1978

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USDA Corvallis, Hop Research

USDA-SEA

HOP RESEARCH

1978 ANNUAL REPORT

HOP BREEDING, GENETICS, CHEMISTRY, AND PATHOLOGY

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Corvallis, Oregon

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HOP PATHOLOGY

WEED CONTROL IN HOPS

HOP CHEMISTRY

1978 HOP PRODUCTION STATISTICS (HAC DATA)

Total salable hop production in 1978 was 280,210 bales with an average bale weight of 196 lbs. per bale and in a total salable weight of 54.556 million lbs. of hops (Table 1). Final production figures including fire losses and miscellaneous disappearance were slightly higher, amounting to 55.071 million lbs. (Table 3). This production was achieved on a total area of 30,949 acres, an area only 1% larger than that of the previous year (Table 2). This acreage included 2,367 acres of new plantings or replantings (babies) of which 1,286 acres were English (Bullion and Brewer's Gold), mostly in Washington (Table 2). The baby acreage was in part offset by 1,017 acres that were plowed out and not replanted, primarily in Washington and Idaho (Table 2).

Early Clusters continued to be the predominant variety with 45% of total U.S. hop acreage in 1978, followed by English (13%), Cascade (12%), Late Clusters (11%), and Fuggle (7%) (Table 2).

The largest expansion of any hop variety was in Bullion and Brewer's Gold (primarily in Washington), while Idaho and Washington Cascades suffered the greatest reduction (Table 2A).

Total 1978 hop acreage by states increased in Washington, decreased slightly in Oregon and Idaho, and remained unchanged in California (Table 3). Average hop yields, however, showed a significant drop in Oregon, primarily due to poor Fuggle yields (1,001 lbs.per acre), a dramatic drop of nearly 300 lbs. per acre in California, but were slightly higher in Washington and Idaho. For the third year in a row, Cascades outyielded any other hop variety in Washington (Table 3).

The 1978 U.S. hop production was 23% of the total world hop production as compared to 28% (66.7 million lbs.) for Western Germany, the leading producer (Table 4).

The 1977-78 brewing year showed an export of 25.1 million lbs. of U.S. grown hops, a net domestic usage of U.S. produced hops of 24.2 million lbs., and 12.28 million lbs. of hop imports (Table 4). An unaccounted difference of 6.5 million lbs. occurred probably in part because of incorrect conversion factors from raw hops to hop extracts.

A demonstration of world hop cycles is presented in Table 5 with a projected export of 29 million lbs. of U.S. grown hops from the 1978 production year.

The average farm price for hops in the four producing states continues to show a slight improvement, particularly in Oregon, resulting in a total value of the U.S. hop crop of 49.01 million dollars.

Tables 7 and 8 summarize the 1978 world hop production by countries. Total world hop acreage in 1978 was nearly 192,000 acres, a drop of slightly over 3,000 acres from the previous year. West Germany continues to be the leading producer followed by the United States, Czechoslovakia, England, and Yugoslavia. Average acre yields were highest in Australia (1,960 lbs. per acre) followed by the United States (1,783 lbs. per acre), France, West Germany, and Belgium. Poland, Czechoslovakia, and Hungary again had very

low hop yields. Data for non-member countries of the International Hop Production Bureau were not available for 1978 but are presumed to average only slightly over 800 lbs. per acre, except for Japan.

U.S. hop imports, after a steady decline since 1974-75, appear to be edging upwards again (Table 9), presumably due to greater demand for aroma hops by domestic breweries.

Exports of U.S. grown hops during the past six years ranged from 25 to 29 million lbs. (Table 10), resulting in a favorable trade balance for each of these years. Brazil was our #1 customer in 1978, followed by the Soviet Union, Mexico, Canada, and Colombia in that order (Table 11).

A comparison of the domestic supply and disposition of hops during the past four years shows that over 100 million lbs. of hops have been available in each of these years either in brewery hands or in future contracts at the beginning of each production year (Table 13). The hopping ratio in the 1977-78 brewing year showed a slight improvement to 0.209 lbs. per barrel of beer from the low of 0.200 lbs. per barrel reached the previous year. Pellets and enriched pellets have come into widespread use among domestic brewers partly at the expense of hop extracts. In 1978, the equivalent of 13.3 million lbs. of hops was used in pelleted form as compared to 6.96 lbs. of hops that were extracted.

U. S. HOP ADMINISTRATIVE COMMITTEE

Table 1
1/16/79

Total 1978 Production

Hops	Calif.	Idaho	Oregon	Wash.	Total
Actual Bales	10,016	24,566	42,528	203,100	280,210
			1,000 lbs.		
Production 1/	2,041	4,846	8,172	39,909	54,968
Less: Fire Loss	0	0	63	152	215
Reserves	0	54	0	143	197
Total Salable	2,041	4,792	8,109	39,614	54,556
1/ Average bale wts. used	204	197	192	197	196

1978 Reserve Pool Categories (Bales)

I Hops					
Grp. A (Clstr. or higher alpha type)	--	275	--	719	994
" B (English type)	--	--	--	--	--
" C (Fuggle type)	--	--	--	--	--
" D (Cont. or lower alpha type)	--	--	--	16	16
II (Screenings)	--	--	--	--	--
III (Package Hops)	--	--	--	--	--
Total	--	275	--	735	1,010

