2.8	66	8.4	.29	.51	65	0.00	0.00	0	70
21144	6185-001	CONE	051:51-52	8/31/79	0	0	3.8	5.8	39	9.6	.25	1.05	31	0.00	0.00	0	65
21145	6305-004	CONE	052:51-52	9/14/79	0	0	3.8	4.1	48	7.9	.26	.57	59	0.00	0.00	0	345
21146	6305-005	CONE	053:51-52	9/14/79	0	0	4.4	2.7	61	7.2	.29	.71	49	0.00	0.00	0	346
21147	6305-006	CONE	054:51-52	8/31/79	0	0	5.6	2.4	70	8.0	.28	.38	79	0.00	0.00	34	49
21148	6305-007	CONE	055:51-52	8/31/79	0	0	6.2	2.4	72	8.5	.26	.55	62	0.00	0.00	33	63
21149	6616-002	CONE	048:51-52	9/14/79	0	0	8.0	5.8	57	13.7	.27	1.30	20	0.00	0.00	50	343
21150	6616-010	CONE	049:51-52	9/14/79	0	0	4.6	4.1	52	8.7	.25	1.02	32	0.00	0.00	0	339
21151	6616-020	CONE	030:51-52	9/14/79	0	0	7.8	6.2	55	14.0	.18	1.08	29	0.00	0.00	42	328
21152	6618-002	CONE	022:51-52	8/31/79	0	0	3.9	7.1	35	11.0	.32	1.44	16	0.00	0.00	0	48

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21154	6806-001	CONE	008:49-50	8/31/79	0	0	9.9	2.8	77	12.7	.28	.59	58	0.00	0.00	0	115
21154	6806-001	CONE	047:15-16	9/12/79	0	0	10.5	3.2	76	13.7	.27	.58	59	0.00	0.00	38	209
21155	6806-040	CONE	038:49-50	8/31/79	0	0	7.2	2.0	78	9.1	.29	.70	50	0.00	0.00	0	92
21155	6806-040	CONE	048:15-16	9/12/79	0	0	7.8	2.7	74	10.5	.27	.81	43	0.00	0.00	42	192
21156	6806-094	CONE	009:51-52	8/31/79	0	0	6.0	2.3	72	8.4	.27	.71	49	0.00	0.00	0	87
21156	6806-094	CONE	049:15-16	9/12/79	0	0	6.8	2.7	71	9.4	.29	1.28	21	0.00	0.00	0	205
21157	6806-098	CONE	048:49-50	8/31/79	0	0	6.6	3.4	65	10.1	.29	.55	62	0.00	0.00	40	93
21157	6806-098	CONE	050:15-16	9/11/79	0	0	5.9	3.1	65	9.0	.26	0.00	0	0.00	0.00	0	197
21158	6806-099	CONE	049:49-50	8/31/79	0	0	11.3	2.9	79	14.1	.25	.85	41	0.00	0.00	32	98
21158	6806-099	CONE	051:15-16	9/12/79	0	0	9.7	3.0	76	12.7	.25	.96	35	0.00	0.00	0	200
21159	6818-043	CONE	053:15-16	9/12/79	0	0	4.2	8.2	34	12.4	.23	0.00	0	0.00	0.00	0	196
21159	6818-043	CONE	010:51-52	9/14/79	0	0	3.3	7.3	31	10.5	.22	.62	56	0.00	0.00	0	317
21160	6901-140	CONE	051:49-50	8/31/79	0	0	4.0	6.1	39	10.1	.26	.28	93	0.00	0.00	0	69
21160	6901-140	CONE	032:17-18	9/12/79	0	0	4.1	5.7	42	9.8	.22	.37	80	0.00	0.00	0	246
21161	6903-226	CONE	039:51-52	8/31/79	0	0	2.6	6.1	29	8.7	.22	.48	68	0.00	0.00	0	58
21161	6903-226	CONE	036:17-18	9/12/79	0	0	3.7	7.6	32	11.3	.23	0.00	0	0.00	0.00	0	198
21162	6903-263	CONE	037:17-18	9/12/79	0	0	4.5	6.2	42	10.6	.22	0.00	0	0.00	0.00	0	195
21162	6903-263	CONE	040:51-52	9/14/79	0	0	5.9	6.4	48	12.3	.24	.42	75	0.00	0.00	29	334
21163	6907-058	CONE	052:49-50	8/31/79	0	0	5.6	7.2	43	12.8	.24	.34	84	0.00	0.00	31	64
21163	6907-058	CONE	039:17-18	9/12/79	0	0	5.1	8.2	38	13.3	.23	0.00	0	0.00	0.00	36	194
21164	6907-077	CONE	055:49-50	8/31/79	0	0	5.0	8.0	38	13.0	.22	.37	80	0.00	0.00	0	54
21164	6907-077	CONE	040:17-18	9/12/79	0	0	6.5	8.1	44	14.5	.22	.44	72	0.00	0.00	38	212
21165	6913-096	CONE	041:17-18	9/12/79	0	0	6.7	8.3	44	15.0	.23	.68	51	0.00	0.00	35	191
21166	6916-024	CONE	042:17-18	9/12/79	0	0	7.8	6.7	53	14.5	.24	.71	50	0.00	0.00	36	199
21169	TARDIF D'BOURG	CONE	024:01-04	9/19/79	0	0	4.7	5.6	45	10.3	.23	.33	86	0.00	0.00	0	716
21170	ELSASSER	CONE	025:01-04	9/19/79	0	0	3.0	5.9	33	8.9	.25	.38	79	0.00	0.00	0	696
21171	HERSBRUCKER-P	CONE	026:01-04	9/19/79	0	0	3.8	2.3	62	6.0	.29	.54	62	0.00	0.00	25	717
21180	7003-143	CONE	034:51-52	9/14/79	0	0	6.5	7.5	46	14.0	.23	.66	53	0.00	0.00	26	329
21181	7003-243	CONE	035:51-52	8/31/79	0	0	6.7	5.5	54	12.2	.24	.35	83	0.00	0.00	39	71
21182	GALENA, I43-16	CONE	008:05-08	9/19/79	0	0	5.6	3.8	59	9.4	.24	.32	86	0.00	0.00	41	714
50024	BB 301-2	CONE	011:49-50	9/13/79	0	0	8.7	3.7	70	12.3	.25	0.00	0	0.00	0.00	0	351
50040	BB301-1	CONE	046:49-50	8/31/79	0	0	3.2	5.6	36	8.8	.23	.48	68	0.00	0.00	0	96
50075	BB 101-2	CONE	047:49-50	8/31/79	0	0	4.3	3.1	58	7.4	.26	.48	68	0.00	0.00	0	89
52013	84-S, BB 215-2	CONE	050:49-50	8/31/79	0	0	4.0	6.0	39	9.9	.24	.42	75	0.00	0.00	0	66
53050	109I	CONE	053:49-50	8/31/79	0	0	1.1	2.6	29	3.7	.29	.43	73	0.00	0.00	0	53
54002	BB 504-3	CONE	054:49-50	8/31/79	0	0	1.8	1.2	59	3.0	.29	.46	70	0.00	0.00	0	52
54003	BB 504-2	CONE	031:51-52	9/14/79	0	0	5.7	3.1	64	8.8	.26	.71	49	0.00	0.00	0	325

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ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL MLS/ 100G	OIL HUM/ CARY	OIL COH	SERIAL NUMBER
54005	BB 507-3	CONE	033:51-52	8/31/79	0	0	1.4	2.0	42	3.4	.35	.57	60	0.00	0.00	0	59
56008	OB 826	CONE	013:49-50	8/31/79	0	0	8.8	5.8	60	14.6	.26	.69	51	0.00	0.00	37	103
56012	73-S	CONE	014:49-50	9/13/79	0	0	5.2	2.5	67	7.7	.30	0.00	0	0.00	0.00	0	354
56013	CASCADE	CONE	001:13	9/17/79	0	0	4.7	4.9	49	9.6	.23	.93	36	0.00	0.00	0	512
56013	CASCADE	CONE	046:47	9/19/79	0	0	5.3	5.1	50	10.4	.24	.73	48	0.00	0.00	36	671
58112	OB 835	CONE	019:49-50	9/13/79	0	0	6.0	2.7	68	8.7	.32	0.00	0	0.00	0.00	0	348
60014	ARIZ 1-3	CONE	020:49-50	9/13/79	0	0	1.9	2.7	42	4.6	.33	0.00	0	0.00	0.00	0	356
60015	ARIZ 1-4	CONE	021:49-50	9/13/79	0	0	1.7	2.3	42	4.1	.27	0.00	0	0.00	0.00	0	364
60016	NM 1-3	CONE	022:49-50	8/31/79	0	0	3.2	3.1	50	6.3	.27	.48	68	0.00	0.00	70	112
60020	NM 2-4	CONE	025:49-50	9/13/79	0	0	1.8	3.8	32	5.7	.25	0.00	0	0.00	0.00	0	357
60021	NM 3-1	CONE	026:49-50	9/14/79	0	0	4.6	2.1	69	6.7	.24	.62	56	0.00	0.00	64	335
60024	COLO 1-2	CONE	027:49-50	8/31/79	0	0	5.3	3.6	59	8.8	.26	.53	63	0.00	0.00	62	117
60025	COLO 1-3	CONE	028:49-50	8/31/79	0	0	5.4	3.6	60	8.9	.25	.48	68	0.00	0.00	58	105
60027	COLO 2-2	CONE	029:49-50	9/14/79	0	0	2.2	3.4	38	5.6	.30	1.02	32	0.00	0.00	57	341
60029	COLO 3-1	CONE	030:49-50	8/31/79	0	0	6.2	4.3	58	10.6	.26	.45	71	0.00	0.00	70	99
60032	COLO 5-1	CONE	001:51-52	8/31/79	0	0	1.9	1.1	63	3.0	.27	.36	81	0.00	0.00	46	82
60033	COLO 6-1	CONE	002:51-52	8/31/79	0	0	1.1	2.3	32	3.4	.23	.49	67	0.00	0.00	68	88
60035	COLO 7-2	CONE	004:51-52	9/14/79	0	0	2.6	2.7	48	5.3	.29	.66	52	0.00	0.00	0	316
60037	WYO 2-1	CONE	005:51-52	8/31/79	0	0	5.9	4.6	56	10.4	.24	.28	93	0.00	0.00	42	73
60038	WYO 3-1	CONE	006:51-52	8/31/79	0	0	1.7	3.4	33	5.1	.29	1.09	29	0.00	0.00	62	72
61008	C2/66 POLAND	CONE	037:51-52	8/31/79	0	0	3.2	4.4	42	7.7	.24	.53	63	0.00	0.00	20	60
61011	P/K1 POLAND	CONE	038:51-52	8/31/79	0	0	4.9	4.2	53	9.1	.27	.49	67	0.00	0.00	22	55
61017	N18 USSR	CONE	042:51-52	8/31/79	0	0	3.9	4.5	46	8.4	.23	.61	56	0.00	0.00	21	61
62013	COMET	CONE	054:01-02	9/06/79	0	0	7.7	3.2	70	10.9	.25	.87	39	0.00	0.00	39	147
63008	N 48-8	CONE	011:51-52	8/31/79	0	0	4.4	4.7	48	9.1	.25	1.22	24	0.00	0.00	0	83
63018	N 47-35	CONE	012:51-52	9/14/79	0	0	5.5	5.9	48	11.4	.27	1.00	33	0.00	0.00	18	315
63019	N 47-40	CONE	013:51-52	9/14/79	0	0	7.4	4.4	62	11.8	.25	.62	56	0.00	0.00	0	333
63020	N 47-42	CONE	014:51-52	9/14/79	0	0	7.5	5.4	58	12.9	.28	.60	57	0.00	0.00	32	314
63021	N 48-1	CONE	015:51-52	9/14/79	0	0	4.0	5.6	41	9.6	.22	.68	51	0.00	0.00	0	330
63027	BG X 19040M	CONE	016:51-52	9/14/79	0	0	3.6	5.4	39	9.0	.21	.56	61	0.00	0.00	0	338
63032	BA X 58015M	CONE	035:49-50	8/31/79	0	0	7.2	4.0	64	11.2	.27	.61	56	0.00	0.00	0	118
64002		CONE	017:51-52	9/14/79	0	0	2.3	4.2	35	6.5	.27	.61	56	0.00	0.00	0	342
64003		CONE	018:51-52	9/14/79	0	0	1.5	4.6	24	6.0	.22	.89	39	0.00	0.00	32	336
64007		CONE	017:49-50	9/13/79	0	0	3.0	7.7	27	10.7	.25	0.00	0	0.00	0.00	30	355
64008		CONE	019:51-52	8/31/79	0	0	7.6	5.4	58	13.0	.24	.63	55	0.00	0.00	21	86
64009		CONE	020:51-52	8/31/79	0	0	5.5	3.0	64	8.5	.31	.64	54	0.00	0.00	0	819
64010		CONE	021:51-52	8/31/79	0	0	3.4	4.6	42	8.0	.25	.41	75	0.00	0.00	0	78

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL ML/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
64020		CONE	044:51-52	9/14/79	0	0	4.2	2.4	63	6.6	.30	.59	58	0.00	0.00	0	344
64026		CONE	045:51-52	9/14/79	0	0	4.9	6.4	43	11.3	.24	.64	54	0.00	0.00	0	340
64100	BULLION	CONE	035:03-04	9/06/79	0	0	11.4	4.1	73	15.4	.25	.66	53	0.00	0.00	0	143
64106	WYE 22/56/2	CONE	046:51-52	8/31/79	0	0	7.0	8.0	46	15.0	.26	.72	49	0.00	0.00	25	57
65009	BG X 19058M	CONE	028:51-52	8/31/79	0	0	11.4	8.5	57	19.9	.23	.79	44	0.00	0.00	34	56
7003-004		CONE	032:07-08	9/06/79	0	0	8.9	6.1	59	15.0	.23	.62	56	0.00	0.00	42	170
7003-029		CONE	032:19-20	9/12/79	0	0	2.2	9.1	19	11.3	.21	0.00	0	0.00	0.00	0	232
7003-038		CONE	010:47-48	9/13/79	0	0	6.1	5.3	53	11.4	.28	0.00	0	0.00	0.00	35	353
7003-046		CONE	033:07-08	9/06/79	0	0	9.4	4.2	68	13.6	.23	0.00	0	0.00	0.00	0	169
7003-052		CONE	033:19-20	9/12/79	0	0	2.2	10.6	17	12.9	.21	0.00	0	0.00	0.00	0	247
7003-066		CONE	011:47-48	9/13/79	0	0	4.7	4.2	52	8.9	.27	0.00	0	0.00	0.00	0	349
7003-081		CONE	012:47-48	9/13/79	0	0	7.4	5.5	57	12.9	.24	0.00	0	0.00	0.00	29	359
7003-114		CONE	034:07-08	9/06/79	0	0	3.5	4.3	44	7.8	.25	0.00	0	0.00	0.00	0	168
7003-118		CONE	035:07-08	9/06/79	0	0	5.2	7.6	40	12.8	.24	.32	87	0.00	0.00	39	167
7003-121		CONE	036:07-08	9/06/79	0	0	5.0	2.5	66	7.4	.25	0.00	0	0.00	0.00	0	171
7003-176		CONE	013:47-48	9/13/79	0	0	8.0	5.9	57	13.8	.26	0.00	0	0.00	0.00	46	350
7003-284		CONE	014:47-48	9/13/79	0	0	2.2	4.5	32	6.7	.24	0.00	0	0.00	0.00	0	358
7003-287		CONE	041:07-08	9/06/79	0	0	10.0	7.2	58	17.1	.25	1.08	29	0.00	0.00	29	166
7003-306		CONE	043:07-08	9/06/79	0	0	6.1	5.9	51	12.0	.28	.80	43	0.00	0.00	24	145
7004-138		CONE	034:19-20	9/12/79	0	0	5.8	10.0	36	15.8	.22	0.00	0	0.00	0.00	0	234
7005-002		CONE	035:19-20	9/12/79	0	0	9.6	5.1	65	14.6	.27	0.00	0	0.00	0.00	0	235
7005-006		CONE	015:47-48	9/13/79	0	0	9.7	5.0	65	14.7	.26	0.00	0	0.00	0.00	0	371
7005-008		CONE	036:19-20	9/12/79	0	0	8.8	4.1	68	13.0	.27	0.00	0	0.00	0.00	0	242
7005-014		CONE	037:19-20	9/12/79	0	0	8.5	5.7	60	14.1	.24	.38	79	0.00	0.00	51	231
7005-040		CONE	016:47-48	9/13/79	0	0	6.6	3.4	65	10.0	.26	0.00	0	0.00	0.00	0	360
7005-087		CONE	017:47-48	9/13/79	0	0	10.6	3.2	76	13.8	.28	0.00	0	0.00	0.00	0	367
7005-113		CONE	046:07-08	9/06/79	0	0	12.1	7.6	61	19.7	.24	.86	40	0.00	0.00	37	149
7005-123		CONE	047:07-08	9/06/79	0	0	10.8	7.2	59	18.0	.26	.68	52	0.00	0.00	34	140
7005-149		CONE	043:03-04	9/06/79	0	0	12.6	3.6	77	16.3	.24	.41	75	0.00	0.00	40	153
7005-178		CONE	049:07-08	9/06/79	0	0	5.4	3.0	64	8.3	.30	0.00	0	0.00	0.00	0	139
7005-182		CONE	018:47-48	9/13/79	0	0	10.7	4.3	71	15.0	.27	0.00	0	0.00	0.00	0	347
7005-183		CONE	050:07-08	9/06/79	0	0	9.9	5.0	66	15.0	.23	0.00	0	0.00	0.00	0	146
7005-201		CONE	019:47-48	9/13/79	0	0	10.9	5.5	66	16.3	.26	0.00	0	0.00	0.00	0	363
7006-055		CONE	052:07-08	9/06/79	0	0	9.5	8.6	52	18.1	.20	.97	34	0.00	0.00	28	142
7006-061		CONE	043:03-04	9/06/79	0	0	10.8	3.0	78	13.8	.30	0.00	0	0.00	0.00	0	154
7006-061		CONE	020:47-48	9/13/79	0	0	7.2	2.0	78	9.2	.32	0.00	0	0.00	0.00	0	365
7006-074		CONE	053:07-08	9/06/79	0	0	9.2	4.7	66	13.9	.25	0.00	0	0.00	0.00	0	141

AGRICULTURAL CHEMISTRY DEPT**OREGON STATE UNIVERSITY**AGRICULTURE RESEARCH**SEA**U S DEPT AGRICULTURE**CORVALLIS, OREGON

1979 BALE AND 5-CONE ANALYSES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (5-CONE) AS OF 80/10/09.

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL ML/ 100G	OIL HUM/ CARY	OIL COH	SERIAL NUMBER
7006-095		CONE	054:07-08	9/06/79	0	0	12.2	6.2	66	18.4	.25	.65	54	0.00	0.00	37	148
7006-170		CONE	032:09-10	9/06/79	0	0	8.9	4.9	64	13.8	.24	0.00	0	0.00	0.00	0	173
7006-229		CONE	035:09-10	9/06/79	0	0	11.3	6.7	62	17.9	.23	0.00	0	0.00	0.00	0	165
7006-237		CONE	037:09-10	9/10/79	0	0	9.5	5.3	64	14.8	.29	0.00	0	0.00	0.00	0	253
7006-273		CONE	039:09-10	9/10/79	0	0	11.5	3.5	76	15.0	.29	0.00	0	0.00	0.00	0	250
7006-276		CONE	040:09-10	9/10/79	0	0	11.8	5.1	69	16.9	.24	0.00	0	0.00	0.00	0	255
7006-278		CONE	021:47-48	9/13/79	0	0	7.2	2.4	74	9.6	.33	0.00	0	0.00	0.00	0	369
7006-302		CONE	022:47-48	9/13/79	0	0	11.7	4.1	74	15.8	.27	0.00	0	0.00	0.00	0	370
7006-318		CONE	023:47-48	9/13/79	0	0	12.8	4.5	73	17.3	.31	0.00	0	0.00	0.00	22	352
7006-321		CONE	044:09-10	9/10/79	0	0	6.5	2.0	76	8.5	.31	0.00	0	0.00	0.00	0	248
7006-331		CONE	048:09-10	9/10/79	0	0	8.6	4.5	65	13.1	.25	0.00	0	0.00	0.00	0	252
7006-336		CONE	024:47-48	9/13/79	0	0	10.4	6.7	60	17.1	.27	0.00	0	0.00	0.00	35	368
7006-370		CONE	025:47-48	9/12/79	0	0	10.0	8.8	53	18.8	.25	.79	44	0.00	0.00	20	214
7006-382		CONE	052:09-10	9/10/79	0	0	11.6	4.2	73	15.8	.29	0.00	0	0.00	0.00	37	244
7006-398		CONE	026:47-48	9/12/79	0	0	14.5	7.3	66	21.8	.24	.48	68	0.00	0.00	0	202
7006-406		CONE	027:47-48	9/12/79	0	0	9.5	3.7	71	13.2	.25	0.00	0	0.00	0.00	0	213
7006-408		CONE	028:47-48	9/12/79	0	0	10.9	4.2	72	15.0	.29	0.00	0	0.00	0.00	0	201
7006-428		CONE	032:11-12	9/10/79	0	0	8.4	2.9	74	11.3	.26	0.00	0	0.00	0.00	0	257
7006-435		CONE	029:47-48	9/12/79	0	0	10.8	4.9	68	15.7	.29	0.00	0	0.00	0.00	0	216
7006-444		CONE	034:11-12	9/10/79	0	0	10.5	5.7	64	16.2	.25	0.00	0	0.00	0.00	0	241
7006-456		CONE	030:47-48	9/12/79	0	0	11.0	4.5	71	15.5	.27	0.00	0	0.00	0.00	0	208
7006-463		CONE	035:11-12	9/10/79	0	0	13.1	6.1	68	19.2	.25	.59	58	0.00	0.00	24	243
7006-465		CONE	036:11-12	9/10/79	0	0	9.9	3.6	73	13.5	.24	0.00	0	0.00	0.00	0	258
7007-003		CONE	038:19-20	9/12/79	0	0	3.0	2.7	52	5.7	.27	0.00	0	0.00	0.00	0	238
7007-009		CONE	039:19-20	9/12/79	0	0	3.8	2.7	58	6.6	.27	0.00	0	0.00	0.00	0	239
7007-019		CONE	038:11-12	9/10/79	0	0	5.6	1.5	78	7.2	.28	0.00	0	0.00	0.00	0	259
7007-097		CONE	040:11-12	9/10/79	0	0	4.8	4.0	54	8.8	.31	0.00	0	0.00	0.00	0	245
7007-137		CONE	041:11-12	9/10/79	0	0	5.5	3.7	59	9.2	.25	.58	59	0.00	0.00	30	249
7007-162		CONE	042:11-12	9/10/79	0	0	8.9	4.5	66	13.4	.26	0.00	0	0.00	0.00	0	251
7007-229		CONE	045:11-12	9/10/79	0	0	4.3	2.6	62	6.8	.34	0.00	0	0.00	0.00	0	254
7007-324		CONE	051:11-12	9/10/79	0	0	5.7	5.2	51	10.9	.25	.65	53	0.00	0.00	30	256
7301-008		CONE	031:23-24	8/31/79	0	0	6.9	1.8	79	8.8	.27	0.00	0	0.00	0.00	0	75
7301-009		CONE	032:23-24	9/12/79	0	0	11.3	3.5	76	14.8	.26	0.00	0	0.00	0.00	0	237
7301-126		CONE	033:23-24	9/12/79	0	0	14.3	4.8	75	19.1	.24	.46	70	0.00	0.00	42	223
7301-139		CONE	034:23-24	9/12/79	0	0	15.3	4.9	75	20.2	.29	.61	56	0.00	0.00	31	222
7302-037		CONE	035:23-24	9/12/79	0	0	8.1	2.6	75	10.7	.24	0.00	0	0.00	0.00	0	224
7302-041		CONE	036:23-24	8/31/79	0	0	11.5	5.0	69	16.5	.27	0.00	0	0.00	0.00	0	80

AGRICULTURAL CHEMISTRY DEPT**OREGON STATE UNIVERSITY**AGRICULTURE RESEARCH**SEA**U S DEPT AGRICULTURE**CORVALLIS, OREGON

1979 BALE AND 5-CONE ANALYSES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (5-CONE) AS OF 80/10/09.

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL MLS/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
7302-113		CONE	037:23-24	9/12/79	0	0	9.9	3.7	72	13.6	.27	0.00	0	0.00	0.00	0	204
7302-172		CONE	038:23-24	9/12/79	0	0	8.3	3.1	72	11.4	.27	0.00	0	0.00	0.00	0	210
7302-178		CONE	039:23-24	8/31/79	0	0	8.2	4.2	66	12.4	.29	0.00	0	0.00	0.00	0	76
7303-122		CONE	040:23-24	8/31/79	0	0	9.4	4.2	69	13.5	.30	0.00	0	0.00	0.00	0	84
7303-197		CONE	041:23-24	9/12/79	0	0	10.1	2.7	79	12.8	.30	0.00	0	0.00	0.00	0	221
7303-200		CONE	042:23-24	9/12/79	0	0	7.8	7.0	52	14.8	.28	.83	42	0.00	0.00	38	203
7304-010		CONE	043:23-24	9/12/79	0	0	12.5	4.8	72	17.2	.28	.92	37	0.00	0.00	36	206
7304-107		CONE	045:23-24	9/12/79	0	0	13.0	3.4	79	16.4	.26	1.00	33	0.00	0.00	29	225
7305-005		CONE	047:23-24	8/31/79	0	0	10.0	5.7	63	15.8	.24	0.00	0	0.00	0.00	0	77
7305-152		CONE	049:23-24	8/31/79	0	0	9.8	5.7	63	15.5	.24	0.00	0	0.00	0.00	0	81
7306-008		CONE	050:23-24	8/31/79	0	0	8.8	3.2	73	12.0	.27	0.00	0	0.00	0.00	63	79
7306-030		CONE	051:23-24	8/31/79	0	0	8.9	3.3	73	12.2	.28	0.00	0	0.00	0.00	0	85
7306-097		CONE	054:23-24	8/31/79	0	0	9.5	4.1	70	13.5	.27	0.00	0	0.00	0.00	0	136
7306-163		CONE	032:25-26	8/31/79	0	0	12.0	3.9	75	16.0	.26	.35	83	0.00	0.00	29	127
7306-190		CONE	035:25-26	9/12/79	0	0	10.8	5.0	68	15.7	.27	0.00	0	0.00	0.00	0	219
7306-193		CONE	036:25-26	8/31/79	0	0	12.4	4.2	74	16.6	.26	.34	84	0.00	0.00	32	125
7306-194		CONE	037:25-26	8/31/79	0	0	8.5	3.4	71	12.0	.25	0.00	0	0.00	0.00	0	131
7307-043		CONE	040:25-26	8/31/79	0	0	10.6	3.7	74	14.3	.29	0.00	0	0.00	0.00	30	132
7307-052		CONE	041:25-26	8/31/79	0	0	7.5	2.3	76	9.8	.27	0.00	0	0.00	0.00	30	129
7308-061		CONE	042:25-26	9/12/79	0	0	6.4	7.0	47	13.4	.26	.64	54	0.00	0.00	31	207
7308-064		CONE	043:25-26	8/31/79	0	0	7.4	2.7	73	10.2	.30	0.00	0	0.00	0.00	0	135
7309-048		CONE	044:25-26	8/31/79	0	0	7.9	2.7	74	10.7	.31	0.00	0	0.00	0.00	0	137
7309-068		CONE	046:25-26	8/31/79	0	0	9.3	4.4	67	13.7	.29	0.00	0	0.00	0.00	0	128
7310-027		CONE	047:25-26	8/31/79	0	0	8.0	2.5	76	10.5	.25	0.00	0	0.00	0.00	0	133
7310-029		CONE	048:25-26	8/31/79	0	0	6.3	7.0	47	13.2	.25	.83	42	0.00	0.00	30	138
7311-022		CONE	049:25-26	9/12/79	0	0	12.3	4.8	71	17.1	.27	.60	57	0.00	0.00	38	220
7311-028		CONE	050:25-26	9/12/79	0	0	15.2	5.5	73	20.7	.24	.39	78	0.00	0.00	38	218
7312-051		CONE	054:25-26	8/31/79	0	0	11.4	3.5	76	14.9	.26	0.00	0	0.00	0.00	0	134
7312-053		CONE	055:25-26	9/12/79	0	0	13.6	3.4	80	17.0	.27	.56	60	0.00	0.00	26	217
7312-057		CONE	031:27-28	9/04/79	0	0	10.2	2.1	82	12.3	.27	0.00	0	0.00	0.00	0	120
7312-060		CONE	032:27-28	9/04/79	0	0	7.4	1.8	80	9.1	.27	0.00	0	0.00	0.00	0	126
7312-081		CONE	033:27-28	9/04/79	0	0	11.2	3.0	78	14.2	.35	0.00	0	0.00	0.00	0	124
7312-084		CONE	034:27-28	9/04/79	0	0	10.9	2.7	80	13.6	.30	0.00	0	0.00	0.00	0	122
7312-106		CONE	035:27-28	9/12/79	0	0	14.3	4.9	74	19.3	.26	.54	62	0.00	0.00	38	215
7312-115		CONE	036:27-28	9/12/79	0	0	11.8	3.2	78	14.9	.30	0.00	0	0.00	0.00	0	211
7312-116		CONE	037:27-28	9/04/79	0	0	10.1	2.9	77	12.9	.29	0.00	0	0.00	0.00	0	130
7312-124		CONE	039:27-28	9/04/79	0	0	5.6	2.0	74	7.6	.35	0.00	0	0.00	0.00	0	121

1979 BALE AND 5-CONE ANALYSES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (5-CONE) AS OF 80/10/09.

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL MLS/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
7312-128		CONE	040:27-28	9/04/79	0	0	13.4	3.6	78	17.0	.28	.34	84	0.00	0.00	33	123
7312-133		CONE	041:27-28	9/04/79	0	0	11.9	3.3	78	15.3	.26	0.00	0	0.00	0.00	0	162
7313-028		CONE	042:27-28	9/04/79	0	0	11.3	4.4	71	15.7	.27	0.00	0	0.00	0.00	0	159
7313-111		CONE	044:27-28	9/04/79	0	0	12.7	5.3	70	18.0	.23	.47	69	0.00	0.00	41	161
7314-033		CONE	045:27-28	9/04/79	0	0	9.3	4.3	68	13.6	.27	0.00	0	0.00	0.00	0	157
7315-001		CONE	047:27-28	9/04/79	0	0	11.7	3.3	78	14.9	.25	0.00	0	0.00	0.00	43	160
7315-035		CONE	049:27-28	9/06/79	0	0	14.0	3.5	79	17.5	.26	.67	52	0.00	0.00	27	152
7315-103		CONE	050:27-28	9/04/79	0	0	9.7	2.2	81	11.8	.25	0.00	0	0.00	0.00	39	172
7317-001		CONE	050:05-06	9/06/79	0	0	.8	3.8	16	4.6	.27	0.00	0	0.00	0.00	0	164
7501-002		CONE	001:64	9/14/79	0	0	0.0	4.6	0	4.6	.44	0.00	0	0.00	0.00	0	380
7501-004		CONE	001:66	9/14/79	0	0	0.0	12.2	0	12.2	.27	0.00	0	0.00	0.00	0	379
7502-004		CONE	001:73	9/14/79	0	0	.5	3.2	14	3.7	.32	0.00	0	0.00	0.00	0	387
7502-005		CONE	001:74	9/14/79	0	0	.1	5.7	1	5.8	.27	0.00	0	0.00	0.00	0	378
7502-006		CONE	001:75	9/14/79	0	0	0.0	5.6	0	5.6	.33	0.00	0	0.00	0.00	0	388
7502-007		CONE	001:76	9/14/79	0	0	.2	7.6	2	7.8	.34	0.00	0	0.00	0.00	0	381
7502-009		CONE	001:78	9/14/79	0	0	.2	2.7	8	3.0	.36	0.00	0	0.00	0.00	0	383
7502-016		CONE	001:85	9/14/79	0	0	.5	6.6	7	7.1	.31	0.00	0	0.00	0.00	0	389
7502-017		CONE	001:86	9/14/79	0	0	.3	3.5	7	3.8	.29	0.00	0	0.00	0.00	0	391
7502-018		CONE	001:87	9/14/79	0	0	0.0	6.0	0	6.0	.27	0.00	0	0.00	0.00	0	382
7502-022		CONE	001:91	9/14/79	0	0	0.0	10.8	0	10.8	.27	0.00	0	0.00	0.00	0	385
7502-024		CONE	001:93	9/14/79	0	0	0.0	5.9	0	5.9	.31	0.00	0	0.00	0.00	0	377
7503-001		CONE	002:61	9/17/79	0	0	.7	2.8	19	3.5	.30	0.00	0	0.00	0.00	0	471
7503-002		CONE	002:62	9/17/79	0	0	1.0	4.3	18	5.3	.27	0.00	0	0.00	0.00	0	466
7503-004		CONE	002:64	9/17/79	0	0	.4	2.8	12	3.1	.45	0.00	0	0.00	0.00	0	481
7503-006		CONE	002:66	9/17/79	0	0	.6	.8	42	1.4	.45	0.00	0	0.00	0.00	0	498
7503-008		CONE	002:68	9/17/79	0	0	.3	2.2	13	2.5	.43	0.00	0	0.00	0.00	0	494
7503-009		CONE	002:69	9/17/79	0	0	.2	3.9	3	4.1	.42	0.00	0	0.00	0.00	0	493
7503-010		CONE	002:70	9/17/79	0	0	.4	2.5	14	2.9	.42	0.00	0	0.00	0.00	0	487
7503-011		CONE	002:71	9/17/79	0	0	.2	2.9	7	3.1	.34	0.00	0	0.00	0.00	0	491
7503-012		CONE	002:72	9/17/79	0	0	.2	1.1	17	1.4	.51	0.00	0	0.00	0.00	0	477
7503-013		CONE	002:73	9/17/79	0	0	.2	2.6	7	2.8	.52	0.00	0	0.00	0.00	0	475
7503-014		CONE	002:74	9/17/79	0	0	.5	2.5	16	3.1	.45	0.00	0	0.00	0.00	0	497
7503-015		CONE	002:75	9/17/79	0	0	.5	3.9	10	4.3	.33	0.00	0	0.00	0.00	0	485
7503-017		CONE	002:77	9/17/79	0	0	.4	2.4	13	2.8	.41	0.00	0	0.00	0.00	0	482
7503-018		CONE	002:78	9/17/79	0	0	0.0	4.8	0	4.8	.29	0.00	0	0.00	0.00	0	495
7503-020		CONE	002:80	9/17/79	0	0	.1	3.1	1	3.1	.37	0.00	0	0.00	0.00	0	484
7503-023		CONE	002:83	9/17/79	0	0	.6	3.4	15	4.0	.37	0.00	0	0.00	0.00	0	496

AGRICULTURAL CHEMISTRY DEPT**OREGON STATE UNIVERSITY**AGRICULTURE RESEARCH**SEA**U S DEPT AGRICULTURE**CORVALLIS, OREGON

1979 BALE AND 5-CONE ANALYSES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (5-CONE) AS OF 80/10/09.

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL MLS/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
7503-024		CONE	002:84	9/17/79	0	0	.8	3.1	19	3.8	.46	0.00	0	0.00	0.00	0	500
7503-025		CONE	002:85	9/17/79	0	0	0.0	6.8	0	6.8	.27	0.00	0	0.00	0.00	0	490
7503-026		CONE	002:86	9/17/79	0	0	1.0	2.4	28	3.4	.41	0.00	0	0.00	0.00	0	499
7503-027		CONE	002:87	9/17/79	0	0	.5	3.6	11	4.1	.39	0.00	0	0.00	0.00	0	479
7503-030		CONE	002:90	9/17/79	0	0	.2	3.6	4	3.7	.40	0.00	0	0.00	0.00	0	474
7503-031		CONE	002:91	9/17/79	0	0	.3	2.8	10	3.1	.30	0.00	0	0.00	0.00	0	478
7503-032		CONE	002:92	9/17/79	0	0	.8	4.5	14	5.3	.35	0.00	0	0.00	0.00	0	476
7503-033		CONE	002:93	9/14/79	0	0	.2	2.5	7	2.7	.39	0.00	0	0.00	0.00	0	384
7503-034		CONE	002:94	9/14/79	0	0	.1	3.4	2	3.4	.38	0.00	0	0.00	0.00	0	376
7503-040		CONE	003:66	9/17/79	0	0	.5	3.0	15	3.5	.35	0.00	0	0.00	0.00	0	483
7503-043		CONE	003:69	9/17/79	0	0	.3	1.4	18	1.7	.33	0.00	0	0.00	0.00	0	461
7503-047		CONE	003:73	9/17/79	0	0	.3	3.8	7	4.1	.37	0.00	0	0.00	0.00	0	464
7503-048		CONE	003:74	9/17/79	0	0	.4	2.5	14	2.9	.37	0.00	0	0.00	0.00	0	468
7503-051		CONE	003:77	9/17/79	0	0	.2	2.3	6	2.4	.46	0.00	0	0.00	0.00	0	472
7503-052		CONE	003:78	9/17/79	0	0	.8	3.4	18	4.2	.28	0.00	0	0.00	0.00	0	459
7503-053		CONE	003:79	9/17/79	0	0	.4	5.3	6	5.7	.30	0.00	0	0.00	0.00	0	470
7503-055		CONE	003:81	9/17/79	0	0	.3	2.2	11	2.5	.57	0.00	0	0.00	0.00	0	480
7503-056		CONE	003:82	9/17/79	0	0	.1	3.2	3	3.3	.28	0.00	0	0.00	0.00	0	460
7503-058		CONE	003:84	9/17/79	0	0	.4	1.7	18	2.1	.31	0.00	0	0.00	0.00	0	469
7503-059		CONE	003:85	9/17/79	0	0	.1	2.2	4	2.3	.36	0.00	0	0.00	0.00	0	462
7503-061		CONE	003:87	9/17/79	0	0	.2	3.6	5	3.8	.35	0.00	0	0.00	0.00	0	488
7503-062		CONE	003:88	9/17/79	0	0	.3	1.8	14	2.1	.58	0.00	0	0.00	0.00	0	489
7503-065		CONE	003:91	9/17/79	0	0	.6	1.9	25	2.5	.49	0.00	0	0.00	0.00	0	503
7503-066		CONE	003:92	9/17/79	0	0	.3	3.2	8	3.5	.34	0.00	0	0.00	0.00	0	473
7503-072		CONE	004:64	9/17/79	0	0	.2	1.9	8	2.1	.40	0.00	0	0.00	0.00	0	492
7503-073		CONE	004:65	9/17/79	0	0	.8	2.1	26	2.9	.66	0.00	0	0.00	0.00	0	501
7503-074		CONE	004:66	9/17/79	0	0	.2	2.6	6	2.7	.31	0.00	0	0.00	0.00	0	463
7503-075		CONE	004:67	9/17/79	0	0	.8	2.2	26	3.0	.60	0.00	0	0.00	0.00	0	502
7503-076		CONE	004:68	9/17/79	0	0	.1	3.6	2	3.7	.39	0.00	0	0.00	0.00	0	504
7503-077		CONE	004:69	9/17/79	0	0	.3	1.1	18	1.4	.64	0.00	0	0.00	0.00	0	486
7503-079		CONE	004:71	9/17/79	0	0	.2	2.4	5	2.6	.33	0.00	0	0.00	0.00	0	465
7503-081		CONE	004:73	9/17/79	0	0	0.0	6.0	0	6.0	.33	1.17	26	0.00	0.00	0	467
7701-009		CONE	002:13	9/17/79	0	0	4.6	2.6	63	7.1	.33	0.00	0	0.00	0.00	0	507
7701-010		CONE	002:14	9/17/79	0	0	3.0	2.2	57	5.2	.41	0.00	0	0.00	0.00	0	506
7701-011		CONE	002:15	9/17/79	0	0	4.2	4.8	46	9.0	.32	0.00	0	0.00	0.00	0	523
7701-013		CONE	002:17	9/17/79	0	0	7.4	4.4	62	11.8	.24	0.00	0	0.00	0.00	38	524
7701-018		CONE	002:22	9/17/79	0	0	3.0	3.0	50	6.0	.27	0.00	0	0.00	0.00	0	513

1979 BALE AND 5-CONE ANALYSES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (5-CONE) AS OF 80/10/09.

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL MLS/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
7702-002		CONE	003:22	9/17/79	0	0	3.7	1.3	73	4.9	.30	0.00	0	0.00	0.00	0	520
7702-003		CONE	003:23	9/17/79	0	0	5.7	1.8	75	7.5	.29	0.00	0	0.00	0.00	0	525
7702-004		CONE	003:24	9/17/79	0	0	4.4	2.4	65	6.8	.30	0.00	0	0.00	0.00	0	518
7702-005		CONE	003:25	9/17/79	0	0	6.7	3.5	65	10.2	.25	0.00	0	0.00	0.00	0	519
7702-006		CONE	003:26	9/17/79	0	0	6.3	3.5	64	9.8	.24	0.00	0	0.00	0.00	0	516
7703-016		CONE	005:18	9/17/79	0	0	4.7	3.6	57	8.3	.31	0.00	0	0.00	0.00	0	511
7703-017		CONE	005:19	9/17/79	0	0	4.0	1.4	73	5.4	.39	0.00	0	0.00	0.00	0	515
7703-018		CONE	005:20	9/17/79	0	0	3.6	3.2	52	6.8	.29	0.00	0	0.00	0.00	0	505
7703-020		CONE	005:22	9/17/79	0	0	3.2	3.4	48	6.6	.32	0.00	0	0.00	0.00	0	509
7703-021		CONE	005:23	9/17/79	0	0	5.7	5.3	51	10.9	.33	1.38	18	0.00	0.00	50	510
7704-001		CONE	006:19	9/17/79	0	0	3.6	2.1	63	5.7	.33	0.00	0	0.00	0.00	0	514
7704-002		CONE	006:20	9/17/79	0	0	3.6	1.7	68	5.3	.29	0.00	0	0.00	0.00	0	521
7704-003		CONE	006:21	9/17/79	0	0	3.1	2.5	55	5.6	.39	0.00	0	0.00	0.00	0	508
7704-004		CONE	006:22	9/17/79	0	0	7.1	3.7	65	10.8	.26	0.00	0	0.00	0.00	0	517
7704-005		CONE	006:23	9/17/79	0	0	5.5	4.2	56	9.7	.26	.53	63	0.00	0.00	40	522
7705-013		CONE	008:13	9/18/79	0	0	4.3	4.1	51	8.4	.22	0.00	0	0.00	0.00	0	453
7705-016		CONE	008:16	9/18/79	0	0	6.3	2.8	69	9.1	.26	0.00	0	0.00	0.00	0	448
7705-018		CONE	008:18	9/18/79	0	0	6.3	4.0	61	10.3	.23	0.00	0	0.00	0.00	0	437
7705-019		CONE	008:19	9/18/79	0	0	4.7	3.2	59	7.8	.25	0.00	0	0.00	0.00	0	442
7705-021		CONE	008:21	9/18/79	0	0	3.6	2.9	55	6.5	.24	0.00	0	0.00	0.00	0	435
7706-001		CONE	008:22	9/18/79	0	0	3.3	5.4	38	8.7	.22	0.00	0	0.00	0.00	0	450
7706-002		CONE	008:23	9/18/79	0	0	3.8	2.2	63	6.0	.27	0.00	0	0.00	0.00	0	443
7706-010		CONE	008:31	9/18/79	0	0	3.6	2.4	59	6.0	.29	0.00	0	0.00	0.00	0	438
7706-016		CONE	008:37	9/18/79	0	0	3.9	2.5	60	6.4	.28	0.00	0	0.00	0.00	0	439
7707-026		CONE	010:29	9/18/79	0	0	2.3	1.2	66	3.5	.30	0.00	0	0.00	0.00	0	451
7707-029		CONE	010:32	9/18/79	0	0	4.7	2.2	67	6.9	.26	0.00	0	0.00	0.00	0	452
7707-030		CONE	010:33	9/18/79	0	0	1.8	.9	66	2.7	.30	0.00	0	0.00	0.00	0	440
7707-031		CONE	010:34	9/18/79	0	0	3.1	1.7	64	4.7	.26	0.00	0	0.00	0.00	0	441
7707-033		CONE	010:36	9/18/79	0	0	3.3	1.3	70	4.6	.26	0.00	0	0.00	0.00	0	444
7708-021		CONE	011:23	9/18/79	0	0	4.8	4.9	49	9.7	.22	0.00	0	0.00	0.00	0	436
7708-023		CONE	011:25	9/18/79	0	0	4.0	4.0	50	8.1	.23	0.00	0	0.00	0.00	0	446
7708-024		CONE	011:26	9/18/79	0	0	3.9	3.0	57	6.9	.24	0.00	0	0.00	0.00	0	455
7708-025		CONE	011:27	9/18/79	0	0	3.2	1.8	63	5.0	.25	0.00	0	0.00	0.00	0	449
7708-027		CONE	011:29	9/18/79	0	0	3.4	2.7	55	6.1	.25	0.00	0	0.00	0.00	0	445
7709-003		CONE	012:21	9/18/79	0	0	1.6	2.7	37	4.3	.26	0.00	0	0.00	0.00	0	456
7709-004		CONE	012:22	9/18/79	0	0	4.0	3.6	52	7.6	.25	0.00	0	0.00	0.00	0	454
7709-006		CONE	012:24	9/18/79	0	0	3.5	4.0	46	7.5	.24	0.00	0	0.00	0.00	0	458

AGRICULTURAL CHEMISTRY DEPT**OREGON STATE UNIVERSITY**AGRICULTURE RESEARCH**SEA**U S DEPT AGRICULTURE**CORVALLIS, OREGON

1979 BALE AND 5-CONE ANALYSES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (5-CONE) AS OF 80/10/09.

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL MLS/ 100G	OIL HUM/ CARY	OIL COH	SERIAL NUMBER
7709-008		CONE	012:26	9/18/79	0	0	1.8	2.7	39	4.6	.27	0.00	0	0.00	0.00	0	447
7709-009		CONE	012:27	9/18/79	0	0	3.7	2.6	58	6.3	.25	0.00	0	0.00	0.00	0	457
7710-019		CONE	014:19	9/18/79	0	0	5.5	2.2	71	7.7	.25	0.00	0	0.00	0.00	0	430
7710-022		CONE	014:22	9/18/79	0	0	6.6	3.4	66	9.9	.25	0.00	0	0.00	0.00	0	431
7710-025		CONE	014:25	9/18/79	0	0	7.6	5.9	56	13.5	.24	0.00	0	0.00	0.00	29	421
7710-026		CONE	014:26	9/18/79	0	0	4.2	2.9	59	7.1	.26	0.00	0	0.00	0.00	0	426
7710-027		CONE	014:27	9/18/79	0	0	7.4	6.1	54	13.6	.22	.66	53	0.00	0.00	29	429
7711-003		CONE	015:19	9/18/79	0	0	3.3	1.7	65	5.0	.28	0.00	0	0.00	0.00	0	425
7711-005		CONE	015:21	9/18/79	0	0	2.2	1.4	61	3.6	.32	0.00	0	0.00	0.00	0	428
7711-006		CONE	015:22	9/18/79	0	0	5.1	2.3	69	7.4	.26	0.00	0	0.00	0.00	0	423
7711-008		CONE	015:24	9/18/79	0	0	3.9	1.4	72	5.3	.25	0.00	0	0.00	0.00	0	415
7711-011		CONE	015:27	9/18/79	0	0	4.6	2.7	62	7.3	.29	0.00	0	0.00	0.00	0	420
7712-004		CONE	016:36	9/18/79	0	0	4.5	4.1	52	8.6	.35	0.00	0	0.00	0.00	0	418
7712-006		CONE	016:38	9/18/79	0	0	4.3	3.0	59	7.4	.27	0.00	0	0.00	0.00	0	422
7712-009		CONE	016:41	9/18/79	0	0	5.0	3.9	56	9.0	.27	0.00	0	0.00	0.00	49	424
7713-008		CONE	017:24	9/18/79	0	0	13.3	7.7	63	21.0	.26	0.00	0	0.00	2.97	31	414
7713-009		CONE	017:25	9/18/79	0	0	7.0	3.8	64	10.8	.28	0.00	0	0.00	0.00	0	432
7713-010		CONE	017:26	9/18/79	0	0	8.5	2.2	79	10.7	.28	0.00	0	0.00	0.00	0	416
7713-012		CONE	017:28	9/18/79	0	0	5.2	2.8	65	8.0	.27	0.00	0	0.00	0.00	0	434
7713-013		CONE	017:29	9/18/79	0	0	8.0	3.8	67	11.7	.26	0.00	0	0.00	0.00	0	419
7714-027		CONE	019:25	9/18/79	0	0	6.0	4.5	57	10.4	.24	.94	36	0.00	0.00	40	427
7714-029		CONE	019:27	9/18/79	0	0	7.1	2.8	71	9.8	.28	0.00	0	0.00	0.00	0	417
7714-030		CONE	019:28	9/18/79	0	0	8.6	6.6	56	15.2	.22	0.00	0	0.00	0.00	29	413
7714-031		CONE	014:29	9/18/79	0	0	6.3	3.1	66	9.4	.25	0.00	0	0.00	0.00	0	433
7714-033		CONE	019:31	9/18/79	0	0	6.9	2.8	71	9.8	.24	0.00	0	0.00	0.00	0	412
7715-010		CONE	020:24	9/18/79	0	0	5.9	3.5	62	9.4	.37	0.00	0	0.00	0.00	0	406
7715-012		CONE	020:26	9/18/79	0	0	7.4	4.0	64	11.4	.26	0.00	0	0.00	0.00	0	408
7715-013		CONE	020:27	9/18/79	0	0	5.0	4.4	53	9.5	.25	0.00	0	0.00	0.00	38	410
7715-014		CONE	020:28	9/18/79	0	0	5.1	3.2	61	8.3	.24	0.00	0	0.00	0.00	0	411
7715-017		CONE	020:31	9/18/79	0	0	4.3	3.2	57	7.6	.34	0.00	0	0.00	0.00	0	407
7716-001		CONE	046:45	9/19/79	0	0	5.4	3.6	60	9.0	.25	.51	65	0.00	0.00	48	692
7716-002		CONE	046:46	9/19/79	0	0	4.4	5.3	45	9.7	.25	0.00	0	0.00	0.00	0	676
7717-003		CONE	021:33	9/18/79	0	0	4.8	1.8	73	6.6	.29	0.00	0	0.00	0.00	0	405
7717-005		CONE	021:35	9/18/79	0	0	6.1	2.4	71	8.5	.27	0.00	0	0.00	0.00	0	404
7717-006		CONE	021:36	9/18/79	0	0	5.9	2.6	69	8.5	.31	0.00	0	0.00	0.00	0	403
7717-008		CONE	021:38	9/18/79	0	0	5.6	2.2	71	7.8	.28	0.00	0	0.00	0.00	0	399
7717-011		CONE	021:41	9/18/79	0	0	6.7	2.7	71	9.4	.28	0.00	0	0.00	0.00	0	402

1979 BALE AND 5-CONE ANALYSES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (5-CONE) AS OF 80/10/09.

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL MLS/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
7718-017		CONE	023:31	9/18/79	0	0	6.9	5.2	57	12.1	.23	0.00	0	0.00	0.00	25	409
7718-022		CONE	023:36	9/18/79	0	0	8.3	4.1	66	12.3	.24	0.00	0	0.00	0.00	0	400
7718-023		CONE	023:37	9/18/79	0	0	5.8	2.7	67	8.5	.27	0.00	0	0.00	0.00	0	401
7718-024		CONE	023:38	9/18/79	0	0	6.0	4.6	56	10.6	.25	0.00	0	0.00	0.00	39	398
7718-027		CONE	023:41	9/18/79	0	0	5.8	3.2	64	9.0	.28	0.00	0	0.00	0.00	0	397
7719-003		CONE	024:33	9/19/79	0	0	6.7	3.2	67	9.9	.31	0.00	0	0.00	0.00	0	592
7719-004		CONE	024:34	9/19/79	0	0	6.1	3.2	65	9.3	.28	0.00	0	0.00	0.00	0	588
7719-009		CONE	024:39	9/19/79	0	0	9.9	2.6	79	12.5	.25	0.00	0	0.00	0.00	0	587
7719-010		CONE	024:40	9/19/79	0	0	5.3	3.1	62	8.4	.29	0.00	0	0.00	0.00	0	590
7719-013		CONE	023:43	9/19/79	0	0	5.7	8.0	41	13.7	.28	0.00	0	0.00	0.00	36	581
7720-002		CONE	025:17	9/19/79	0	0	6.7	4.1	62	10.8	.30	0.00	0	0.00	0.00	0	580
7720-003		CONE	025:18	9/19/79	0	0	5.9	3.7	61	9.6	.27	0.00	0	0.00	0.00	0	594
7720-005		CONE	025:20	9/19/79	0	0	4.4	4.3	50	8.7	.29	0.00	0	0.00	0.00	0	582
7721-019		CONE	025:39	9/19/79	0	0	5.0	3.4	59	8.4	.30	0.00	0	0.00	0.00	0	584
7721-020		CONE	025:40	9/19/79	0	0	4.0	4.3	48	8.4	.37	0.00	0	0.00	0.00	0	561
7721-021		CONE	025:41	9/19/79	0	0	5.6	2.9	66	8.5	.30	0.00	0	0.00	0.00	0	583
7721-022		CONE	025:42	9/19/79	0	0	5.8	2.7	68	8.5	.35	0.00	0	0.00	0.00	0	589
7721-023		CONE	025:43	9/19/79	0	0	9.3	4.9	65	14.2	.28	0.00	0	0.00	0.00	0	579
7722-015		CONE	027:17	9/19/79	0	0	2.3	1.1	68	3.4	.41	0.00	0	0.00	0.00	0	591
7722-018		CONE	027:20	9/18/79	0	0	2.0	1.7	54	3.7	.37	0.00	0	0.00	0.00	0	572
7722-022		CONE	027:24	9/18/79	0	0	6.5	3.1	67	9.7	.31	0.00	0	0.00	0.00	0	565
7722-023		CONE	027:23	9/18/79	0	0	3.4	2.9	53	6.3	.33	0.00	0	0.00	0.00	0	585
7722-024		CONE	027:26	9/18/79	0	0	5.4	2.6	68	8.0	.33	0.00	0	0.00	0.00	0	564
7723-017		CONE	028:20	9/19/79	0	0	5.4	1.8	75	7.2	.32	0.00	0	0.00	0.00	0	586
7723-019		CONE	028:22	9/19/79	0	0	7.4	2.3	76	9.7	.28	0.00	0	0.00	0.00	0	573
7723-020		CONE	028:23	9/19/79	0	0	5.9	1.8	76	7.7	.33	0.00	0	0.00	0.00	0	563
7723-024		CONE	028:27	9/18/79	0	0	5.4	1.6	77	7.0	.30	0.00	0	0.00	0.00	0	578
7723-025		CONE	028:28	9/19/79	0	0	8.7	4.0	68	12.7	.26	0.00	0	0.00	0.00	0	593
7724-008		CONE	029:14	9/19/79	0	0	6.7	2.4	73	9.1	.34	0.00	0	0.00	0.00	0	568
7724-010		CONE	029:16	9/19/79	0	0	5.7	4.3	56	10.1	.28	0.00	0	0.00	0.00	28	567
7724-011		CONE	029:17	9/19/79	0	0	9.4	3.3	74	12.6	.28	0.00	0	0.00	0.00	0	575
7724-012		CONE	029:18	9/19/79	0	0	5.3	2.4	69	7.7	.29	0.00	0	0.00	0.00	36	577
7724-013		CONE	029:19	9/19/79	0	0	6.3	2.5	71	8.7	.29	0.00	0	0.00	0.00	0	574
7724-014		CONE	029:20	9/19/79	0	0	8.0	2.9	73	10.8	.28	0.00	0	0.00	0.00	0	571
7725-001		CONE	030:17	9/18/79	0	0	5.2	2.8	65	8.0	.30	0.00	0	0.00	0.00	0	566
7725-005		CONE	030:21	9/19/79	0	0	5.2	1.9	73	7.1	.34	0.00	0	0.00	0.00	0	562
7725-006		CONE	030:22	9/19/79	0	0	4.6	1.8	72	6.4	.29	0.00	0	0.00	0.00	0	569

AGRICULTURAL CHEMISTRY DEPT**OREGON STATE UNIVERSITY**AGRICULTURE RESEARCH**SEA**U S DEPT AGRICULTURE**CORVALLIS, OREGON

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ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL ML/ 100G	OIL HUM/ CARY	OIL COH	SERIAL NUMBER
7725-007		CONE	030:23	9/19/79	0	0	4.7	2.8	62	7.5	.31	0.00	0	0.00	0.00	0	576
7725-008		CONE	030:24	9/19/79	0	0	8.2	4.0	67	12.2	.29	0.00	0	0.00	0.00	0	570
7726-001		CONE	032:31	9/19/79	0	0	8.8	5.0	63	13.7	.25	0.00	0	0.00	0.00	0	690
7726-005		CONE	032:35	9/19/79	0	0	6.7	2.0	77	8.6	.27	0.00	0	0.00	0.00	0	686
7726-008		CONE	032:38	9/19/79	0	0	4.0	2.1	65	6.0	.30	0.00	0	0.00	0.00	0	677
7726-010		CONE	032:40	9/19/79	0	0	2.8	2.1	57	5.0	.26	0.00	0	0.00	0.00	0	679
7726-012		CONE	032:42	9/19/79	0	0	5.2	2.2	70	7.3	.28	0.00	0	0.00	0.00	0	687
7727-001		CONE	034:43	9/19/79	0	0	9.9	2.9	77	12.8	.26	0.00	0	0.00	0.00	0	689
7727-013		CONE	035:35	9/19/79	0	0	6.9	2.7	71	9.6	.27	0.00	0	0.00	0.00	0	680
7727-019		CONE	035:41	9/19/79	0	0	5.7	2.4	70	8.1	.27	0.00	0	0.00	0.00	0	672
7727-024		CONE	035:46	9/19/79	0	0	8.9	4.1	68	13.0	.25	0.00	0	0.00	0.00	0	691
7727-034		CONE	036:36	9/19/79	0	0	1.8	.7	73	2.5	.26	0.00	0	0.00	0.00	0	673
7728-002		CONE	037:34	9/19/79	0	0	7.2	2.7	72	9.9	.31	0.00	0	0.00	0.00	0	685
7728-004		CONE	037:36	9/19/79	0	0	5.3	2.4	68	7.7	.32	0.00	0	0.00	0.00	0	684
7728-005		CONE	037:37	9/19/79	0	0	6.1	4.7	56	10.8	.25	.53	63	0.00	0.00	36	681
7728-024		CONE	038:36	9/19/79	0	0	10.8	4.4	70	15.2	.25	0.00	0	0.00	0.00	0	678
7728-025		CONE	038:37	9/19/79	0	0	8.3	3.7	69	12.0	.21	0.00	0	0.00	0.00	0	675
7729-011		CONE	040:33	9/19/79	0	0	6.8	2.6	72	9.4	.28	0.00	0	0.00	0.00	0	683
7729-015		CONE	040:37	9/19/79	0	0	9.7	3.6	73	13.3	.27	0.00	0	0.00	0.00	0	688
7729-022		CONE	040:44	9/19/79	0	0	9.2	3.3	73	12.5	.26	0.00	0	0.00	0.00	0	682
7729-069		CONE	043:31	9/19/79	0	0	7.0	2.3	75	9.3	.25	0.00	0	0.00	0.00	0	674
7729-088	M.yard; West	CONE	044:30	9/19/79	0	0	9.7	2.8	77	12.6	.28	0.00	0	0.00	0.00	0	670
19001	BREWERS GOLD	CONE	158:36	9/19/79	0	0	12.1	4.8	71	16.8	.24	.55	61	0.00	0.00	0	699
19001	BREWERS GOLD	CONE	150:45	9/19/79	0	0	10.9	5.1	68	16.0	.27	0.00	0	0.00	0.00	0	660
19001	BREWERS GOLD	CONE	173:43	9/20/79	0	0	9.3	4.8	65	14.2	.26	.85	41	0.00	0.00	0	776
7303-007		CONE	141:42	9/18/79	0	0	11.4	3.2	78	14.6	.30	0.00	0	0.00	0.00	0	545
7303-007		CONE	140:24	9/18/79	0	0	13.2	4.4	74	17.6	.27	.45	70	0.00	2.50	36	552
7303-007		CONE	173:48	9/20/79	0	0	12.2	4.6	72	16.8	.27	1.41	17	0.00	0.00	0	778
7307-007		CONE	139:03	9/18/79	0	0	12.5	4.1	75	16.6	.30	.50	66	0.00	0.00	36	820
7312-036		CONE	144:25	9/19/79	0	0	14.8	3.7	79	18.5	.30	0.00	0	0.00	0.00	0	611
7312-036		CONE	147:50	9/19/79	0	0	14.9	4.0	78	18.9	.27	.35	83	0.00	0.00	30	667
7312-036		CONE	143:07	9/19/79	0	0	15.0	3.6	80	18.6	.30	0.00	0	0.00	0.00	0	604
7312-042		CONE	150:23	9/19/79	0	0	10.3	3.3	75	13.6	.31	.45	70	0.00	1.82	54	666
7312-042		CONE	173:50	9/20/79	0	0	9.7	3.1	75	12.7	.30	0.00	0	0.00	0.00	0	773
7312-083		CONE	157:37	9/19/79	0	0	13.9	3.7	78	17.6	.29	.43	73	0.00	0.00	25	712
7312-083		CONE	154:07	9/19/79	0	0	14.6	3.9	78	18.6	.27	.65	54	0.00	0.00	0	634
7312-083		CONE	150:47	9/19/79	0	0	13.8	3.9	78	17.6	.29	.42	74	0.00	0.00	25	648

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ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL MLS/ 100G	OIL HUM/ CARY	OIL COH	SERIAL NUMBER
7312-083		CONE	173:51	9/20/79	0	0	13.1	3.4	79	16.5	.29	.39	78	0.00	0.00	23	770
7312-134		CONE	164:15	9/19/79	0	0	9.9	2.6	79	12.4	.28	0.00	0	0.00	0.00	0	742
7312-134		CONE	161:25	9/19/79	0	0	8.9	2.8	76	11.7	.28	0.00	0	0.00	0.00	0	757
7312-134		CONE	158:41	9/19/79	0	0	12.2	3.0	80	15.3	.23	.39	78	0.00	0.00	34	711
7313-134		CONE	173:52	9/20/79	0	0	7.8	2.3	77	10.1	.28	0.00	0	0.00	0.00	0	772
7314-012		CONE	167:26	9/20/79	0	0	13.0	5.6	69	18.6	.26	.43	73	0.00	3.20	40	789
7314-012		CONE	173:53	9/20/79	0	0	14.6	3.5	80	18.0	.27	.52	64	0.00	0.00	0	762
7314-012		CONE	169:25	9/20/79	0	0	14.6	6.8	68	21.4	.26	.38	79	0.00	0.00	43	790
7314-012		CONE	171:31	9/20/79	0	0	13.7	6.3	68	20.0	.26	.43	74	0.00	0.00	41	781
7601-006		CONE	139:12	9/18/79	0	0	13.2	2.9	82	16.1	.33	.40	76	0.00	0.00	38	540
7601-008		CONE	139:14	9/18/79	0	0	6.5	1.8	77	8.3	.35	0.00	0	0.00	0.00	0	541
7601-022		CONE	139:28	9/18/79	0	0	9.6	1.8	84	11.4	.31	.40	77	0.00	0.00	0	539
7601-032		CONE	139:38	9/18/79	0	0	8.7	4.4	66	13.1	.32	0.00	0	0.00	0.00	0	535
7601-033		CONE	139:39	9/18/79	0	0	12.6	3.0	80	15.6	.33	.60	57	0.00	0.00	38	528
7601-046		CONE	139:52	9/18/79	0	0	8.3	3.5	70	11.8	.30	0.00	0	0.00	0.00	0	526
7602-017		CONE	140:41	9/18/79	0	0	13.5	4.3	75	17.8	.29	.42	74	0.00	0.00	40	527
7602-019		CONE	140:43	9/18/79	0	0	4.0	2.1	65	6.1	.36	0.00	0	0.00	0.00	0	549
7602-025		CONE	140:49	9/18/79	0	0	10.4	3.2	76	13.6	.29	.35	83	0.00	0.00	0	529
7602-030		CONE	141:01	9/18/79	0	0	7.0	3.9	64	10.8	.30	0.00	0	0.00	0.00	0	544
7602-035		CONE	141:06	9/18/79	0	0	9.5	3.7	72	13.2	.31	0.00	0	0.00	0.00	0	536
7602-036		CONE	141:07	9/18/79	0	0	7.6	3.4	69	11.0	.31	0.00	0	0.00	0.00	0	532
7602-037		CONE	141:08	9/18/79	0	0	7.7	3.1	71	10.8	.31	0.00	0	0.00	0.00	0	537
7602-038		CONE	141:09	9/18/79	0	0	6.1	2.0	75	8.0	.33	0.00	0	0.00	0.00	0	531
7602-039		CONE	141:10	9/18/79	0	0	8.1	2.6	75	10.8	.35	0.00	0	0.00	0.00	0	551
7602-042		CONE	141:13	9/18/79	0	0	10.2	3.3	75	13.5	.31	0.00	0	0.00	0.00	0	547
7602-054		CONE	141:25	9/18/79	0	0	8.3	3.0	73	11.3	.28	0.00	0	0.00	0.00	0	550
7602-067		CONE	141:38	9/18/79	0	0	11.0	3.9	73	14.8	.29	.37	80	0.00	0.00	0	543
7603-004		CONE	141:46	9/18/79	0	0	7.7	2.4	76	10.1	.34	0.00	0	0.00	0.00	0	542
7603-006		CONE	141:48	9/18/79	0	0	2.5	.7	79	3.2	.32	0.00	0	0.00	0.00	0	546
7603-012		CONE	142:01	9/19/79	0	0	7.5	2.3	76	9.8	.33	0.00	0	0.00	0.00	0	613
7603-018		CONE	142:07	9/19/79	0	0	6.0	2.2	73	8.2	.37	0.00	0	0.00	0.00	0	598
7603-025		CONE	142:14	9/19/79	0	0	8.5	3.2	72	11.7	.33	0.00	0	0.00	0.00	0	601
7603-041		CONE	142:30	9/18/79	0	0	12.0	3.0	79	15.1	.29	.39	77	0.00	0.00	44	548
7603-047		CONE	142:36	9/18/79	0	0	12.0	3.7	76	15.7	.30	.86	40	0.00	0.00	38	530
7603-065		CONE	143:01	9/19/79	0	0	5.1	3.0	63	8.0	.32	0.00	0	0.00	0.00	0	607
7604-003		CONE	143:10	9/19/79	0	0	9.5	2.8	77	12.3	.31	.82	42	0.00	0.00	0	602
7604-004		CONE	143:11	9/19/79	0	0	9.5	4.3	68	13.8	.29	0.00	0	0.00	0.00	0	606

1979 BALE AND 5-CONE ANALYSES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (5-CONE) AS OF 80/10/09.

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL MLS/ 1006	OIL HUM/ CARY	COH	SERIAL NUMBER
7604-013		CONE	143:20	9/19/79	0	0	11.1	3.3	76	14.4	.28	.40	76	0.00	0.00	35	595
7604-025		CONE	143:32	9/18/79	0	0	12.0	6.0	66	18.0	.26	0.00	0	0.00	0.00	0	534
7604-031		CONE	143:38	9/18/79	0	0	7.8	4.0	66	11.7	.28	0.00	0	0.00	0.00	0	533
7604-031		CONE	143:38	9/19/79	0	0	7.4	3.9	65	11.2	.28	0.00	0	0.00	0.00	0	617
7604-039		CONE	143:46	9/18/79	0	0	9.0	3.2	73	12.2	.33	.40	76	0.00	0.00	0	538
7605-005		CONE	144:30	9/19/79	0	0	15.5	5.9	72	21.4	.27	.63	55	0.00	0.00	27	621
7605-009		CONE	144:34	9/19/79	0	0	14.7	6.8	68	21.5	.26	0.00	0	0.00	0.00	30	615
7605-013		CONE	144:38	9/19/79	0	0	13.1	4.7	73	17.8	.25	0.00	0	0.00	0.00	0	616
7605-028		CONE	144:53	9/19/79	0	0	7.4	2.8	72	10.1	.32	0.00	0	0.00	0.00	0	619
7605-040		CONE	145:12	9/19/79	0	0	10.9	2.8	79	13.7	.34	.38	79	0.00	0.00	0	599
7605-047		CONE	145:19	9/19/79	0	0	12.3	3.5	77	15.7	.27	0.00	0	0.00	0.00	52	605
7605-055		CONE	145:27	9/19/79	0	0	11.7	2.9	79	14.6	.21	.40	76	0.00	0.00	0	610
7605-059		CONE	145:31	9/19/79	0	0	7.4	2.5	74	9.9	.31	0.00	0	0.00	0.00	0	622
7605-060		CONE	145:32	9/19/79	0	0	6.3	3.0	67	9.3	.28	0.00	0	0.00	0.00	0	612
7605-068		CONE	145:40	9/19/79	0	0	9.8	3.0	76	12.8	.36	0.00	0	0.00	0.00	0	620
7605-083		CONE	146:02	9/19/79	0	0	8.5	4.3	66	12.8	.34	0.00	0	0.00	0.00	0	608
7605-101		CONE	146:20	9/19/79	0	0	11.2	2.6	81	13.8	.29	.50	66	0.00	0.00	0	596
7605-108		CONE	146:27	9/19/79	0	0	11.5	3.5	76	15.0	.29	.43	73	0.00	0.00	0	609
7605-117		CONE	146:36	9/19/79	0	0	6.9	2.9	70	9.8	.30	0.00	0	0.00	0.00	0	614
7605-148		CONE	147:14	9/19/79	0	0	8.2	2.4	77	10.6	.34	0.00	0	0.00	0.00	0	603
7605-149		CONE	147:15	9/19/79	0	0	6.5	1.9	77	8.5	.33	0.00	0	0.00	0.00	0	600
7605-158		CONE	147:24	9/19/79	0	0	6.0	2.6	69	8.6	.33	0.00	0	0.00	0.00	0	597
7605-166		CONE	147:32	9/19/79	0	0	7.8	2.8	73	10.6	.30	0.00	0	0.00	0.00	0	618
7606-001		CONE	147:51	9/19/79	0	0	9.7	2.5	79	12.2	.29	.40	76	0.00	0.00	0	661
7606-002		CONE	147:52	9/19/79	0	0	8.4	2.7	76	11.1	.28	.46	70	0.00	0.00	0	663
7606-003		CONE	147:53	9/19/79	0	0	10.0	3.2	75	13.2	.28	0.00	0	0.00	0.00	0	664
7606-032		CONE	148:29	9/19/79	0	0	9.1	2.2	80	11.3	.28	.42	75	0.00	0.00	0	651
7606-035		CONE	148:32	9/19/79	0	0	11.7	3.5	77	15.2	.31	.54	62	0.00	0.00	0	653
7606-039		CONE	148:36	9/19/79	0	0	10.5	2.7	79	13.2	.27	.38	79	0.00	0.00	0	665
7606-048		CONE	148:45	9/19/79	0	0	13.3	4.0	76	17.3	.26	.35	83	0.00	0.00	34	662
7606-050		CONE	148:47	9/19/79	0	0	12.4	3.4	78	15.8	.30	.42	74	0.00	0.00	36	649
7606-057		CONE	149:01	9/19/79	0	0	12.6	4.1	75	16.7	.27	.47	69	0.00	0.00	36	652
7606-064		CONE	149:08	9/19/79	0	0	7.8	2.5	75	10.2	.29	0.00	0	0.00	0.00	0	659
7606-066		CONE	149:10	9/19/79	0	0	9.1	3.2	73	12.2	.27	0.00	0	0.00	0.00	0	668
7606-086		CONE	149:30	9/19/79	0	0	14.3	5.7	71	20.0	.24	.38	79	0.00	0.00	31	669
7606-108		CONE	149:52	9/19/79	0	0	9.6	2.6	78	12.2	.28	0.00	0	0.00	0.00	0	657
7606-110		CONE	150:01	9/19/79	0	0	11.1	3.5	76	14.6	.26	0.00	0	0.00	0.00	0	658

1979 BALE AND 5-CONE ANALYSES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (5-CONE) AS OF 80/10/09.

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL MLS/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
7606-112		CONE	150:03	9/19/79	0	0	8.1	2.0	79	10.1	.30	0.00	0	0.00	0.00	0	655
7607-011		CONE	150:21	9/19/79	0	0	7.7	2.4	76	10.0	.32	0.00	0	0.00	0.00	0	650
7610-003		CONE	150:50	9/19/79	0	0	9.5	4.3	68	13.8	.28	0.00	0	0.00	0.00	0	656
7610-005		CONE	150:52	9/19/79	0	0	9.5	3.0	76	12.5	.31	0.00	0	0.00	0.00	0	654
7610-009		CONE	151:03	9/19/79	0	0	10.8	3.0	78	13.8	.34	.46	70	0.00	0.00	0	623
7610-025		CONE	151:19	9/19/79	0	0	10.1	2.5	80	12.6	.28	.81	43	0.00	0.00	0	640
7610-028		CONE	151:22	9/19/79	0	0	11.1	4.0	73	15.0	.26	.60	57	0.00	0.00	0	630
7610-050		CONE	151:44	9/19/79	0	0	14.2	3.0	82	17.3	.27	.35	83	0.00	0.00	26	626
7610-053		CONE	151:47	9/19/79	0	0	9.9	2.4	80	12.3	.26	.72	49	0.00	0.00	0	645
7610-096		CONE	152:37	9/19/79	0	0	10.5	2.5	80	13.0	.29	.42	74	0.00	0.00	0	638
7610-097		CONE	152:38	9/19/79	0	0	13.7	4.2	76	17.8	.31	.39	78	0.00	0.00	34	636
7610-104		CONE	152:45	9/19/79	0	0	13.7	3.7	78	17.4	.27	.37	80	0.00	0.00	30	633
7610-109		CONE	152:50	9/19/79	0	0	11.3	4.1	73	15.4	.25	.60	57	0.00	0.00	0	637
7610-114		CONE	153:02	9/19/79	0	0	8.9	2.4	78	11.3	.28	0.00	0	0.00	0.00	0	635
7610-124		CONE	153:12	9/19/79	0	0	11.6	4.6	71	16.2	.27	.88	39	0.00	0.00	0	628
7610-127		CONE	153:15	9/19/79	0	0	9.7	1.8	84	11.5	.31	.39	77	0.00	0.00	0	643
7610-137		CONE	153:25	9/19/79	0	0	11.7	4.3	73	16.1	.26	.36	81	0.00	0.00	0	627
7610-138		CONE	153:26	9/19/79	0	0	8.3	2.2	78	10.5	.29	0.00	0	0.00	0.00	0	639
7610-143		CONE	153:31	9/19/79	0	0	10.5	2.4	81	12.9	.27	.49	67	0.00	0.00	0	624
7610-152		CONE	153:40	9/19/79	0	0	8.4	5.1	62	13.4	.27	0.00	0	0.00	0.00	0	632
7611-005		CONE	154:12	9/19/79	0	0	13.8	3.8	78	17.6	.30	.38	79	0.00	0.00	31	629
7611-012		CONE	154:19	9/19/79	0	0	9.2	2.8	76	11.9	.28	.42	74	0.00	0.00	0	641
7611-025		CONE	154:32	9/19/79	0	0	7.9	1.8	81	9.8	.29	.36	81	0.00	0.00	0	647
7611-026		CONE	154:33	9/19/79	0	0	11.1	3.7	75	14.7	.28	.41	76	0.00	0.00	0	646
7611-028		CONE	154:35	9/19/79	0	0	8.9	2.9	75	11.8	.31	0.00	0	0.00	0.00	0	625
7611-030		CONE	154:37	9/19/79	0	0	8.5	3.1	73	11.6	.29	0.00	0	0.00	0.00	0	644
7611-043		CONE	154:50	9/19/79	0	0	9.0	2.6	77	11.6	.29	0.00	0	0.00	0.00	0	642
7611-044		CONE	154:51	9/19/79	0	0	10.3	3.4	74	13.8	.29	0.00	0	0.00	0.00	0	631
7611-067		CONE	155:21	9/19/79	0	0	12.7	6.1	67	18.8	.25	.39	77	0.00	0.00	28	727
7611-069		CONE	155:23	9/19/79	0	0	14.0	3.0	82	17.0	.29	.50	66	0.00	0.00	0	721
7611-084		CONE	155:38	9/19/79	0	0	13.2	4.3	75	17.5	.30	.42	74	0.00	0.00	30	698
7611-088		CONE	155:42	9/19/79	0	0	10.9	3.3	76	14.2	.27	.42	74	0.00	0.00	0	706
7611-091		CONE	155-45	9/19/79	0	0	10.1	2.7	78	12.9	.27	.43	73	0.00	0.00	0	710
7611-096		CONE	155:50	9/19/79	0	0	8.2	2.5	76	10.7	.29	0.00	0	0.00	0.00	0	702
7611-108		CONE	156:09	9/19/79	0	0	15.4	3.5	81	18.9	.30	.36	82	0.00	0.00	31	724
7611-117		CONE	156:18	9/19/79	0	0	11.7	3.0	79	14.7	.27	0.00	0	0.00	0.00	0	729
7611-123		CONE	156:24	9/19/79	0	0	7.9	2.5	75	10.5	.31	.42	74	0.00	0.00	0	722

1979 BALE AND 5-CONE ANALYSES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (5-CONE) AS OF 80/10/09.

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL HLS/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
7611-124		CONE	156:25	9/19/79	0	0	11.4	3.0	79	14.4	.28	.43	73	0.00	0.00	0	720
7611-128		CONE	156:29	9/19/79	0	0	9.7	2.7	78	12.4	.28	.39	78	0.00	0.00	0	700
7611-143		CONE	156:44	9/19/79	0	0	14.6	3.3	81	17.9	.27	.37	80	0.00	0.00	25	695
7611-158		CONE	157:06	9/19/79	0	0	10.7	3.4	76	14.1	.26	.34	84	0.00	0.00	0	723
7611-169		CONE	157:17	9/19/79	0	0	14.7	6.1	70	20.8	.28	.38	78	0.00	0.00	36	731
7611-170		CONE	157:18	9/19/79	0	0	9.4	2.4	79	11.8	.32	0.00	0	0.00	0.00	0	728
7611-178		CONE	157:26	9/19/79	0	0	13.1	3.4	79	16.5	.29	.41	75	0.00	0.00	38	705
7611-183		CONE	157:31	9/19/79	0	0	10.8	4.1	72	14.9	.26	.36	82	0.00	0.00	0	715
7612-002		CONE	157:39	9/19/79	0	0	11.5	4.4	72	15.9	.28	.62	56	0.00	0.00	0	713
7612-008		CONE	157:45	9/19/79	0	0	12.4	3.7	77	16.1	.26	.38	79	0.00	0.00	26	694
7612-020		CONE	158:04	9/19/79	0	0	11.0	2.4	81	13.5	.33	.45	71	0.00	0.00	0	732
7612-022		CONE	158:06	9/19/79	0	0	11.8	3.9	75	15.7	.27	.37	80	0.00	0.00	0	726
7612-035		CONE	158:19	9/19/79	0	0	14.6	3.1	82	17.7	.27	.39	77	0.00	0.00	30	725
7612-044		CONE	158:28	9/19/79	0	0	13.2	4.1	76	17.3	.26	.48	68	0.00	0.00	0	707
7612-049		CONE	158:33	9/19/79	0	0	9.3	2.6	78	11.9	.28	0.00	0	0.00	0.00	0	709
7613-014		CONE	159:02	9/19/79	0	0	8.3	2.6	76	10.9	.30	0.00	0	0.00	0.00	0	719
7613-032		CONE	159:20	9/19/79	0	0	5.9	1.5	79	7.4	.32	0.00	0	0.00	0.00	0	734
7613-032		CONE	159:20	9/19/79	0	0	7.6	1.9	80	9.5	.27	0.00	0	0.00	0.00	0	708
7613-037		CONE	159:25	9/19/79	0	0	12.8	3.0	81	15.7	.27	.39	77	0.00	0.00	28	718
7613-061		CONE	159:49	9/19/79	0	0	11.0	4.1	72	15.0	.27	.50	66	0.00	0.00	0	697
7613-072		CONE	160:07	9/19/79	0	0	12.0	2.5	82	14.5	.27	.30	90	0.00	0.00	41	730
7613-083		CONE	160:18	9/19/79	0	0	7.1	3.4	67	10.5	.31	0.00	0	0.00	0.00	0	733
7613-103		CONE	160:38	9/19/79	0	0	7.2	2.5	73	9.7	.30	0.00	0	0.00	0.00	0	704
7613-116		CONE	160:51	9/19/79	0	0	12.3	4.4	73	16.7	.23	.63	55	0.00	0.00	0	701
7613-124		CONE	161:06	9/19/79	0	0	10.8	2.3	82	13.1	.26	.34	84	0.00	0.00	0	741
7613-134		CONE	161:16	9/19/79	0	0	9.3	2.0	82	11.3	.32	0.00	0	0.00	0.00	0	735
7613-137		CONE	161:19	9/19/79	0	0	6.9	1.6	81	8.5	.31	0.00	0	0.00	0.00	0	737
7614-004		CONE	161:29	9/19/79	0	0	8.0	7.4	51	15.4	.27	.60	57	0.00	0.00	61	751
7614-016		CONE	161:41	9/19/79	0	0	14.2	4.2	77	18.4	.28	.45	71	0.00	0.00	43	756
7614-017		CONE	161:42	9/19/79	0	0	12.3	3.6	77	15.9	.26	.32	87	0.00	0.00	51	747
7614-027		CONE	161:52	9/19/79	0	0	11.7	3.5	76	15.3	.26	.34	84	0.00	0.00	0	750
7614-050		CONE	162:22	9/19/79	0	0	11.4	2.8	80	14.2	.32	.42	74	0.00	0.00	0	739
7614-055		CONE	162:27	9/19/79	0	0	8.5	2.1	80	10.7	.26	.51	65	0.00	0.00	0	749
7614-064		CONE	162:36	9/19/79	0	0	12.3	2.8	81	15.1	.27	.31	88	0.00	0.00	46	753
7614-079		CONE	162:51	9/19/79	0	0	12.6	4.7	72	17.3	.26	.34	85	0.00	0.00	29	755
7614-097		CONE	163:16	9/19/79	0	0	7.0	1.9	78	8.9	.29	0.00	0	0.00	0.00	0	738
7614-101		CONE	163:20	9/19/79	0	0	12.9	3.0	81	15.9	.29	.32	87	0.00	0.00	42	736

AGRICULTURAL CHEMISTRY DEPT**OREGON STATE UNIVERSITY**AGRICULTURE RESEARCH**SEA**U S DEPT AGRICULTURE**CORVALLIS, OREGON

1979 BALE AND 5-CONE ANALYSES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (5-CONE) AS OF 80/10/09.

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL MLS/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
7614-102		CONE	163:21	9/19/79	0	0	10.1	2.7	79	12.7	.27	.38	79	0.00	0.00	0	740
7614-115		CONE	163:34	9/19/79	0	0	15.4	5.0	75	20.4	.25	.33	86	0.00	0.00	34	754
7614-141		CONE	164:07	9/19/79	0	0	7.3	2.9	71	10.2	.28	0.00	0	0.00	0.00	0	744
7615-004		CONE	164:19	9/19/79	0	0	9.4	2.8	77	12.2	.31	0.00	0	0.00	0.00	0	745
7615-007		CONE	164:22	9/19/79	0	0	11.4	3.1	78	14.5	.29	.45	71	0.00	0.00	0	743
7615-012		CONE	164:27	9/19/79	0	0	7.5	2.0	78	9.5	.31	.47	68	0.00	0.00	0	748
7615-015		CONE	164:30	9/19/79	0	0	8.2	2.3	78	10.5	.32	.50	66	0.00	0.00	0	758
7615-019		CONE	164:34	9/19/79	0	0	5.4	1.8	74	7.2	.29	0.00	0	0.00	0.00	0	752
7615-038		CONE	164:53	9/19/79	0	0	11.8	3.7	76	15.5	.29	.49	67	0.00	0.00	0	746
7615-059		CONE	165:21	9/20/79	0	0	11.7	3.2	78	14.8	.26	.40	76	0.00	0.00	0	783
7615-074		CONE	165:36	9/20/79	0	0	7.5	2.4	75	10.0	.28	0.00	0	0.00	0.00	0	801
7615-075		CONE	165:37	9/20/79	0	0	9.0	2.5	78	11.5	.28	.43	73	0.00	0.00	0	774
7615-079		CONE	165:41	9/20/79	0	0	8.9	2.7	76	11.5	.31	.47	69	0.00	0.00	0	761
7615-083		CONE	165:45	9/20/79	0	0	10.1	2.0	83	12.1	.28	.37	80	0.00	0.00	0	775
7615-099		CONE	166:08	9/20/79	0	0	14.7	4.3	77	19.0	.27	.38	79	0.00	0.00	35	791
7615-105		CONE	166:14	9/20/79	0	0	5.7	2.2	71	7.9	.31	0.00	0	0.00	0.00	0	796
7615-112		CONE	166:21	9/20/79	0	0	6.7	2.7	71	9.3	.28	0.00	0	0.00	0.00	0	792
7615-139		CONE	166:48	9/20/79	0	0	7.7	3.0	72	10.7	.31	0.00	0	0.00	0.00	0	764
7616-002		CONE	167:28	9/20/79	0	0	9.2	2.6	77	11.8	.28	.72	49	0.00	0.00	0	785
7616-015		CONE	167:41	9/20/79	0	0	10.8	3.5	75	14.2	.25	.56	61	0.00	0.00	0	760
7616-029		CONE	168:02	9/20/79	0	0	11.7	4.5	72	16.2	.29	0.00	0	0.00	0.00	0	803
7616-047		CONE	168:20	9/20/79	0	0	12.4	3.4	78	15.8	.28	.72	49	0.00	0.00	0	780
7616-056		CONE	168:29	9/20/79	0	0	10.4	2.4	81	12.8	.26	.68	51	0.00	0.00	36	787
7616-075		CONE	168:48	9/20/79	0	0	10.5	3.4	75	13.9	.28	.78	45	0.00	0.00	0	763
7616-079		CONE	168:52	9/20/79	0	0	12.9	4.9	72	17.8	.25	.87	40	0.00	0.00	0	767
7616-101		CONE	169:21	9/20/79	0	0	5.8	2.0	74	7.8	.26	0.00	0	0.00	0.00	0	779
7617-002		CONE	169:27	9/20/79	0	0	9.0	2.9	75	11.9	.28	.67	52	0.00	0.00	0	788
7617-007		CONE	169:32	9/20/79	0	0	16.3	5.9	73	22.2	.26	.42	74	0.00	0.00	37	795
7617-009		CONE	169:34	9/20/79	0	0	11.2	4.1	73	15.3	.28	.46	70	0.00	0.00	0	802
7617-015		CONE	169:40	9/20/79	0	0	9.4	5.1	64	14.6	.27	0.00	0	0.00	0.00	0	777
7617-029		CONE	170:01	9/20/79	0	0	9.7	3.6	72	13.3	.28	.50	66	0.00	0.00	0	806
7617-048		CONE	170:20	9/20/79	0	0	11.6	5.8	66	17.4	.27	0.00	0	0.00	0.00	0	804
7617-065		CONE	170:37	9/20/79	0	0	11.3	3.5	76	14.8	.27	.42	74	0.00	0.00	0	799
7617-067		CONE	170:39	9/20/79	0	0	11.1	4.2	72	15.3	.25	0.00	0	0.00	0.00	0	768
7617-083		CONE	171:03	9/20/79	0	0	10.0	4.3	69	14.3	.28	0.00	0	0.00	0.00	0	808
7617-083		CONE	171:02	9/20/79	0	0	11.0	4.7	70	15.7	.28	0.00	0	0.00	0.00	0	805
7617-090		CONE	171:09	9/20/79	0	0	9.8	4.2	69	14.0	.28	0.00	0	0.00	0.00	0	797

1979 BALE AND 5-CONE ANALYSES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (5-CONE) AS OF 80/10/09.

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL MLS/ 1006	OIL HUM/ CARY	COH	SERIAL NUMBER
7617-107		CONE	171:26	9/20/79	0	0	13.8	5.5	71	19.3	.27	.58	59	0.00	0.00	0	794
7617-109		CONE	171:28	9/20/79	0	0	11.5	4.7	71	16.2	.26	0.00	0	0.00	0.00	0	784
7618-011		CONE	171:42	9/20/79	0	0	12.2	5.7	68	17.9	.27	.53	63	0.00	0.00	0	759
7618-016		CONE	171:47	9/20/79	0	0	9.0	2.8	76	11.7	.29	.43	73	0.00	0.00	0	766
7618-021		CONE	171:52	9/20/79	0	0	14.4	5.5	72	19.9	.24	0.00	0	0.00	0.00	0	769
7618-031		CONE	172:09	9/20/79	0	0	10.9	5.3	67	16.3	.31	0.00	0	0.00	0.00	0	811
7618-040		CONE	172:18	9/20/79	0	0	13.1	4.2	75	17.3	.27	.42	75	0.00	0.00	41	809
7618-045		CONE	172:23	9/20/79	0	0	13.8	4.0	77	17.8	.26	.41	75	0.00	0.00	32	786
7618-048		CONE	172:26	9/20/79	0	0	15.7	5.5	74	21.2	.27	.41	76	0.00	0.00	45	782
7618-053		CONE	172:31	9/20/79	0	0	11.9	4.2	74	16.1	.28	.36	81	0.00	0.00	0	798
7618-065		CONE	172:43	9/20/79	0	0	8.4	3.0	73	11.3	.31	0.00	0	0.00	0.00	0	765
7618-078		CONE	173:03	9/20/79	0	0	8.7	4.3	66	13.0	.28	0.00	0	0.00	0.00	.0	807
7618-092		CONE	173:17	9/20/79	0	0	12.4	6.7	64	19.1	.27	.59	58	0.00	0.00	0	800
7618-098		CONE	173:23	9/20/79	0	0	13.6	4.7	74	18.3	.26	.35	83	0.00	0.00	38	793
7618-111		CONE	173:36	9/20/79	0	0	13.8	6.1	69	19.8	.28	0.00	0	0.00	0.00	0	810
7618-117	Smith Yd. ↓	CONE	173:42	9/20/79	0	0	13.6	5.4	71	19.0	.28	.46	70	0.00	0.00	44	771
21185	HERSBRUCKER-G ↓	CONE	240:01-10	9/18/79	0	0	5.3	8.8	37	14.1	.24	0.00	0	0.00	0.00	0	556
21187	S. BREWER	CONE	242:01-10	9/18/79	0	0	8.9	4.9	64	13.7	.26	0.00	0	0.00	0.00	0	554
21188	NF2/55 (S. AFR)	CONE	243:01-10	9/18/79	0	0	5.3	3.9	57	9.2	.29	0.00	0	0.00	0.00	30	555
7003-079		CONE	231:12-16	9/18/79	0	0	6.3	8.8	41	15.1	.29	0.00	0	0.00	0.00	30	558
7006-296		CONE	230:23-27	9/18/79	0	0	11.4	5.9	65	17.3	.29	0.00	0	0.00	0.00	0	559
7006-302		CONE	233:23-27	9/18/79	0	0	9.8	6.1	61	15.9	.29	0.00	0	0.00	0.00	0	560
7006-318		CONE	236:23-27	9/18/79	0	0	11.3	4.7	70	16.0	.27	0.00	0	0.00	0.00	0	557
7007-339	Wi. Yard ↓	CONE	241:28-32	9/18/79	0	0	12.5	7.6	62	20.1	.28	1.46	15	0.00	0.00	0	553
21170	ELSASSER ↓	CONE	316:01-05	9/13/79	0	0	3.0	5.1	36	8.1	.24	.37	80	0.00	0.00	26	310
66052	PRIDE RINGWOOD	CONE	324:01-05	9/13/79	0	0	8.0	5.5	59	13.5	.23	.38	79	0.00	0.00	31	300
66054	CALICROSS	CONE	325:01-04	9/13/79	0	0	6.2	5.2	54	11.4	.23	.33	86	0.00	0.00	40	304
6771-021		CONE	313:11-15	9/13/79	0	0	3.1	2.9	51	6.1	.26	.60	58	0.00	0.00	0	308
7003-066		CONE	323:11-15	9/13/79	0	0	5.5	5.6	49	11.1	.23	.41	75	0.00	0.00	28	301
7003-075		CONE	324:11-15	9/13/79	0	0	8.2	6.1	57	14.3	.22	.59	58	0.00	0.00	19	296
7003-176		CONE	330:11-15	9/13/79	0	0	8.1	6.2	56	14.3	.22	.68	51	0.00	0.00	47	306
7005-168		CONE	317:16-20	9/13/79	0	0	8.7	3.3	72	11.9	.26	0.00	0	0.00	0.00	0	284
7006-095		CONE	322:16-20	9/13/79	0	0	10.3	5.2	66	15.5	.25	0.00	0	0.00	0.00	0	307
7006-382		CONE	326:16-20	9/13/79	0	0	11.7	4.5	72	16.2	.30	0.00	0	0.00	0.00	0	299
7006-398		CONE	306:21-25	9/13/79	0	0	14.1	7.5	65	21.6	.24	.45	71	0.00	0.00	20	298
7006-456		CONE	313:21-25	9/13/79	0	0	6.0	3.0	66	9.1	.27	0.00	0	0.00	0.00	0	286
7007-206		CONE	318:21-25	9/13/79	0	0	10.1	7.1	58	17.2	.27	.57	60	0.00	0.00	35	285

AGRICULTURAL CHEMISTRY DEPT**OREGON STATE UNIVERSITY**AGRICULTURE RESEARCH**SEA**U S DEPT AGRICULTURE**CORVALLIS, OREGON

1979 BALE AND 5-CONE ANALYSES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (5-CONE) AS OF 80/10/09.

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL ML/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
7007-339		CONE	321:21-25	9/13/79	0	0	11.0	7.0	61	18.0	.26	0.00	0	0.00	0.00	0	289
7303-007		CONE	328:26-30	9/13/79	0	0	10.6	3.6	74	14.2	.29	0.00	0	0.00	0.00	0	295
7303-019		CONE	329:26-30	9/13/79	0	0	12.6	3.8	76	16.4	.25	.43	73	0.00	0.00	33	305
7306-040		CONE	301:31-35	9/13/79	0	0	10.4	3.4	75	13.8	.25	0.00	0	0.00	0.00	0	292
7306-042		CONE	302:31-35	9/13/79	0	0	11.1	3.8	74	14.8	.26	0.00	0	0.00	0.00	0	293
7308-034		CONE	311:31-35	9/13/79	0	0	9.3	4.8	66	14.1	.30	0.00	0	0.00	0.00	0	288
7311-031		CONE	314:31-35	9/13/79	0	0	12.5	3.9	76	16.4	.28	.79	44	0.00	0.00	38	290
7311-095		CONE	319:31-35	9/13/79	0	0	12.0	2.8	80	14.8	.27	0.00	0	0.00	0.00	0	312
7311-177		CONE	322:31-35	9/13/79	0	0	9.1	5.0	64	14.1	.29	0.00	0	0.00	0.00	0	287
7312-023		CONE	326:31-35	9/13/79	0	0	7.7	3.4	69	11.1	.31	0.00	0	0.00	0.00	0	294
7312-041		CONE	328:31-35	9/13/79	0	0	15.5	6.0	72	21.6	.26	.47	69	0.00	0.00	33	291
7312-129		CONE	344:01-05	9/13/79	0	0	10.1	4.7	68	14.7	.28	0.00	0	0.00	0.00	0	302
7313-092		CONE	337:01-05	9/13/79	0	0	8.6	7.4	53	16.0	.27	.48	68	0.00	0.00	46	309
7314-011		CONE	339:01-05	9/13/79	0	0	12.2	4.2	74	16.4	.27	.41	75	0.00	0.00	37	303
7314-012		CONE	340:01-04	9/13/79	0	0	11.0	5.5	66	16.5	.26	0.00	0	0.00	0.00	0	311
7314-044		CONE	341:01-05	9/13/79	0	0	13.3	3.7	78	17.0	.27	.45	71	0.00	0.00	41	297

1979 BALES SAMPLES WITH MORE THAN 70% REMAINING

SELECTED GENOTYPES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (CONE) SORTED BY PERCENT α AS OF 80/10/23.(N= 98) PAGE 1

1979: 9 Bales: SORTED BY % alpha remaining after 6 months at r.t.

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL ML/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
21057	LATE CL. SEEDL.	BALE	036:49-50	9/15/79	1279	63	5.0	4.8	50	9.8	.38	.39	92	.73	3.17	41	1047
7313-043		BALE	334:01-05	8/29/79	1937	164	8.5	5.1	62	13.5	.29	.37	90	1.47	0.00	0	1030
7306-043		BALE	303:31-35	9/05/79	1254	130	10.4	3.7	73	14.1	.29	.36	90	1.93	2.23	28	918
60037	WYO 2-1	BALE	005:51-52	9/15/79	896	47	5.3	3.8	57	9.1	.26	.36	88	.58	1.73	45	1072
62052	DENSITY	BALE	001:05-08	8/27/79	1653	89	5.4	2.4	68	7.8	.22	.43	88	.41	0.00	0	1129
7312-134		BALE	326:06-10	9/14/79	1530	165	10.8	5.0	68	15.8	.25	.33	87	1.38	2.46	38	896
21182	GALENA, I43-16	BALE	239:03-05	8/20/79	981	93	9.6	6.8	58	16.3	.24	.37	86	1.00	0.00	0	1107
21095	6903-259	BALE	307:11-15	9/10/79	700	40	5.9	5.1	53	11.0	.24	.35	85	.71	1.90	34	1071
65102	YAKIMA CL (L1)	BALE	006:05-08	9/04/79	1066	61	5.7	3.4	63	9.1	.26	.39	85	.58	2.12	41	906
21193	7005-194	BALE	051:07-08	9/04/79	1023	142	14.0	4.8	74	18.8	.22	.32	85	1.42	0.00	24	923
21049	STYRIAN	BALE	020:05-06	8/10/79	1429	78	5.5	2.8	66	8.3	.27	.31	85	.85	0.00	0	29
7311-032		BALE	315:31-35	9/05/79	2159	279	13.0	4.0	76	16.9	.28	.39	85	1.50	1.28	34	922
66051	PROGRESS	BALE	009:05-08	8/21/79	1331	109	8.2	2.7	75	10.9	.26	.36	85	.71	3.26	0	1124
21182	GALENA, I43-16	BALE	301:21-25	8/22/79	816	90	11.0	7.4	59	18.4	.27	.41	84	.73	0.00	0	1104
21094	6903-112	BALE	235:01-10	9/13/79	1305	113	8.7	7.3	54	16.0	.22	.48	84	.94	1.71	35	1019
66050	ALLIANCE	BALE	012:05-08	8/21/79	1013	64	6.4	2.2	74	8.6	.27	.37	83	.76	0.00	0	1126
48209	FUGGLE H	BALE	303:01-02	8/15/79	533	21	4.1	2.3	64	6.4	.33	.49	83	1.11	0.00	0	41
21187	S. BREWER	BALE	242:01-10	9/18/79	0	0	9.6	5.0	65	14.6	.25	.34	83	2.87	1.70	36	1074
7312-083		BALE	325:06-10	9/07/79	1271	171	13.5	3.9	77	17.3	.29	.40	82	1.74	2.89	27	1034
7301-001		BALE	322:26-30	9/06/79	1118	60	5.4	2.7	66	8.1	.31	.43	82	.76	.01	34	1054
7311-078		BALE	318:31-35	9/06/79	1113	122	11.0	3.3	77	14.3	.29	.39	81	.25	1.76	41	1036
21011	L 16	BALE	005:01-04	9/04/79	1948	123	6.4	4.3	59	10.7	.26	.38	81	.25	1.80	42	1069
66054	CALICROSS	BALE	325:01-05	9/13/79	2122	153	7.2	6.3	53	13.5	.24	.37	81	1.00	0.00	0	1010
66054	CALICROSS	BALE	014:05-08	9/11/79	1229	72	5.9	4.4	57	10.2	.26	.37	81	.64	0.00	39	996
21083	VOJVODINA	BALE	007:09-10	8/27/79	2132	179	8.4	3.3	71	11.7	.26	.32	80	.62	0.00	0	187
21083	VOJVODINA	BALE	223:01-10	9/12/79	1792	161	9.0	4.1	68	13.1	.27	.43	79	1.35	0.00	0	1099
21081	DUNAV	BALE	221:01-02	8/20/79	2538	163	6.5	4.1	61	10.6	.25	.44	79	1.50	0.00	0	1011
7006-061		BALE	323:16-20	8/31/79	1075	101	9.4	2.6	78	12.1	.28	.42	78	1.09	2.38	30	875
7302-029		BALE	326:26-30	9/67/9	1171	137	11.7	3.0	79	14.8	.30	.45	78	1.50	.06	42	932
7306-139		BALE	306:31-35	9/05/79	926	99	10.7	4.6	69	15.4	.27	.44	78	1.96	2.54	37	929
56002	BACKA	BALE	012:01-04	9/04/79	955	33	3.6	5.5	39	9.1	.25	.42	78	.62	3.25	25	910
48209	FUGGLE H	BALE	010:01-02	8/10/79	1098	56	5.1	2.5	67	7.6	.26	.37	78	.73	0.00	0	24
21095	6903-259	BALE	236:01-10	9/13/79	1695	109	6.5	6.9	48	13.3	.23	.35	78	.76	1.84	0	1003
64107	N. BREWER	BALE	312:01-05	8/15/79	764	78	10.3	4.4	70	14.7	.26	.43	78	2.01	2.65	23	38
61020	SAV GOLDING	BALE	018:01-04	8/21/79	720	36	5.1	2.6	66	7.7	.30	.44	77	.89	0.00	0	1114

1979 BALES SAMPLES WITH MORE THAN 70% REMAINING

SELECTED GENOTYPES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (CONE) SORTED BY PERCENT AS OF 80/10/23.(N= 98)

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL MLS/ 100G	OIL HUM/ CARY	OIL COH	SERIAL NUMBER
21053	AURORA	BALE	219:01-04	8/20/79	1424	178	12.5	5.3	70	17.8	.23	.34	77	1.46	0.00	20	815
21083	VOJVODINA	BALE	223:01-05	8/28/79	3387	317	9.4	4.0	70	13.3	.28	.40	77	1.04	0.00	0	1037
7311-068		BALE	317:31-35	9/06/79	2167	222	10.3	6.9	59	17.1	.30	.46	77	1.99	2.04	39	1056
21081	DUNAV	BALE	305:06-10	9/07/79	811	48	6.0	3.9	60	9.9	.36	.48	77	1.32	0.00	27	827
61020	SAV GOLDING	BALE	247:03-04	8/10/79	827	45	5.5	3.1	63	8.6	.31	.47	77	1.17	2.83	27	31
7003-015		BALE	319:11-15	9/10/79	1868	200	10.7	4.7	69	15.4	.23	.38	77	1.14	2.03	27	838
21055	6806-080	BALE	316:06-10	8/29/79	853	125	14.7	4.8	75	19.5	.28	.41	77	1.93	0.00	45	845
48209	FUGGLE H	BALE	010:03-04	8/21/79	1141	58	5.2	2.8	65	7.9	.33	.45	76	1.21	0.00	0	825
21016	FUGGLE N VF	BALE	304:01-02	8/15/79	320	19	6.2	3.4	64	9.6	.26	.43	76	1.28	0.00	0	46
7307-023		BALE	309:31-35	9/05/79	1267	127	10.1	4.1	71	14.2	.31	.48	76	.67	2.29	25	1082
21202	6903-107	BALE	314:11-15	9/10/79	2039	98	4.8	5.9	45	10.7	.27	.45	76	.80	3.35	32	1055
61019	YUGO GOLDING	BALE	017:01-04	8/21/79	0	0	5.6	2.7	67	8.3	.25	.40	76	.73	2.74	0	1108
21193	7005-194	BALE	315:16-20	8/31/79	1589	211	13.3	4.9	73	18.2	.26	.44	76	1.53	2.24	27	1101
21093	N. BREWER VF	BALE	313:01-02	8/15/79	938	111	11.9	5.2	69	17.0	.27	.40	76	1.92	2.60	24	40
66050	ALLIANCE	BALE	231:01-05	8/20/79	1152	69	6.0	2.3	72	8.4	.24	.40	76	.92	0.00	0	858
21049	STYRIAN	BALE	214:01-02	8/10/79	0	0	4.8	3.0	61	7.9	.28	.50	76	1.29	2.92	31	23
68051	BRAMLING CROSS	BALE	011:05-08	8/27/79	1008	54	5.5	3.0	64	8.5	.31	.49	76	.89	1.76	0	1127
7312-036		BALE	323:06-10	9/07/79	619	66	10.8	5.9	64	16.6	.34	.37	76	1.56	2.32	38	894
21053	AURORA	BALE	003:09-12	8/27/79	933	94	10.1	3.8	72	13.9	.28	.40	75	1.25	0.00	0	1112
21016	FUGGLE N VF	BALE	009:01-02	8/10/79	1728	90	5.3	2.9	64	8.2	.28	.41	75	0.00	0.00	0	35
7307-051		BALE	310:31-35	8/22/79	640	61	9.7	3.1	75	12.7	.27	.41	75	1.25	3.32	28	818
61019	YUGO GOLDING	BALE	246:03-04	8/10/79	942	52	5.6	3.1	64	8.7	.28	.49	75	1.22	2.92	28	26
21040	COLUMBIA	BALE	309:01-05	9/07/79	1382	102	7.4	4.1	64	11.6	.26	.43	75	0.00	2.13	38	990
7003-015		BALE	213:12-16	9/17/79	1382	129	9.4	4.8	66	14.2	.26	.44	74	1.14	0.00	0	865
7306-091		BALE	305:31-35	9/05/79	802	73	9.2	2.9	76	12.1	.25	.43	74	1.67	1.89	28	927
21083	VOJVODINA	BALE	007:09-12	9/11/79	1723	148	8.6	3.5	71	12.1	.27	.45	74	1.28	0.00	0	1001
21182	GALENA, I43-16	BALE	239:01-02	8/10/79	533	54	10.3	8.2	55	18.5	.25	.40	74	.96	1.85	35	32
21081	DUNAV	BALE	221:03-08	8/28/79	1988	151	7.6	4.0	65	11.7	.28	.47	74	1.42	3.38	27	847
66050	ALLIANCE	BALE	244:07-08	8/20/79	1066	62	5.9	2.3	72	8.1	.27	.42	74	1.21	2.96	26	856
21043	WYE CHALLENGER	BALE	018:05-08	8/27/79	885	59	6.7	4.0	62	10.7	.27	.49	73	1.14	0.00	0	1117
21081	DUNAV	BALE	005:09-10	8/27/79	1386	97	7.1	3.6	66	10.7	.29	.45	73	.96	2.55	0	1103
64107	N. BREWER	BALE	225:01-05	8/23/79	697	75	10.9	4.9	68	15.8	.26	.43	73	1.72	0.00	0	876
7313-053		BALE	335:01-05	8/29/79	1160	126	10.9	5.0	68	15.9	.30	.41	73	2.12	1.57	39	260
7313-029		BALE	332:01-05	8/22/79	1141	129	11.3	4.9	69	16.2	.26	.45	73	1.85	2.68	29	822
7312-027		BALE	327:31-35	9/06/79	1041	143	13.8	4.2	76	18.0	.28	.46	72	1.92	1.49	29	1035

1979 BALES SAMPLES WITH MORE THAN 70% REMAINING

SELECTED GENOTYPES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (CONE) SORTED BY PERCENT AS OF 80/10/23.(N= 98) PAGE 3

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL MLS/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
21167	HYBRID 2 INDIA	BALE	014:01-04	9/11/79	1916	163	8.5	4.4	65	13.0	.28	.46	72	.38	0.00	0	1097
21055	6806-080	BALE	212:01-05	8/20/79	657	91	13.9	5.3	72	19.2	.27	.44	72	2.01	1.64	43	860
66055	FIRST CHOICE	BALE	015:05-08	9/11/79	1187	56	4.8	4.5	51	9.3	.28	.48	72	.89	.45	42	871
62052	DENSITY	BALE	232:01-10	9/13/79	1058	58	5.6	3.7	60	9.2	.20	.43	72	.51	2.50	0	1002
21049	STYRIAN	BALE	020:07-09	8/21/79	1450	70	4.9	2.7	64	7.5	.26	.48	72	.85	0.00	0	852
66056	SMOOTHCONE	BALE	244:09-10	9/17/79	704	55	7.9	4.4	64	12.3	.26	.49	72	1.53	0.00	0	1111
21016	FUGGLE N VF	BALE	009:03-04	8/21/79	981	49	5.1	2.9	63	7.9	.24	.46	71	1.14	0.00	0	857
7311-152		BALE	321:31-35	9/06/79	1519	213	14.0	4.9	74	19.0	.28	.47	71	2.01	.22	39	1057
21080	BACKA	BALE	008:09-12	8/09/79	833	29	3.6	5.6	38	9.1	.20	.51	71	.60	0.00	0	1073
21016	FUGGLE N VF	BALE	204:03-05	8/20/79	635	41	6.5	3.4	65	9.9	.26	.48	71	1.32	2.82	25	854
21082	NEOPLANTA	BALE	006:09-10	8/27/79	2480	246	9.9	3.6	73	13.6	.28	.42	71	1.10	0.00	0	1113
61021	TETTNANG-SWISS	BALE	019:01-04	8/21/79	270	4	1.7	5.1	25	6.8	.25	.57	71	.73	3.19	0	1125
21083	VOJVODINA	BALE	327:06-10	9/07/79	2048	175	8.6	3.8	69	12.3	.29	.43	71	.96	2.59	29	898
7006-456		BALE	216:28-32	9/14/79	1578	137	8.7	4.4	66	13.1	.28	.50	71	1.93	3.20	35	917
64107	N. BREWER	BALE	247:05-06	8/20/79	555	64	11.6	5.3	68	16.9	.24	.41	71	2.35	2.60	24	816
21053	AURORA	BALE	330:01-05	8/29/79	889	93	10.6	4.3	71	14.8	.26	.43	71	1.47	0.00	0	861
64107	N. BREWER	BALE	004:05-08	8/21/79	654	61	9.4	3.8	71	13.2	.23	.47	71	1.96	0.00	0	863
21016	FUGGLE N VF	BALE	204:01-02	8/10/79	960	58	6.1	3.4	64	9.5	.27	.51	71	1.35	0.00	0	25
19209	FUGGLE	BALE	003:01-02	8/10/79	789	37	4.7	2.6	64	7.3	.27	.43	71	.44	0.00	0	36
21094	6903-112	BALE	306:11-15	9/10/79	811	56	7.0	6.6	51	13.6	.23	.41	71	.69	1.38	0	998
21195	7006-408	BALE	309:21-25	9/14/79	1485	174	11.8	5.6	67	17.4	.29	.53	70	2.56	0.00	0	907
21016	FUGGLE N VF	BALE	304:01-05	8/22/79	444	21	5.0	2.7	64	7.6	.34	.54	70	1.09	0.00	0	1018
21081	DUNAV	BALE	005:09-12	9/11/79	684	51	7.5	3.6	67	11.1	.29	.51	70	1.49	3.15	0	1024
21082	NEOPLANTA	BALE	306:06-10	8/29/79	1681	156	9.3	4.5	67	13.8	.24	.44	70	1.53	0.00	0	1048
21193	7005-194	BALE	237:01-05	8/28/79	2058	275	13.4	5.2	72	18.6	.26	.44	70	1.15	2.15	25	879
21082	NEOPLANTA	BALE	222:01-05	8/28/79	2538	211	8.3	4.2	66	12.5	.26	.38	70	1.29	2.43	38	849
7007-175		BALE	317:21-25	8/22/79	793	60	7.7	4.8	61	12.5	.32	.59	70	1.99	3.09	0	1118
7312-078		BALE	329:31-35	9/06/79	636	70	11.0	6.2	64	17.2	.28	.45	70	2.01	2.22	43	842

1979 CONE SAMPLES WITH MORE THAN 70% REMAINING

SELECTED GENOTYPES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (CONE) SORTED BY PERCENT α AS OF 80/10/23.(N= 126)

1979: 9 cone-basis:

SORTED BY % α remaining after 6 months at room temp.

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL ML/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
21160	6901-140	CONE	051:49-50	8/31/79	0	0	4.0	6.1	39	10.1	.26	.28	93	0.00	0.00	0	69
60037	WYO 2-1	CONE	005:51-52	8/31/79	0	0	5.9	4.6	56	10.4	.24	.28	93	0.00	0.00	42	73
19110		CONE	002:49-50	8/29/79	0	0	6.1	5.6	52	11.7	.22	.29	92	0.00	0.00	55	101
7613-072		CONE	160:07	9/19/79	0	0	12.0	2.5	82	14.5	.27	.30	90	0.00	0.00	41	730
7614-064		CONE	162:36	9/19/79	0	0	12.3	2.8	81	15.1	.27	.31	88	0.00	0.00	46	753
21138	6701-054	CONE	016:49-50	8/31/79	0	0	1.7	2.3	41	3.9	.33	.32	88	0.00	0.00	0	113
7003-118		CONE	035:07-08	9/06/79	0	0	5.2	7.6	40	12.8	.24	.32	87	0.00	0.00	39	167
7614-101		CONE	163:20	9/19/79	0	0	12.9	3.0	81	15.9	.29	.32	87	0.00	0.00	42	736
7614-017		CONE	161:42	9/19/79	0	0	12.3	3.6	77	15.9	.26	.32	87	0.00	0.00	51	747
66054	CALICROSS	CONE	325:01-04	9/13/79	0	0	6.2	5.2	54	11.4	.23	.33	86	0.00	0.00	40	304
7614-115		CONE	163:34	9/19/79	0	0	15.4	5.0	75	20.4	.25	.33	86	0.00	0.00	34	754
21169	TARDIF D'BOURG	CONE	024:01-04	9/19/79	0	0	4.7	5.6	45	10.3	.23	.33	86	0.00	0.00	0	716
21094	6903-112	CONE	009:49-50	8/31/79	0	0	4.5	3.9	53	8.4	.22	.33	86	0.00	0.00	0	104
21182	GALENA, I43-16	CONE	008:05-08	9/19/79	0	0	5.6	3.8	59	9.4	.24	.32	86	0.00	0.00	41	714
7614-079		CONE	162:51	9/19/79	0	0	12.6	4.7	72	17.3	.26	.34	85	0.00	0.00	29	755
7614-027		CONE	161:52	9/19/79	0	0	11.7	3.5	76	15.3	.26	.34	84	0.00	0.00	0	750
7306-193		CONE	036:25-26	8/31/79	0	0	12.4	4.2	74	16.6	.26	.34	84	0.00	0.00	32	125
7312-128		CONE	040:27-28	9/04/79	0	0	13.4	3.6	78	17.0	.28	.34	84	0.00	0.00	33	123
21163	6907-058	CONE	052:49-50	8/31/79	0	0	5.6	7.2	43	12.8	.24	.34	84	0.00	0.00	31	64
7611-158		CONE	157:06	9/19/79	0	0	10.7	3.4	76	14.1	.26	.34	84	0.00	0.00	0	723
21007	6735-005	CONE	041:49-50	8/31/79	0	0	3.1	2.2	58	5.3	.26	.34	84	0.00	0.00	0	91
7613-124		CONE	161:06	9/19/79	0	0	10.8	2.3	82	13.1	.26	.34	84	0.00	0.00	0	741
7610-050		CONE	151:44	9/19/79	0	0	14.2	3.0	82	17.3	.27	.35	83	0.00	0.00	26	626
7312-036		CONE	147:50	9/19/79	0	0	14.9	4.0	78	18.9	.27	.35	83	0.00	0.00	30	667
7306-163		CONE	032:25-26	8/31/79	0	0	12.0	3.9	75	16.0	.26	.35	83	0.00	0.00	29	127
7606-048		CONE	148:45	9/19/79	0	0	13.3	4.0	76	17.3	.26	.35	83	0.00	0.00	34	662
7618-098		CONE	173:23	9/20/79	0	0	13.6	4.7	74	18.3	.26	.35	83	0.00	0.00	38	793
7602-025		CONE	140:49	9/18/79	0	0	10.4	3.2	76	13.6	.29	.35	83	0.00	0.00	0	529
21181	7003-243	CONE	035:51-52	8/31/79	0	0	6.7	5.5	54	12.2	.24	.35	83	0.00	0.00	39	71
7611-108		CONE	156:09	9/19/79	0	0	15.4	3.5	81	18.9	.30	.36	82	0.00	0.00	31	724
7611-183		CONE	157:31	9/19/79	0	0	10.8	4.1	72	14.9	.26	.36	82	0.00	0.00	0	715
60032	COLO 5-1	CONE	001:51-52	8/31/79	0	0	1.9	1.1	63	3.0	.27	.36	81	0.00	0.00	46	82
7611-025		CONE	154:32	9/19/79	0	0	7.9	1.8	81	9.8	.29	.36	81	0.00	0.00	0	647
7610-137		CONE	153:25	9/19/79	0	0	11.7	4.3	73	16.1	.26	.36	81	0.00	0.00	0	627
7618-053		CONE	172:31	9/20/79	0	0	11.9	4.2	74	16.1	.28	.36	81	0.00	0.00	0	798

1979 CONE SAMPLES WITH MORE THAN 70% REMAINING

SELECTED GENOTYPES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (CONE) SORTED BY PERCENT AS OF 80/10/23.(N= 126)

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL MLS/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
21164	6907-077	CONE	055:49-50	8/31/79	0	0	5.0	8.0	38	13.0	.22	.37	80	0.00	0.00	0	54
21057	LATE CL. SEEDL.	CONE	036:49-50	9/14/79	0	0	6.1	5.4	52	11.5	.23	.37	80	0.00	0.00	42	337
7611-143		CONE	156:44	9/19/79	0	0	14.6	3.3	81	17.9	.27	.37	80	0.00	0.00	25	695
21170	ELSASSER	CONE	316:01-05	9/13/79	0	0	3.0	5.1	36	8.1	.24	.37	80	0.00	0.00	26	310
7615-083		CONE	165:45	9/20/79	0	0	10.1	2.0	83	12.1	.28	.37	80	0.00	0.00	0	775
7612-022		CONE	158:06	9/19/79	0	0	11.8	3.9	75	15.7	.27	.37	80	0.00	0.00	0	726
7602-067		CONE	141:38	9/18/79	0	0	11.0	3.9	73	14.8	.29	.37	80	0.00	0.00	0	543
7610-104		CONE	152:45	9/19/79	0	0	13.7	3.7	78	17.4	.27	.37	80	0.00	0.00	30	633
21160	6901-140	CONE	032:17-18	9/12/79	0	0	4.1	5.7	42	9.8	.22	.37	80	0.00	0.00	0	246
7611-005		CONE	154:12	9/19/79	0	0	13.8	3.8	78	17.6	.30	.38	79	0.00	0.00	31	629
7606-086		CONE	149:30	9/19/79	0	0	14.3	5.7	71	20.0	.24	.38	79	0.00	0.00	31	669
21170	ELSASSER	CONE	025:01-04	9/19/79	0	0	3.0	5.9	33	8.9	.25	.38	79	0.00	0.00	0	696
7605-040		CONE	145:12	9/19/79	0	0	10.9	2.8	79	13.7	.34	.38	79	0.00	0.00	0	599
66052	PRIDE RINGWOOD	CONE	324:01-05	9/13/79	0	0	8.0	5.5	59	13.5	.23	.38	79	0.00	0.00	31	300
7314-012		CONE	169:25	9/20/79	0	0	14.6	6.8	68	21.4	.26	.38	79	0.00	0.00	43	790
7612-008		CONE	157:45	9/19/79	0	0	12.4	3.7	77	16.1	.26	.38	79	0.00	0.00	26	694
7606-039		CONE	148:36	9/19/79	0	0	10.5	2.7	79	13.2	.27	.38	79	0.00	0.00	0	665
7615-099		CONE	166:08	9/20/79	0	0	14.7	4.3	77	19.0	.27	.38	79	0.00	0.00	35	791
21147	6305-006	CONE	054:51-52	8/31/79	0	0	5.6	2.4	70	8.0	.28	.38	79	0.00	0.00	34	49
7005-014		CONE	037:19-20	9/12/79	0	0	8.5	5.7	60	14.1	.24	.38	79	0.00	0.00	51	231
7614-102		CONE	163:21	9/19/79	0	0	10.1	2.7	79	12.7	.27	.38	79	0.00	0.00	0	740
7611-169		CONE	157:17	9/19/79	0	0	14.7	6.1	70	20.8	.28	.38	78	0.00	0.00	36	731
7611-128		CONE	156:29	9/19/79	0	0	9.7	2.7	78	12.4	.28	.39	78	0.00	0.00	0	700
7311-028		CONE	050:25-26	9/12/79	0	0	15.2	5.5	73	20.7	.24	.39	78	0.00	0.00	38	218
7610-097		CONE	152:38	9/19/79	0	0	13.7	4.2	76	17.8	.31	.39	78	0.00	0.00	34	636
7312-083		CONE	173:51	9/20/79	0	0	13.1	3.4	79	16.5	.29	.39	78	0.00	0.00	23	770
7312-134		CONE	158:41	9/19/79	0	0	12.2	3.0	80	15.3	.23	.39	78	0.00	0.00	34	711
19185		CONE	006:49-50	8/29/79	0	0	4.7	2.5	65	7.2	.25	.39	78	0.00	0.00	37	100
7601-022		CONE	139:28	9/18/79	0	0	9.6	1.8	84	11.4	.31	.40	77	0.00	0.00	0	539
7613-037		CONE	159:25	9/19/79	0	0	12.8	3.0	81	15.7	.27	.39	77	0.00	0.00	28	718
7612-035		CONE	158:19	9/19/79	0	0	14.6	3.1	82	17.7	.27	.39	77	0.00	0.00	30	725
7611-067		CONE	155:21	9/19/79	0	0	12.7	6.1	67	18.8	.25	.39	77	0.00	0.00	28	727
7610-127		CONE	153:15	9/19/79	0	0	9.7	1.8	84	11.5	.31	.39	77	0.00	0.00	0	643
7603-041		CONE	142:30	9/18/79	0	0	12.0	3.0	79	15.1	.29	.39	77	0.00	0.00	44	548
7601-006		CONE	139:12	9/18/79	0	0	13.2	2.9	82	16.1	.33	.40	76	0.00	0.00	38	540

1979 CONE SAMPLES WITH MORE THAN 70% REMAINING

SELECTED GENOTYPES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (CONE) SORTED BY PERCENT AS OF 80/10/23.(N= 126) PAGE 3

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL ML/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
7615-059		CONE	165:21	9/20/79	0	0	11.7	3.2	78	14.8	.26	.40	76	0.00	0.00	0	783
7606-001		CONE	147:51	9/19/79	0	0	9.7	2.5	79	12.2	.29	.40	76	0.00	0.00	0	661
7611-026		CONE	154:33	9/19/79	0	0	11.1	3.7	75	14.7	.28	.41	76	0.00	0.00	0	646
7604-039		CONE	143:46	9/18/79	0	0	9.0	3.2	73	12.2	.33	.40	76	0.00	0.00	0	538
7604-013		CONE	143:20	9/19/79	0	0	11.1	3.3	76	14.4	.28	.40	76	0.00	0.00	35	595
7605-055		CONE	145:27	9/19/79	0	0	11.7	2.9	79	14.6	.21	.40	76	0.00	0.00	0	610
7618-048		CONE	172:26	9/20/79	0	0	15.7	5.5	74	21.2	.27	.41	76	0.00	0.00	45	782
7314-011		CONE	339:01-05	9/13/79	0	0	12.2	4.2	74	16.4	.27	.41	75	0.00	0.00	37	303
7003-066		CONE	323:11-15	9/13/79	0	0	5.5	5.6	49	11.1	.23	.41	75	0.00	0.00	28	301
7618-045		CONE	172:23	9/20/79	0	0	13.8	4.0	77	17.8	.26	.41	75	0.00	0.00	32	786
21162	6903-263	CONE	040:51-52	9/14/79	0	0	5.9	6.4	48	12.3	.24	.42	75	0.00	0.00	29	334
7611-178		CONE	157:26	9/19/79	0	0	13.1	3.4	79	16.5	.29	.41	75	0.00	0.00	38	705
7618-040		CONE	172:18	9/20/79	0	0	13.1	4.2	75	17.3	.27	.42	75	0.00	0.00	41	809
52013	84-S, BB 215-2	CONE	050:49-50	8/31/79	0	0	4.0	6.0	39	9.9	.24	.42	75	0.00	0.00	0	66
7606-032		CONE	148:29	9/19/79	0	0	9.1	2.2	80	11.3	.28	.42	75	0.00	0.00	0	651
7005-149		CONE	043:03-04	9/06/79	0	0	12.6	3.6	77	16.3	.24	.41	75	0.00	0.00	40	153
64010		CONE	021:51-52	8/31/79	0	0	3.4	4.6	42	8.0	.25	.41	75	0.00	0.00	0	78
7611-088		CONE	155:42	9/19/79	0	0	10.9	3.3	76	14.2	.27	.42	74	0.00	0.00	0	706
7611-123		CONE	156:24	9/19/79	0	0	7.9	2.5	75	10.5	.31	.42	74	0.00	0.00	0	722
7617-065		CONE	170:37	9/20/79	0	0	11.3	3.5	76	14.8	.27	.42	74	0.00	0.00	0	799
7611-084		CONE	155:38	9/19/79	0	0	13.2	4.3	75	17.5	.30	.42	74	0.00	0.00	30	698
7314-012		CONE	171:31	9/20/79	0	0	13.7	6.3	68	20.0	.26	.43	74	0.00	0.00	41	781
7312-083		CONE	150:47	9/19/79	0	0	13.8	3.9	78	17.6	.29	.42	74	0.00	0.00	25	648
7606-050		CONE	148:47	9/19/79	0	0	12.4	3.4	78	15.8	.30	.42	74	0.00	0.00	36	649
7610-096		CONE	152:37	9/19/79	0	0	10.5	2.5	80	13.0	.29	.42	74	0.00	0.00	0	638
7614-050		CONE	162:22	9/19/79	0	0	11.4	2.8	80	14.2	.32	.42	74	0.00	0.00	0	739
7617-007		CONE	169:32	9/20/79	0	0	16.3	5.9	73	22.2	.26	.42	74	0.00	0.00	37	795
7611-012		CONE	154:19	9/19/79	0	0	9.2	2.8	76	11.9	.28	.42	74	0.00	0.00	0	641
7602-017		CONE	140:41	9/18/79	0	0	13.5	4.3	75	17.8	.29	.42	74	0.00	0.00	40	527
7314-012		CONE	167:26	9/20/79	0	0	13.0	5.6	69	18.6	.26	.43	73	0.00	3.20	40	789
7618-016		CONE	171:47	9/20/79	0	0	9.0	2.8	76	11.7	.29	.43	73	0.00	0.00	0	766
7615-075		CONE	165:37	9/20/79	0	0	9.0	2.5	78	11.5	.28	.43	73	0.00	0.00	0	774
7611-091		CONE	155-45	9/19/79	0	0	10.1	2.7	78	12.9	.27	.43	73	0.00	0.00	0	710
7303-019		CONE	329:26-30	9/13/79	0	0	12.6	3.8	76	16.4	.25	.43	73	0.00	0.00	33	305
21001	FR2	CONE	031:49-50	8/31/79	0	0	5.1	3.7	58	8.8	.26	.43	73	0.00	0.00	34	114

1979 CONE SAMPLES WITH MORE THAN 70% REMAINING

SELECTED GENOTYPES AT 8% MOISTURE CONTENT (BALE) OR AS IS BASIS (CONE) SORTED BY PERCENT AS OF 80/10/23.(N= 126)

ACCESSION OR NURSERY NUMBER	IDENTIFICATION	TYPE	LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	ALPHA (%)	BETA (%)	ALPHA RATIO	ALPHA +BETA (%)	HOP STORAGE INDEX	SIX MONTH HSI	% A+B REMAIN (6 MO)	OIL ML/ 100G	OIL HUM/ CARY	COH	SERIAL NUMBER
7611-124		CONE	156:25	9/19/79	0	0	11.4	3.0	79	14.4	.28	.43	73	0.00	0.00	0	720
53050	109I	CONE	053:49-50	8/31/79	0	0	1.1	2.6	29	3.7	.29	.43	73	0.00	0.00	0	53
7312-083		CONE	157:37	9/19/79	0	0	13.9	3.7	78	17.6	.29	.43	73	0.00	0.00	25	712
7605-108		CONE	146:27	9/19/79	0	0	11.5	3.5	76	15.0	.29	.43	73	0.00	0.00	0	609
21164	6907-077	CONE	040:17-18	9/12/79	0	0	6.5	8.1	44	14.5	.22	.44	72	0.00	0.00	38	212
7615-007		CONE	164:22	9/19/79	0	0	11.4	3.1	78	14.5	.29	.45	71	0.00	0.00	.0	743
21028	6616-003	CONE	023:51-52	8/31/79	0	0	8.2	5.9	58	14.1	.25	.45	71	0.00	0.00	34	51
7314-044		CONE	341:01-05	9/13/79	0	0	13.3	3.7	78	17.0	.27	.45	71	0.00	0.00	41	297
60029	COLO 3-1	CONE	030:49-50	8/31/79	0	0	6.2	4.3	58	10.6	.26	.45	71	0.00	0.00	70	99
21097	HULLER BITTER	CONE	030:09-12	9/19/79	0	0	6.4	4.6	57	11.0	.24	.45	71	0.00	0.00	31	703
7006-398		CONE	306:21-25	9/13/79	0	0	14.1	7.5	65	21.6	.24	.45	71	0.00	0.00	20	298
7612-020		CONE	158:04	9/19/79	0	0	11.0	2.4	81	13.5	.33	.45	71	0.00	0.00	0	732
7614-016		CONE	161:41	9/19/79	0	0	14.2	4.2	77	18.4	.28	.45	71	0.00	0.00	43	756
7606-002		CONE	147:52	9/19/79	0	0	8.4	2.7	76	11.1	.28	.46	70	0.00	0.00	0	663
7618-117		CONE	173:42	9/20/79	0	0	13.6	5.4	71	19.0	.28	.46	70	0.00	0.00	44	771
7617-009		CONE	169:34	9/20/79	0	0	11.2	4.1	73	15.3	.28	.46	70	0.00	0.00	0	802
7610-009		CONE	151:03	9/19/79	0	0	10.8	3.0	78	13.8	.34	.46	70	0.00	0.00	0	623
7303-007		CONE	140:24	9/18/79	0	0	13.2	4.4	74	17.6	.27	.45	70	0.00	2.50	36	552
7312-042		CONE	150:23	9/19/79	0	0	10.3	3.3	75	13.6	.31	.45	70	0.00	1.82	54	666
54002	BB 504-3	CONE	054:49-50	8/31/79	0	0	1.8	1.2	59	3.0	.29	.46	70	0.00	0.00	0	52
7301-126		CONE	033:23-24	9/12/79	0	0	14.3	4.8	75	19.1	.24	.46	70	0.00	0.00	42	223

1979: RANKING BY HUMULENE/CARYOPH. RATIO GLC OIL COMPOSITION OF 1979 BALE SAMPLES

ACCESSION/ NURSERY NO	IDENTIFICATION NAME OR PEDIGREE	ML OIL 100 GM	H/C RATIO	HUM/ ALPHA	H/F RATIO	H/UNK RATIO	PERCENT IN OIL MYRC	CARY	FARN	HUM	MUUR	GERM	CAD?	LAB NUMBER
21081	DUNAV	1.42	3.38	44	0.0	0.0	61.4	6.5	.9	21.9	0.0	0.0	0.0	847
66051	PROGRESS	.94	3.36	45	0.0	0.0	53.9	8.7	.2	29.1	0.0	0.0	0.0	851
6903-107		.80	3.35	57	7.0	0.0	47.3	8.6	4.1	28.6	0.0	0.0	0.0	1055
7307-051		1.25	3.32	31	0.0	0.0	57.9	6.9	.2	22.9	0.0	0.0	0.0	818
56001	HALLERTAU	.87	3.29	72	0.0	0.0	42.4	10.2	.3	33.6	0.0	0.0	0.0	1119
21080	BACKA	.89	3.27	55	0.0	0.0	58.8	7.7	.2	25.1	0.0	0.0	0.0	1043
66056	SMOOTHCONE	.96	3.27	32	0.0	0.0	56.1	7.2	.4	23.6	0.0	0.0	0.0	1045
66051	PROGRESS	.71	3.26	32	0.0	0.0	36.7	11.4	.5	37.0	.2	1.4	0.0	1124
56002	BACKA	.62	3.25	68	0.0	22.9	44.1	10.2	.2	33.2	1.4	0.0	0.0	910
21014	HALLERTAU MF	.78	3.22	48	0.0	0.0	49.0	9.7	.5	31.1	0.0	0.0	0.0	37
21014	HALLERTAU MF	.76	3.22	77	0.0	28.2	33.5	12.7	.4	40.9	1.4	0.0	0.0	27
7006-456		1.93	3.20	19	0.0	0.0	75.2	2.5	.4	7.9	0.0	0.0	0.0	917
21113	LUBELSKA	.87	3.20	38	1.7	19.8	48.0	6.9	13.2	22.0	1.1	0.0	0.0	43
61021	TETTNANG-SWISS	.73	3.19	31	1.5	0.0	43.8	6.8	15.0	21.8	0.0	0.0	0.0	1125
21057	PR. RING LG CON	.73	3.17	28	0.0	0.0	55.2	6.2	.2	19.6	0.0	0.0	0.0	1047
7312-146		1.03	3.17	8	0.0	.7	61.4	2.4	0.0	7.6	4.5	6.7	0.0	1076
21081	DUNAV	1.49	3.15	42	0.0	0.0	56.6	6.4	.8	20.0	0.0	0.0	0.0	1024
21015	TETTNANGER	1.07	3.12	44	1.5	0.0	51.7	6.7	13.7	20.9	0.0	0.0	0.0	829
21114	NADWISLANSKA	.89	3.12	36	1.7	0.0	50.4	6.7	12.4	20.8	.6	.6	0.0	42
7007-175		1.99	3.09	53	0.0	0.0	64.1	6.1	.1	18.8	0.0	0.0	0.0	1118
21045	SEREBRIANKA	.57	3.09	46	1.9	0.0	39.0	7.9	12.6	24.3	0.0	0.0	0.0	1115
21086	YUGO VIII/27	.96	3.08	30	1.5	0.0	59.6	5.1	10.2	15.7	0.0	0.0	0.0	1044
7003-066		1.61	3.07	40	0.0	0.0	66.3	5.7	0.0	17.5	0.0	0.0	0.0	889
21179	HERSBRUCKER-E	1.17	3.06	67	0.0	0.0	51.0	9.4	.3	28.7	0.0	0.0	0.0	915
21041	WILLAMETTE	1.10	3.05	42	3.6	0.0	60.9	6.3	5.4	19.2	0.0	0.0	0.0	841
7101-096		1.07	3.05	31	4.1	0.0	72.6	3.9	2.9	11.8	0.0	0.0	0.0	1102
21084	YUGO IV/2	.80	3.04	35	1.7	0.0	54.3	5.9	10.8	18.0	0.0	0.0	0.0	1077
7007-175		2.68	3.04	59	0.0	0.0	63.7	6.6	0.0	19.9	0.0	0.0	0.0	1078
7314-058		1.53	3.01	20	3.6	0.0	72.1	4.0	3.3	11.9	0.0	0.0	0.0	263
7101-099		.89	3.01	46	6.0	0.0	61.3	6.9	3.4	20.7	0.0	0.0	0.0	864
7101-175		1.14	3.00	75	5.4	0.0	62.4	6.6	3.6	19.8	0.0	0.0	0.0	867
7101-098		1.71	3.00	86	0.0	0.0	64.7	6.8	0.0	20.3	0.0	0.0	0.0	831
66050	ALLIANCE	1.21	2.96	85	15.1	25.0	39.1	11.9	2.4	35.4	1.4	0.0	0.0	856
61019	YUGO GOLDING	1.22	2.92	65	4.9	0.0	49.6	9.2	5.5	26.8	0.0	0.0	0.0	26
21049	STYRIAN	1.29	2.92	85	4.7	0.0	49.4	9.1	5.7	26.5	0.0	0.0	0.0	23
21043	WYE CHALLENGER	1.67	2.91	33	0.0	2.4	66.3	4.9	.9	14.2	2.0	3.8	0.0	185
21085	YUGO VII/23	1.00	2.91	29	1.4	0.0	67.2	4.0	8.3	11.6	0.0	0.0	0.0	1080
7312-083		1.74	2.89	26	8.4	0.0	53.0	7.0	2.4	20.1	0.0	0.0	0.0	1034
21043	WYE CHALLENGER	.91	2.89	26	18.1	2.3	48.6	6.9	1.1	20.0	3.3	5.5	0.0	1049
61020	SAV GOLDING	1.17	2.88	64	5.0	17.6	48.1	9.6	5.5	27.7	1.6	0.0	0.0	31
21049	STYRIAN	1.57	2.83	56	4.5	0.0	57.7	7.6	4.8	21.5	0.0	0.0	0.0	817
21016	FUGGLE N VF	1.32	2.82	47	4.4	0.0	56.2	7.7	5.0	21.8	0.0	0.0	0.0	854

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ACCESSION/ NURSERY NO	IDENTIFICATION NAME OR PEDIGREE	ML OIL 100 GM	H/C RATIO	HUM/ ALPHA	H/F RATIO	H/UNK RATIO	PERCENT IN OIL MYRC	CARY	FARN	HUM	MUUR	GERN	CAD?	LAB NUMBER
48209	FUGGLE H	1.59	2.81	82	4.7	0.0	49.6	9.2	5.5	25.9	0.0	0.0	0.0	866
21078	RECORD	1.82	2.80	47	0.0	0.0	51.8	9.4	0.0	26.3	0.0	0.0	0.0	264
21003	FUGGLE T	1.07	2.78	92	5.2	0.0	51.1	9.3	4.9	25.8	0.0	0.0	0.0	848
66054	CALICROSS	1.39	2.76	30	0.0	0.0	63.8	5.6	.2	15.5	0.0	0.0	0.0	977
61019	YUGO GOLDING	.73	2.74	36	5.4	0.0	47.7	9.0	4.5	24.7	0.0	0.0	0.0	1108
7005-182		3.20	2.74	42	0.0	0.0	66.0	5.9	0.0	16.1	0.0	0.0	0.0	893
7005-149		1.86	2.74	35	0.0	0.0	55.9	6.3	.1	17.1	0.0	0.0	0.0	1063
56013	CASCADE	1.35	2.69	23	1.8	0.0	73.7	3.2	4.7	8.7	0.0	0.0	0.0	880
56013	CASCADE	1.78	2.69	27	1.9	0.0	77.4	2.9	4.1	7.8	0.0	0.0	0.0	1029
7313-029		1.85	2.68	16	1.0	2.7	62.2	3.6	9.2	9.6	1.3	2.3	0.0	822
21092	CASCADE VF	1.35	2.68	25	2.0	0.0	69.2	3.5	4.5	9.3	0.0	0.0	0.0	1022
21195	7006-408	3.18	2.65	27	0.0	0.0	74.8	4.3	0.0	11.4	0.0	0.0	0.0	902
64107	N. BREWER	2.01	2.65	50	0.0	0.0	55.4	9.5	.2	25.1	0.0	0.0	0.0	38
7101-026		1.03	2.65	27	3.9	0.0	75.6	4.0	2.7	10.5	0.0	0.0	0.0	892
7312-009		2.87	2.63	20	4.8	0.0	71.1	4.5	2.5	11.9	0.0	0.0	0.0	883
62052	DENSITY	.49	2.62	15	0.0	0.0	54.5	7.5	.3	19.6	0.0	0.0	0.0	1038
7312-015		1.24	2.60	17	0.0	1.1	51.6	6.4	0.0	16.6	6.1	9.3	0.0	1083
64107	N. BREWER	2.35	2.60	47	0.0	0.0	59.1	8.6	.2	22.3	0.0	0.0	0.0	816
21093	N. BREWER VF	1.92	2.60	38	0.0	0.0	59.9	8.5	.2	22.0	0.0	0.0	0.0	40
21083	VOJVODINA	.96	2.59	15	0.0	0.0	70.6	5.1	.6	13.2	0.0	0.0	0.0	898
6771-016		1.39	2.59	21	2.6	0.0	75.5	3.5	3.4	9.1	0.0	0.0	0.0	884
21044	WYE NORTHDOWN	2.79	2.59	68	0.0	0.0	56.1	9.5	.9	24.5	0.0	0.0	0.0	869
21092	CASCADE VF	1.79	2.58	20	1.9	0.0	79.2	2.7	3.6	6.9	0.0	0.0	0.0	844
7002-024		1.50	2.56	34	0.0	0.0	71.0	5.3	.7	13.7	0.0	0.0	0.0	1086
21081	DUNAV	.96	2.55	31	4.9	0.0	46.7	9.1	4.7	23.2	0.0	0.0	0.0	1103
21047	SVALOF 85	.16	2.55	9	2.8	2.7	15.9	9.2	8.2	23.4	3.7	4.9	9.0	1150
7306-139		1.96	2.54	16	0.0	0.0	74.4	3.3	0.0	8.4	0.0	0.0	0.0	929
21091	6771-019	1.45	2.52	159	0.0	16.1	42.2	13.0	.3	32.9	1.3	.7	0.0	261
62052	DENSITY	.51	2.50	13	0.0	0.0	66.9	5.3	0.0	13.3	0.0	0.0	0.0	1002
7006-445		2.59	2.49	26	0.0	0.0	73.7	3.7	.9	9.1	0.0	0.0	0.0	983
7005-201		1.88	2.47	14	0.0	0.0	74.7	2.4	0.0	6.0	0.0	0.0	0.0	1005
7312-134		1.38	2.46	22	6.2	0.0	65.4	6.7	2.6	16.4	0.0	0.0	0.0	896
7313-110		2.43	2.45	43	0.0	0.0	55.4	8.7	.2	21.4	0.0	0.0	0.0	836
21053	AURORA	1.71	2.45	16	2.9	0.0	68.1	4.6	3.9	11.2	0.0	0.0	0.0	877
21044	WYE NORTHDOWN	2.79	2.44	75	0.0	0.0	52.2	9.9	.8	24.3	0.0	0.0	0.0	1090
21082	NEOPLANTA	1.29	2.43	34	3.1	18.6	52.4	8.7	6.7	21.2	1.1	0.0	0.0	849
7003-250		2.46	2.42	50	0.0	0.0	62.7	6.7	0.0	16.3	0.0	0.0	0.0	986
21042	6769-002	1.34	2.41	30	2.5	0.0	74.5	3.8	3.7	9.2	0.0	0.0	0.0	870
7006-061		1.09	2.38	18	0.0	0.0	66.4	6.4	0.0	15.2	0.0	0.0	0.0	875
21039	GOLDEN STAR	.57	2.33	20	0.0	2.0	54.5	6.1	0.0	14.2	3.0	4.2	0.0	1084
62053	DEFENDER	.64	2.33	65	7.6	19.6	38.4	13.2	4.1	30.9	1.6	0.0	0.0	868
7005-040		1.89	2.33	34	0.0	0.0	69.5	5.5	0.0	12.9	0.0	0.0	0.0	913

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7312-036		1.56	2.32	28	9.2	0.0	57.6	8.0	2.0	18.5	0.0	0.0	0.0	894
7003-250		2.57	2.31	36	0.0	0.0	74.6	4.2	0.0	9.8	0.0	0.0	0.0	1008
7307-023		.67	2.29	16	9.9	0.0	40.1	10.5	2.4	24.1	.9	1.2	0.0	1082
60042	SHINSHUWASE	.73	2.29	24	0.0	1.9	54.5	5.8	0.0	13.3	2.9	4.0	0.0	1040
7004-003		2.87	2.26	56	0.0	0.0	61.8	7.8	0.0	17.6	0.0	0.0	0.0	1021
7003-032		1.07	2.25	35	0.0	12.1	47.6	10.3	0.0	23.3	1.0	.9	0.0	900
21193	7005-194	1.53	2.24	23	0.0	0.0	52.8	8.8	.2	19.6	0.0	0.0	0.0	1101
7306-043		1.93	2.23	32	0.0	0.0	61.5	7.5	0.0	16.8	0.0	0.0	0.0	918
21180	7003-143	2.25	2.22	74	0.0	23.5	46.5	12.0	.2	26.6	1.1	0.0	0.0	1058
7312-078		2.01	2.22	18	3.4	1.7	63.7	4.7	3.1	10.3	2.0	4.1	0.0	842
7306-005		1.89	2.19	24	0.0	0.0	71.4	5.3	.1	11.7	0.0	0.0	0.0	1100
7007-206		2.34	2.19	27	3.1	0.0	60.8	5.8	4.1	12.7	0.0	0.0	0.0	1062
21051	APOLON	1.39	2.17	22	1.0	0.0	50.8	6.6	14.4	14.4	0.0	0.0	0.0	1095
21193	7005-194	1.15	2.15	19	0.0	10.2	50.9	10.4	.2	22.3	1.0	1.2	0.0	879
21040	COLUMBIA	1.17	2.13	24	3.5	0.0	63.5	6.8	4.2	14.5	0.0	0.0	0.0	990
65102	YAKIMA CL (L1)	.58	2.12	18	0.0	0.0	60.8	7.4	.2	15.6	0.0	0.0	0.0	906
7005-022		2.90	2.11	24	0.0	0.0	74.5	4.0	0.0	8.5	0.0	0.0	0.0	1075
6771-021		2.50	2.09	54	3.0	1.4	57.4	5.2	3.6	10.9	2.8	4.8	0.0	1025
21180	7003-143	2.39	2.08	57	0.0	0.0	50.2	10.4	.2	21.7	0.0	0.0	0.0	1014
7311-068		1.99	2.04	34	3.0	0.0	55.7	8.6	5.8	17.4	0.0	0.0	0.0	1056
21194	7006-311	1.85	2.04	26	6.5	0.0	56.1	8.5	2.7	17.4	0.0	0.0	0.0	833
21052	ATLAS	1.36	2.03	17	.7	0.0	58.6	5.0	14.0	10.2	0.0	0.0	0.0	878
7003-015		1.14	2.03	25	0.0	0.0	47.9	11.0	.2	22.3	0.0	0.0	0.0	838
21188	NP2/55 (S. AFR)	1.53	2.00	50	0.0	2.6	58.8	8.3	.5	16.6	2.2	4.1	0.0	914
21181	7003-243	1.64	1.98	34	0.0	0.0	65.3	7.4	0.0	14.6	.6	.5	0.0	1000
7003-176		1.81	1.97	25	0.0	0.0	68.4	5.7	0.0	11.1	0.0	0.0	0.0	1012
7306-182		2.51	1.93	24	0.0	0.0	77.0	5.6	0.0	10.7	0.0	0.0	0.0	904
21095	6903-259	.71	1.90	25	0.0	7.9	52.8	9.4	.3	17.7	1.2	1.1	0.0	1071
7306-091		1.67	1.89	39	0.0	10.5	52.6	11.4	.2	21.5	1.1	.9	0.0	927
21182	GALENA	.96	1.85	12	0.0	0.0	55.1	7.1	0.0	13.1	0.0	0.0	0.0	32
7005-070		2.04	1.85	24	0.0	0.0	66.3	6.6	0.0	12.1	1.0	1.0	0.0	262
21095	6903-259	.76	1.84	14	0.0	0.0	63.9	6.2	.3	11.5	0.0	0.0	0.0	1003
21116	BREWERS GOLD VF	3.01	1.83	30	0.0	0.0	72.8	5.5	0.0	10.1	0.0	0.0	0.0	901
7006-370		2.73	1.83	28	0.0	0.0	71.7	5.2	0.0	9.4	0.0	0.0	0.0	911
7006-296		2.81	1.82	24	3.7	0.0	63.8	6.7	3.3	12.2	0.0	0.0	0.0	265
7306-148		2.26	1.81	29	0.0	0.0	71.3	6.5	0.0	11.8	0.0	0.0	0.0	920
21050	AHIL	2.29	1.81	18	.8	0.0	67.8	4.8	10.4	8.7	0.0	0.0	0.0	834
21011	L 16	.25	1.80	6	0.0	0.0	50.3	8.5	.3	15.4	0.0	0.0	0.0	1069
21050	AHIL	2.82	1.77	19	.7	0.0	67.3	4.0	9.6	7.0	0.0	0.0	0.0	1087
7311-078		.25	1.76	3	2.1	0.0	46.9	9.0	7.6	15.9	0.0	0.0	0.0	1036
68051	BRAMBLING CROSS	.89	1.76	22	0.0	0.0	65.7	7.3	.2	12.8	0.0	0.0	0.0	1127

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7006-406		2.06	1.75	33	0.0	7.0	52.8	9.4	.1	16.5	1.1	1.2	0.0	1089
60037	WYO 2-1	.58	1.73	16	0.0	0.0	60.0	8.3	.2	14.4	0.0	0.0	0.0	1072
21056	BULLION 10A VF	2.17	1.72	19	0.0	0.0	71.3	6.4	.2	11.0	0.0	0.0	0.0	843
21094	6903-112	.94	1.71	18	0.0	0.0	48.8	9.1	.2	15.6	0.0	0.0	0.0	1019
21187	S. BREWER	2.87	1.70	36	1.0	2.3	50.2	6.7	11.2	11.4	2.1	2.9	0.0	1074
7003-081		1.21	1.69	73	0.0	10.0	28.4	17.8	.3	30.2	1.9	1.1	0.0	1028
19001	BREWERS GOLD	3.42	1.68	44	0.0	0.0	68.9	6.9	.2	11.7	0.0	0.0	0.0	891
21050	AHIL	2.85	1.68	22	.8	0.0	62.9	4.7	10.5	7.9	0.0	0.0	0.0	1088
60024	COLO 1-2	.27	1.67	9	0.0	0.0	66.4	6.1	.3	10.2	.4	.9	0.0	931
65009	BG X 19058M	3.00	1.66	27	0.0	0.0	70.3	6.2	0.0	10.2	0.0	0.0	0.0	846
21056	BULLION 10A VF	2.42	1.65	28	0.0	4.4	59.9	8.7	.2	14.3	1.0	2.2	0.0	1027
21055	6806-080	2.01	1.64	16	1.3	3.3	57.9	6.6	8.1	10.8	1.5	1.8	0.0	860
21112	WYE TARGET VF	1.50	1.62	12	0.0	0.0	69.2	6.6	.2	10.7	0.0	0.0	0.0	814
7005-205		2.51	1.62	24	0.0	0.0	62.3	6.7	0.0	10.8	0.0	0.0	0.0	992
64100	BULLION	2.26	1.60	28	0.0	0.0	66.2	8.6	.2	13.7	0.0	0.0	0.0	835
7005-232		2.70	1.58	18	0.0	0.0	74.1	4.8	0.0	7.6	0.0	0.0	0.0	837
7313-053		2.12	1.57	28	0.0	1.8	53.9	8.7	.2	13.7	2.7	4.9	0.0	260
21099	6921-006	2.18	1.54	15	1.4	1.4	62.2	3.7	4.1	5.6	1.7	2.4	0.0	45
7006-450		2.54	1.54	20	0.0	0.0	70.1	6.3	0.0	9.7	0.0	0.0	0.0	853
21116	BREWERS GOLD VF	2.48	1.53	22	0.0	0.0	66.4	5.9	.1	9.0	0.0	0.0	0.0	1023
7313-083		2.78	1.52	17	0.0	2.7	67.1	6.4	0.0	9.7	1.3	2.3	0.0	266
7005-205		2.15	1.52	20	0.0	0.0	59.9	7.4	.1	11.3	0.0	0.0	0.0	1026
7003-081		1.85	1.52	84	0.0	0.0	44.2	15.1	.2	22.9	.2	1.4	0.0	978
7312-027		1.92	1.49	24	0.0	8.1	56.1	11.2	.2	16.8	1.1	1.0	0.0	1035
7003-075		1.42	1.44	21	0.0	1.9	60.1	6.2	0.0	9.0	1.6	3.1	4.0	921
7311-066		3.25	1.44	9	.6	0.0	80.6	2.1	5.1	3.1	0.0	0.0	0.0	1081
7311-108		1.67	1.39	17	0.0	7.1	62.5	9.6	.2	13.4	1.0	.9	0.0	974
21094	6903-112	.69	1.38	11	0.0	0.0	57.5	8.3	.2	11.5	0.0	0.0	0.0	998
7313-032		2.87	1.35	23	0.0	2.0	64.8	6.7	0.0	9.1	1.6	2.8	0.0	1098
7004-075		2.67	1.29	36	0.0	0.0	59.3	11.8	.2	15.2	0.0	0.0	0.0	850
7311-032		1.50	1.28	12	0.0	0.0	70.3	8.4	0.0	10.8	0.0	0.0	0.0	922
21098	6913-068	2.70	1.26	19	0.0	1.6	76.1	4.0	0.0	5.0	1.2	2.0	2.0	916
7013-130		2.09	1.23	6	0.0	0.0	81.2	1.7	0.0	2.1	.6	.9	1.0	885
60027	COLO 2-2	.41	1.20	15	0.0	0.0	56.6	3.1	0.0	3.7	0.0	0.0	0.0	1051
21054	6806-067	1.92	1.18	10	0.0	0.0	63.2	4.5	.3	5.3	0.0	0.0	1.0	881
65101	TALISMAN	.64	.86	3	0.0	0.0	73.3	4.0	.2	3.4	0.0	0.0	0.0	1015
7301-003		1.77	.48	15	0.0	1.4	64.4	11.0	0.0	5.3	1.4	2.5	1.0	912
66055	FIRST CHOICE	.89	.45	1	.1	.1	73.3	1.5	7.5	.7	3.2	4.8	0.0	871
66052	PRIDE RINGWOOD	1.21	.30	3	0.0	.1	56.7	8.1	0.0	2.4	7.7	12.5	0.0	840
21167	HYBRID 2 INDIA	1.15	.27	3	0.0	.1	52.0	9.0	0.0	2.4	8.5	13.5	0.0	895
7003-038		2.28	.26	2	0.0	.2	68.4	3.5	0.0	.9	1.8	3.5	4.0	924
7301-034		.98	.24	1	0.0	.1	69.6	4.7	0.0	1.2	4.8	7.8	0.0	980

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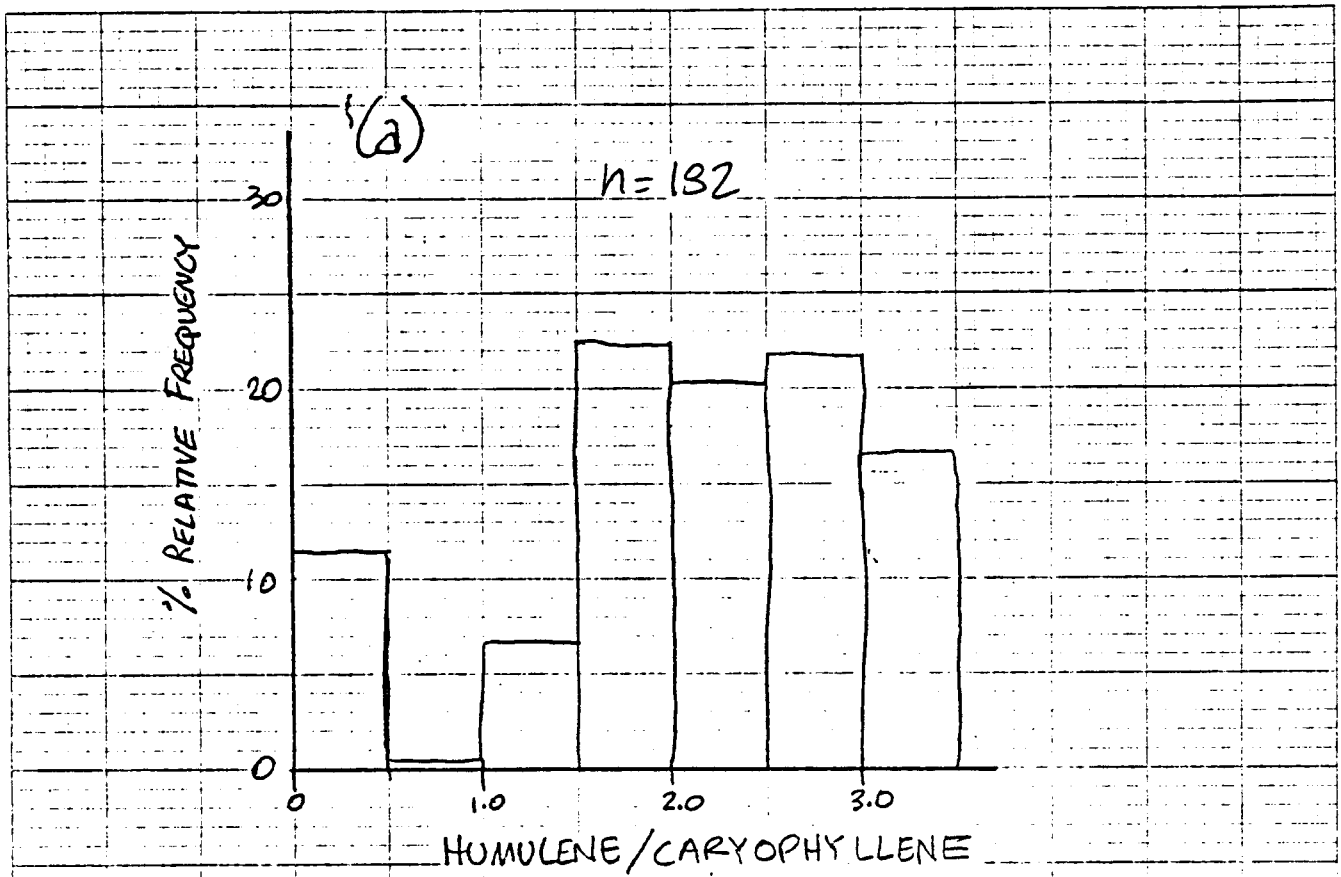
7311-152		2.01	.22	3	0.0	.3	63.1	11.0	0.0	2.4	3.5	5.3	0.0	1057
60020	NM 2-4	.25	.20	5	0.0	.5	35.3	22.6	0.0	4.5	2.9	5.3	2.0	1020
21167	HYBRID 2 INDIA	.87	.17	1	0.0	.1	38.3	11.2	.5	1.9	1.2	25.4	0.0	1066
7315-063		2.14	.13	0	.1	.0	75.1	2.7	5.5	.3	2.6	4.3	0.0	874
62013	COMET	2.15	.12	2	0.0	.1	67.5	9.2	0.0	1.1	3.2	5.3	0.0	899
7003-154		1.09	.12	0	0.0	.1	64.0	4.0	0.0	.5	2.2	4.2	6.0	925
60035	COLO 7-2	.38	.10	2	0.0	.3	67.9	12.9	0.0	1.3	1.6	2.7	0.0	1046
7003-003		1.82	.09	1	0.0	.1	68.9	4.2	0.0	.4	2.3	3.7	4.0	1006
7003-284		2.26	.08	1	0.0	.1	66.8	3.8	0.0	.3	2.1	3.6	4.0	995
I31-11A		1.97	.07	0	0.0	.1	68.4	4.7	0.0	.3	1.6	2.7	4.0	897
7302-029		1.50	.06	0	0.0	.2	73.6	9.4	0.0	.6	1.1	2.1	0.0	932
21183	I34-5 *Eroica*	1.03	.06	0	0.0	.2	68.7	13.2	0.0	.7	1.5	2.8	0.0	1017
7301-183		1.18	.04	0	0.0	.1	67.7	13.5	0.0	.6	1.7	3.2	1.0	905
60038	WYO 3-1	.35	.03	0	0.0	.1	82.1	6.9	0.0	.2	1.1	1.8	0.0	1067
7302-001		.76	.01	0	0.0	.0	50.0	28.3	0.0	.4	2.9	5.4	3.0	1054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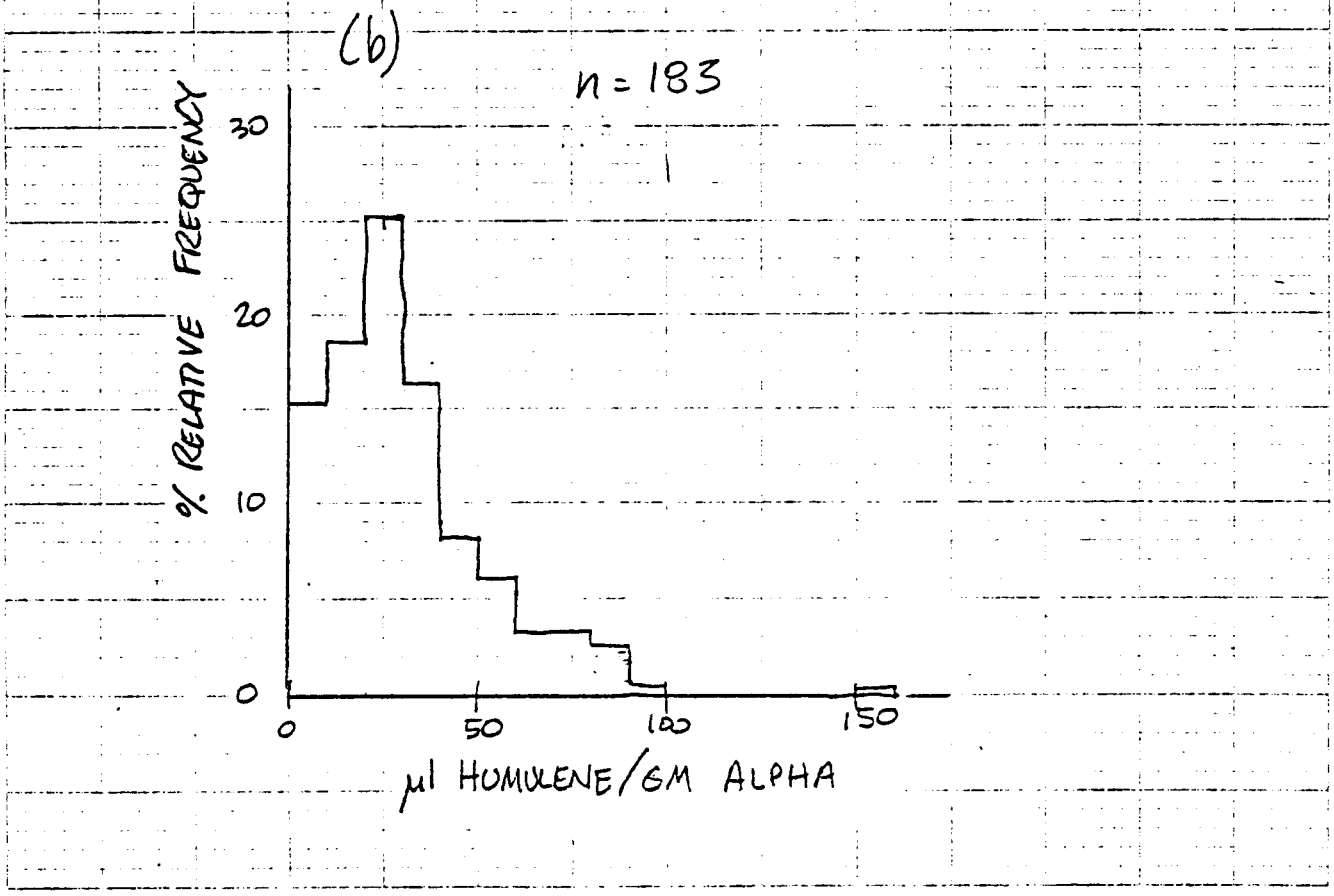
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µl HUMULENE/GM ALPHA

1979: MICROLITERS HUMULENE / g alpha: GLC OIL COMPOSITION OF 1979 BALE SAMPLES

ACCESSION/ NURSERY NO	IDENTIFICATION NAME OR PEDIGREE	ML OIL 100 GM	H/C RATIO	HUM/ ALPHA	H/F RATIO	H/UNK RATIO	PERCENT IN OIL MYRC	CARY	FARN	HUM	MUUR	GERM	CAD?	LAB NUMBER
21091	6771-019	1.45	2.52	159	0.0	16.1	42.2	13.0	.3	32.9	1.3	.7	0.0	261
21003	FUGGLE T	1.07	2.78	92	5.2	0.0	51.1	9.3	4.9	25.8	0.0	0.0	0.0	848
7101-098		1.71	3.00	86	0.0	0.0	64.7	6.8	0.0	20.3	0.0	0.0	0.0	831
66050	ALLIANCE	1.21	2.96	85	15.1	25.0	39.1	11.9	2.4	35.4	1.4	0.0	0.0	856
21049	STYRIAN	1.29	2.92	85	4.7	0.0	49.4	9.1	5.7	26.5	0.0	0.0	0.0	23
7003-081		1.85	1.52	84	0.0	0.0	44.2	15.1	.2	22.9	.2	1.4	0.0	978
48209	FUGGLE H	1.59	2.81	82	4.7	0.0	49.6	9.2	5.5	25.9	0.0	0.0	0.0	866
21014	HALLERTAU MF	.76	3.22	77	0.0	28.2	33.5	12.7	.4	40.9	1.4	0.0	0.0	27
21044	WYE NORTHDOWN	2.79	2.44	75	0.0	0.0	52.2	9.9	.8	24.3	0.0	0.0	0.0	1090
7101-175		1.14	3.00	75	5.4	0.0	62.4	6.6	3.6	19.8	0.0	0.0	0.0	867
21180	7003-143	2.25	2.22	74	0.0	23.5	46.5	12.0	.2	26.6	1.1	0.0	0.0	1058
7003-081		1.21	1.69	73	0.0	10.0	28.4	17.8	.3	30.2	1.9	1.1	0.0	1028
56001	HALLERTAU	.87	3.29	72	0.0	0.0	42.4	10.2	.3	33.6	0.0	0.0	0.0	1119
56002	BACKA	.62	3.25	68	0.0	22.9	44.1	10.2	.2	33.2	1.4	0.0	0.0	910
21044	WYE NORTHDOWN	2.79	2.59	68	0.0	0.0	56.1	9.5	.9	24.5	0.0	0.0	0.0	869
21179	HERSBRUCKER-E	1.17	3.06	67	0.0	0.0	51.0	9.4	.3	28.7	0.0	0.0	0.0	915
62053	DEFENDER	.64	2.33	65	7.6	19.6	38.4	13.2	4.1	30.9	1.6	0.0	0.0	868
61019	YUGO GOLDING	1.22	2.92	65	4.9	0.0	49.6	9.2	5.5	26.8	0.0	0.0	0.0	26
61020	SAV GOLDING	1.17	2.88	64	5.0	17.6	48.1	9.6	5.5	27.7	1.6	0.0	0.0	31
7007-175		2.68	3.04	59	0.0	0.0	63.7	6.6	0.0	19.9	0.0	0.0	0.0	1078
21180	7003-143	2.39	2.08	57	0.0	0.0	50.2	10.4	.2	21.7	0.0	0.0	0.0	1014
6903-107		.80	3.35	57	7.0	0.0	47.3	8.6	4.1	28.6	0.0	0.0	0.0	1055
21049	STYRIAN	1.57	2.83	56	4.5	0.0	57.7	7.6	4.8	21.5	0.0	0.0	0.0	817
7004-003		2.87	2.26	56	0.0	0.0	61.8	7.8	0.0	17.6	0.0	0.0	0.0	1021
21080	BACKA	.89	3.27	55	0.0	0.0	58.8	7.7	.2	25.1	0.0	0.0	0.0	1043
6771-021		2.50	2.09	54	3.0	1.4	57.4	5.2	3.6	10.9	2.8	4.8	0.0	1025
7007-175		1.99	3.09	53	0.0	0.0	64.1	6.1	.1	18.8	0.0	0.0	0.0	1118
21188	NP2/55 (S. AFR)	1.53	2.00	50	0.0	2.6	58.8	8.3	.5	16.6	2.2	4.1	0.0	914
64107	N. BREWER	2.01	2.65	50	0.0	0.0	55.4	9.5	.2	25.1	0.0	0.0	0.0	38
7003-250		2.46	2.42	50	0.0	0.0	62.7	6.7	0.0	16.3	0.0	0.0	0.0	986
21014	HALLERTAU MF	.78	3.22	48	0.0	0.0	49.0	9.7	.5	31.1	0.0	0.0	0.0	37
21016	FUGGLE N VF	1.32	2.82	47	4.4	0.0	56.2	7.7	5.0	21.8	0.0	0.0	0.0	854
21078	RECORD	1.82	2.80	47	0.0	0.0	51.8	9.4	0.0	26.3	0.0	0.0	0.0	264
64107	N. BREWER	2.35	2.60	47	0.0	0.0	59.1	8.6	.2	22.3	0.0	0.0	0.0	816
21045	SEREBRIANKA	.57	3.09	46	1.9	0.0	39.0	7.9	12.6	24.3	0.0	0.0	0.0	1115
7101-099		.89	3.01	46	6.0	0.0	61.3	6.9	3.4	20.7	0.0	0.0	0.0	864
66051	PROGRESS	.94	3.36	45	0.0	0.0	53.9	8.7	.2	29.1	0.0	0.0	0.0	851
21015	TETTNANGER	1.07	3.12	44	1.5	0.0	51.7	6.7	13.7	20.9	0.0	0.0	0.0	829
21081	DUNAV	1.42	3.38	44	0.0	0.0	61.4	6.5	.9	21.9	0.0	0.0	0.0	847
19001	BREWERS GOLD	3.42	1.68	44	0.0	0.0	68.9	6.9	.2	11.7	0.0	0.0	0.0	891
7313-110		2.43	2.45	43	0.0	0.0	55.4	8.7	.2	21.4	0.0	0.0	0.0	836
7005-182		3.20	2.74	42	0.0	0.0	66.0	5.9	0.0	16.1	0.0	0.0	0.0	893

GLC OIL COMPOSITION OF 1979 BALE SAMPLES

ACCESSION/ NURSERY NO	IDENTIFICATION NAME OR PEDIGREE	ML OIL 100 GM	H/C RATIO	HUM/ ALPHA	H/F RATIO	H/UNK RATIO	PERCENT IN OIL MYRC	CARY	FARN	HUM	MUUR	GERM	CAD?	LAB NUMBER
21081	DUNAV	1.49	3.15	42	0.0	0.0	56.6	6.4	.8	20.0	0.0	0.0	0.0	1024
21041	WILLAMETTE	1.10	3.05	42	3.6	0.0	60.9	6.3	5.4	19.2	0.0	0.0	0.0	841
7003-066		1.61	3.07	40	0.0	0.0	66.3	5.7	0.0	17.5	0.0	0.0	0.0	889
7306-091		1.67	1.89	39	0.0	10.5	52.6	11.4	.2	21.5	1.1	.9	0.0	927
21113	LUBELSKA	.87	3.20	38	1.7	19.8	48.0	6.9	13.2	22.0	1.1	0.0	0.0	43
21093	N. BREWER VF	1.92	2.60	38	0.0	0.0	59.9	8.5	.2	22.0	0.0	0.0	0.0	40
21114	NADWISLANSKA	.89	3.12	36	1.7	0.0	50.4	6.7	12.4	20.8	.6	.6	0.0	42
7004-075		2.67	1.29	36	0.0	0.0	59.3	11.8	.2	15.2	0.0	0.0	0.0	850
21187	S. BREWER	2.87	1.70	36	1.0	2.3	50.2	6.7	11.2	11.4	2.1	2.9	0.0	1074
7003-250		2.57	2.31	36	0.0	0.0	74.6	4.2	0.0	9.8	0.0	0.0	0.0	1008
61019	YUGO GOLDING	.73	2.74	36	5.4	0.0	47.7	9.0	4.5	24.7	0.0	0.0	0.0	1108
21084	YUGO IV/2	.80	3.04	35	1.7	0.0	54.3	5.9	10.8	18.0	0.0	0.0	0.0	1077
7003-032		1.07	2.25	35	0.0	12.1	47.6	10.3	0.0	23.3	1.0	.9	0.0	900
7005-149		1.86	2.74	35	0.0	0.0	55.9	6.3	.1	17.1	0.0	0.0	0.0	1063
7005-040		1.89	2.33	34	0.0	0.0	69.5	5.5	0.0	12.9	0.0	0.0	0.0	913
7311-068		1.99	2.04	34	3.0	0.0	55.7	8.6	5.8	17.4	0.0	0.0	0.0	1056
7002-024		1.50	2.56	34	0.0	0.0	71.0	5.3	.7	13.7	0.0	0.0	0.0	1086
21181	7003-243	1.64	1.98	34	0.0	0.0	65.3	7.4	0.0	14.6	.6	.5	0.0	1000
21082	NEOPLANTA	1.29	2.43	34	3.1	18.6	52.4	8.7	6.7	21.2	1.1	0.0	0.0	849
7006-406		2.06	1.75	33	0.0	7.0	52.8	9.4	.1	16.5	1.1	1.2	0.0	1089
21043	WYE CHALLENGER	1.67	2.91	33	0.0	2.4	66.3	4.9	.9	14.2	2.0	3.8	0.0	185
66051	PROGRESS	.71	3.26	32	0.0	0.0	36.7	11.4	.5	37.0	.2	1.4	0.0	1124
66056	SMOOTHCONE	.96	3.27	32	0.0	0.0	56.1	7.2	.4	23.6	0.0	0.0	0.0	1045
7306-043		1.93	2.23	32	0.0	0.0	61.5	7.5	0.0	16.8	0.0	0.0	0.0	918
21081	DUNAV	.96	2.55	31	4.9	0.0	46.7	9.1	4.7	23.2	0.0	0.0	0.0	1103
61021	TETTNANG-SWISS	.73	3.19	31	1.5	0.0	43.8	6.8	15.0	21.8	0.0	0.0	0.0	1125
7307-051		1.25	3.32	31	0.0	0.0	57.9	6.9	.2	22.9	0.0	0.0	0.0	818
7101-096		1.07	3.05	31	4.1	0.0	72.6	3.9	2.9	11.8	0.0	0.0	0.0	1102
66054	CALICROSS	1.39	2.76	30	0.0	0.0	63.8	5.6	.2	15.5	0.0	0.0	0.0	977
21042	6769-002	1.34	2.41	30	2.5	0.0	74.5	3.8	3.7	9.2	0.0	0.0	0.0	870
68052	PETHAM GOLDING	.98	1.76	30	0.0	0.0	55.9	10.7	.6	18.7	.9	1.0	0.0	1116
21116	BREWERS GOLD VF	3.01	1.83	30	0.0	0.0	72.8	5.5	0.0	10.1	0.0	0.0	0.0	901
21086	YUGO VIII/27	.96	3.08	30	1.5	0.0	59.6	5.1	10.2	15.7	0.0	0.0	0.0	1044
7306-148		2.26	1.81	29	0.0	0.0	71.3	6.5	0.0	11.8	0.0	0.0	0.0	920
21085	YUGO VII/23	1.00	2.91	29	1.4	0.0	67.2	4.0	8.3	11.6	0.0	0.0	0.0	1080
7313-053		2.12	1.57	28	0.0	1.8	53.9	8.7	.2	13.7	2.7	4.9	0.0	260
7312-036		1.56	2.32	28	9.2	0.0	57.6	8.0	2.0	18.5	0.0	0.0	0.0	894
21056	BULLION 10A VF	2.42	1.65	28	0.0	4.4	59.9	8.7	.2	14.3	1.0	2.2	0.0	1027
7006-370		2.73	1.83	28	0.0	0.0	71.7	5.2	0.0	9.4	0.0	0.0	0.0	911
21057	PR. RING LG CON	.73	3.17	28	0.0	0.0	55.2	6.2	.2	19.6	0.0	0.0	0.0	1047
64100	BULLION	2.26	1.60	28	0.0	0.0	66.2	8.6	.2	13.7	0.0	0.0	0.0	835
65009	BG X 19058M	3.00	1.66	27	0.0	0.0	70.3	6.2	0.0	10.2	0.0	0.0	0.0	846

GLC OIL COMPOSITION OF 1979 BALE SAMPLES

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21195	7006-408	3.18	2.65	27	0.0	0.0	74.8	4.3	0.0	11.4	0.0	0.0	0.0	902
56013	CASCADE	1.78	2.69	27	1.9	0.0	77.4	2.9	4.1	7.8	0.0	0.0	0.0	1029
7101-026		1.03	2.65	27	3.9	0.0	75.6	4.0	2.7	10.5	0.0	0.0	0.0	892
7007-206		2.34	2.19	27	3.1	0.0	60.8	5.8	4.1	12.7	0.0	0.0	0.0	1062
7312-083		1.74	2.89	26	8.4	0.0	53.0	7.0	2.4	20.1	0.0	0.0	0.0	1034
21194	7006-311	1.85	2.04	26	6.5	0.0	56.1	8.5	2.7	17.4	0.0	0.0	0.0	833
7006-445		2.59	2.49	26	0.0	0.0	73.7	3.7	.9	9.1	0.0	0.0	0.0	983
21043	WYE CHALLENGER	.91	2.89	26	18.1	2.3	48.6	6.9	1.1	20.0	3.3	5.5	0.0	1049
7003-015		1.14	2.03	25	0.0	0.0	47.9	11.0	.2	22.3	0.0	0.0	0.0	838
7003-176		1.81	1.97	25	0.0	0.0	68.4	5.7	0.0	11.1	0.0	0.0	0.0	1012
21095	6903-259	.71	1.90	25	0.0	7.9	52.8	9.4	.3	17.7	1.2	1.1	0.0	1071
21092	CASCADE VF	1.35	2.68	25	2.0	0.0	69.2	3.5	4.5	9.3	0.0	0.0	0.0	1022
7312-027		1.92	1.49	24	0.0	8.1	56.1	11.2	.2	16.8	1.1	1.0	0.0	1035
7005-070		2.04	1.85	24	0.0	0.0	66.3	6.6	0.0	12.1	1.0	1.0	0.0	262
7005-205		2.51	1.62	24	0.0	0.0	62.3	6.7	0.0	10.8	0.0	0.0	0.0	992
7306-005		1.89	2.19	24	0.0	0.0	71.4	5.3	.1	11.7	0.0	0.0	0.0	1100
7006-296		2.81	1.82	24	3.7	0.0	63.8	6.7	3.3	12.2	0.0	0.0	0.0	265
7005-022		2.90	2.11	24	0.0	0.0	74.5	4.0	0.0	8.5	0.0	0.0	0.0	1075
7306-182		2.51	1.93	24	0.0	0.0	77.0	5.6	0.0	10.7	0.0	0.0	0.0	904
60042	SHINSHUWASE	.73	2.29	24	0.0	1.9	54.5	5.8	0.0	13.3	2.9	4.0	0.0	1040
21040	COLUMBIA	1.17	2.13	24	3.5	0.0	63.5	6.8	4.2	14.5	0.0	0.0	0.0	990
7313-032		2.87	1.35	23	0.0	2.0	64.8	6.7	0.0	9.1	1.6	2.8	0.0	1098
56013	CASCADE	1.35	2.69	23	1.8	0.0	73.7	3.2	4.7	8.7	0.0	0.0	0.0	880
21193	7005-194	1.53	2.24	23	0.0	0.0	52.8	8.8	.2	19.6	0.0	0.0	0.0	1101
68051	BRAMBLING CROSS	.89	1.76	22	0.0	0.0	65.7	7.3	.2	12.8	0.0	0.0	0.0	1127
21050	AHIL	2.85	1.68	22	.8	0.0	62.9	4.7	10.5	7.9	0.0	0.0	0.0	1088
7312-134		1.38	2.46	22	6.2	0.0	65.4	6.7	2.6	16.4	0.0	0.0	0.0	896
21116	BREWERS GOLD VF	2.48	1.53	22	0.0	0.0	66.4	5.9	.1	9.0	0.0	0.0	0.0	1023
21051	APOLON	1.39	2.17	22	1.0	0.0	50.8	6.6	14.4	14.4	0.0	0.0	0.0	1095
7003-075		1.42	1.44	21	0.0	1.9	60.1	6.2	0.0	9.0	1.6	3.1	4.0	921
6771-016		1.39	2.59	21	2.6	0.0	75.5	3.5	3.4	9.1	0.0	0.0	0.0	884
21092	CASCADE VF	1.79	2.58	20	1.9	0.0	79.2	2.7	3.6	6.9	0.0	0.0	0.0	844
7006-450		2.54	1.54	20	0.0	0.0	70.1	6.3	0.0	9.7	0.0	0.0	0.0	853
7314-058		1.53	3.01	20	3.6	0.0	72.1	4.0	3.3	11.9	0.0	0.0	0.0	263
7005-205		2.15	1.52	20	0.0	0.0	59.9	7.4	.1	11.3	0.0	0.0	0.0	1026
21039	GOLDEN STAR	.57	2.33	20	0.0	2.0	54.5	6.1	0.0	14.2	3.0	4.2	0.0	1084
7312-009		2.87	2.63	20	4.8	0.0	71.1	4.5	2.5	11.9	0.0	0.0	0.0	883
21056	BULLION 10A VF	2.17	1.72	19	0.0	0.0	71.3	6.4	.2	11.0	0.0	0.0	0.0	843
21050	AHIL	2.82	1.77	19	.7	0.0	67.3	4.0	9.6	7.0	0.0	0.0	0.0	1087
21193	7005-194	1.15	2.16	19	0.0	10.2	50.9	10.4	.2	22.3	1.0	1.2	0.0	879
21098	6913-068	2.70	1.26	19	0.0	1.6	76.1	4.0	0.0	5.0	1.2	2.0	2.0	916
7006-456		1.93	3.20	19	0.0	0.0	75.2	2.5	.4	7.9	0.0	0.0	0.0	917

GLC OIL COMPOSITION OF 1979 BALE SAMPLES

ACCESSION/ NURSERY NO	IDENTIFICATION NAME OR PEDIGREE	ML OIL 100 GM	H/C RATIO	HUM/ ALPHA	H/F RATIO	H/UNK RATIO	PERCENT IN OIL MYRC	CARY	FARN	HUM	MUUR	GERM	CAD?	LAB NUMBER
7312-078		2.01	2.22	18	3.4	1.7	63.7	4.7	3.1	10.3	2.0	4.1	0.0	842
7005-232		2.70	1.58	18	0.0	0.0	74.1	4.8	0.0	7.6	0.0	0.0	0.0	837
7006-061		1.09	2.38	18	0.0	0.0	66.4	6.4	0.0	15.2	0.0	0.0	0.0	875
21094	6903-112	.94	1.71	18	0.0	0.0	48.8	9.1	.2	15.6	0.0	0.0	0.0	1019
21050	AHIL	2.29	1.81	18	.8	0.0	67.8	4.8	10.4	8.7	0.0	0.0	0.0	834
65102	YAKIMA CL (L1)	.58	2.12	18	0.0	0.0	60.8	7.4	.2	15.6	0.0	0.0	0.0	906
7313-083		2.78	1.52	17	0.0	2.7	67.1	6.4	0.0	9.7	1.3	2.3	0.0	266
21052	ATLAS	1.36	2.03	17	.7	0.0	58.6	5.0	14.0	10.2	0.0	0.0	0.0	878
7311-108		1.67	1.39	17	0.0	7.1	62.5	9.6	.2	13.4	1.0	.9	0.0	974
7312-015		1.24	2.60	17	0.0	1.1	51.6	6.4	0.0	16.6	6.1	9.3	0.0	1083
60037	WYO 2-1	.58	1.73	16	0.0	0.0	60.0	8.3	.2	14.4	0.0	0.0	0.0	1072
21055	6806-080	2.01	1.64	16	1.3	3.3	57.9	6.6	8.1	10.8	1.5	1.8	0.0	860
7306-139		1.96	2.54	16	0.0	0.0	74.4	3.3	0.0	8.4	0.0	0.0	0.0	929
7313-029		1.85	2.68	16	1.0	2.7	62.2	3.6	9.2	9.6	1.3	2.3	0.0	822
7307-023		.67	2.29	16	9.9	0.0	40.1	10.5	2.4	24.1	.9	1.2	0.0	1082
21053	AURORA	1.71	2.45	16	2.9	0.0	68.1	4.6	3.9	11.2	0.0	0.0	0.0	877
62052	DENSITY	.49	2.62	15	0.0	0.0	54.5	7.5	.3	19.6	0.0	0.0	0.0	1038
21083	VOJVODINA	.96	2.59	15	0.0	0.0	70.6	5.1	.6	13.2	0.0	0.0	0.0	898
7301-003		1.77	.48	15	0.0	1.4	64.4	11.0	0.0	5.3	1.4	2.5	1.0	912
21099	6921-006	2.18	1.54	15	1.4	1.4	62.2	3.7	4.1	5.6	1.7	2.4	0.0	45
60027	COLO 2-2	.41	1.20	15	0.0	0.0	56.6	3.1	0.0	3.7	0.0	0.0	0.0	1051
21095	6903-259	.76	1.84	14	0.0	0.0	63.9	6.2	.3	11.5	0.0	0.0	0.0	1003
7005-201		1.88	2.47	14	0.0	0.0	74.7	2.4	0.0	6.0	0.0	0.0	0.0	1005
62052	DENSITY	.51	2.50	13	0.0	0.0	66.9	5.3	0.0	13.3	0.0	0.0	0.0	1002
21182	GALENA	.96	1.85	12	0.0	0.0	55.1	7.1	0.0	13.1	0.0	0.0	0.0	32
7311-032		1.50	1.28	12	0.0	0.0	70.3	8.4	0.0	10.8	0.0	0.0	0.0	922
21112	WYE TARGET VF	1.50	1.62	12	0.0	0.0	69.2	6.6	.2	10.7	0.0	0.0	0.0	814
21094	6903-112	.69	1.38	11	0.0	0.0	57.5	8.3	.2	11.5	0.0	0.0	0.0	998
21054	6806-067	1.92	1.18	10	0.0	0.0	63.2	4.5	.3	5.3	0.0	0.0	1.0	881
21047	SVALOF 85	.16	2.55	9	2.8	2.7	15.9	9.2	8.2	23.4	3.7	4.9	9.0	1150
60024	COLO 1-2	.27	1.67	9	0.0	0.0	66.4	6.1	.3	10.2	.4	.9	0.0	931
7311-066		3.25	1.44	9	.6	0.0	80.6	2.1	5.1	3.1	0.0	0.0	0.0	1081
7312-146		1.03	3.17	8	0.0	.7	61.4	2.4	0.0	7.6	4.5	6.7	0.0	1076
21011	L 16	.25	1.80	6	0.0	0.0	50.3	8.5	.3	15.4	0.0	0.0	0.0	1069
7013-130		2.09	1.23	6	0.0	0.0	81.2	1.7	0.0	2.1	.6	.9	1.0	885
60020	NM 2-4	.25	.20	5	0.0	.5	35.3	22.6	0.0	4.5	2.9	5.3	2.0	1020
65101	TALISMAN	.64	.86	3	0.0	0.0	73.3	4.0	.2	3.4	0.0	0.0	0.0	1015
66052	PRIDE RINGWOOD	1.21	.30	3	0.0	.1	56.7	8.1	0.0	2.4	7.7	12.5	0.0	840
7311-078		.25	1.76	3	2.1	0.0	46.9	9.0	7.6	15.9	0.0	0.0	0.0	1036
21167	HYBRID 2 INDIA	1.15	.27	3	0.0	.1	52.0	9.0	0.0	2.4	8.5	13.5	0.0	895
7311-152		2.01	.22	3	0.0	.3	63.1	11.0	0.0	2.4	3.5	5.3	0.0	1057
60035	COLO 7-2	.38	.10	2	0.0	.3	67.9	12.9	0.0	1.3	1.6	2.7	0.0	1046

GLC OIL COMPOSITION OF 1979 BALE SAMPLES

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7003-038		2.28	.26	2	0.0	.2	68.4	3.5	0.0	.9	1.8	3.5	4.0	924
62013	COMET	2.15	.12	2	0.0	.1	67.5	9.2	0.0	1.1	3.2	5.3	0.0	899
7003-284		2.26	.08	1	0.0	.1	66.8	3.8	0.0	.3	2.1	3.6	4.0	995
21167	HYBRID 2 INDIA	.87	.17	1	0.0	.1	38.3	11.2	.5	1.9	1.2	25.4	0.0	1066
66055	FIRST CHOICE	.89	.45	1	.1	.1	73.3	1.5	7.5	.7	3.2	4.8	0.0	871
7003-003		1.82	.09	1	0.0	.1	68.9	4.2	0.0	.4	2.3	3.7	4.0	1006
7301-034		.98	.24	1	0.0	.1	69.6	4.7	0.0	1.2	4.8	7.8	0.0	980
7301-183		1.18	.04	0	0.0	.1	67.7	13.5	0.0	.6	1.7	3.2	1.0	905
60038	WYO 3-1	.35	.03	0	0.0	.1	82.1	6.9	0.0	.2	1.1	1.8	0.0	1067
7302-029		1.50	.06	0	0.0	.2	73.6	9.4	0.0	.6	1.1	2.1	0.0	932
21183	I34-5 Eroica	1.03	.06	0	0.0	.2	68.7	13.2	0.0	.7	1.5	2.8	0.0	1017
7003-154		1.09	.12	0	0.0	.1	64.0	4.0	0.0	.5	2.2	4.2	6.0	925
7302-001		.76	.01	0	0.0	.0	50.0	28.3	0.0	.4	2.9	5.4	3.0	1054
7315-063		2.14	.13	0	.1	.0	75.1	2.7	5.5	.3	2.6	4.3	0.0	874
I31-11A		1.97	.07	0	0.0	.1	68.4	4.7	0.0	.3	1.6	2.7	4.0	897