Summary of Reserve Pools to Date

Reserve Pools	Hops (Bales)	Screen. (Equiv. Bales)	Total (lbs.)	Total Income
1966 thru 1977	50,430 1/	622	9,371,564	$6,516,160.84 2/
1978	1,010	--	196,909	167,446.15
Total	51,440	622	9,568,473	$6,683,606.99 2/

1/ Includes 2,305 bales from 1974 pool, 1,660 from 1975 pool, and 1,308 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

Season Average (9/1-8/31)

Crop Year (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	76.2	76.6
1974-75	113.1	79.3	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 (66% sold).
1977-78	132.7	89.6	83.4
1978-79			86.0
1979-80			

Mo.	Parity Price	Mo.	Parity Price
	$ per lb.		
Sept.	$1.40	Mar.	--
Oct.	- 1.41	April	
Nov.	- 1.41	May	--
Dec.	- 1.41	June	--
Jan.	-	July	--
Feb.	-	Aug.	-

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

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Table 2

1978 ACREAGE BY STATE (STRUNG FOR HARVEST)

1/16/79

	Wash.	Oregon	Idaho	Calif.	Total	Change from Prior Year
			Acres			%
1973-	20,665	5,352	3,981	1,473	31,471	6%
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%)
Plantings new ground 1/	1,201	171	75	2	1,449	
Plow out(will not be repl) 2/	(567)	(180)	(316)	(44)	(1,107)	
1978-	21,341	5,471	2,671	1,466	30,949	
Net Change	634	(9)	(241)	(42)	342	1%

1/ To be harv. first time 1978.
2/ Includes 146 idle acres.

1978 BABY ACREAGE BY STATE

New Plantings 1978	1,201	171	75	2	1,449
Replantings for 1978	788	24	95	11	918
Total Babies	1,989	195	170	13	2,367
% of Total Acreage	9%	4%	6%	1%	8% 1/
Baby English Acreage	1,093	135	58*	-0-	1,286

1/ Babies were 5% of total in 1975, 5% in 1976 and 3% in 1977. * Includes 22 Galena.

1978 ACREAGE -- BY STATE AND VARIETY (STRUNG FOR HARVEST)

	Wash.	Oregon	Idaho	Calif.	Total	% of Total
			Acres			
Categ. I (Med.-High Alpha)						
Clusters - Early	13,628	-0-	332	-0-	13,960	45%
Clusters - Late	2,600	-0-	865	-0-	3,465	11%
Talisman - Late	1/	92	801	-0-	893	3%
Cal. & Gr. P. Sdls. - Late	-0-	87	-0-	1,450	1,537	5%
Categ. II (Higher Alpha Type)						
English - Late	2,032 1/	2,084 2/	36	-0-	4,152	13%
Comets - Late	575	6	2	16	599	2%
Others 3/	4/	1	33	-0-	34	--
Categ. III (Lower Alpha Seeded Aroma)						
Fuggles - Early	-0-	2,112	-0-	-0-	2,112	7%
Categ. IV (Seedless Aroma)						
Cascade - Middle	2,460	925	420	-0-	3,805	12%
Columbia & Willamette	-0-	159	-0-	-0-	159	1%
Others 5/	46	5	182	-0-	233	1%
Total	21,341	5,471	2,671	1,466	30,949	100%

1/ Bullions - 1,755 acres (86%); Brewers Gold - 277 acres (14%).
2/ Bullions - 1,286 acres (62%); Brewers Gold - 798 acres (38%).
3/ Includes other Cat. II higher alpha-type varieties such as North Brewers, Galena and other exper. varieties.
4/ Included with Wash. Late Clusters.
5/ Includes Hallertau M.F., Tettnang and other flavor-type varieties.

SOURCE: HAC records.

Table 2-A
1/16/79

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NET ACREAGE CHANGES BY STATE & VARIETY

	1978 Changes from 1977					Changes Since 1973	
	Wash.	Ore.	Idaho	Calif.	Total		
	acres						
Category I							
Clusters (Early)	(211)	-	(80)	-	(291)	(2,815)	1/
Clusters (Late)	(175)	-	(40)	-	(215)	(1,913)	1/
Talisman (Late)	-	-	13	-	13	(552)	1/
Cal. & Gr. P. Sdless	-	(48)	-	(55)	(103)	(60)	
Sub-Total					(596)	(5,340)	
Category II							
English (Late)	1,247	37	36	-	1,320	2,220	2/
Comets (Late)	(2)	-	-	11	9	599	
Others	-	-	43	-	43	(81)	
Sub-Total					1,372	2,738	
Category III							
Fuggles (Early)	-	(34)	-	-	(34)	(640)	3/
Category IV							
Cascades (Med.-late)	(262)	18	(194)	-	(438)	2,541	3/
Others	34	28	-	-	62	193	3/
Total	631	1	(222)	(44)	366	(508)	

1/ Clusters and Talis. are down 23% (5,340 acres) since 1973.

2/ Higher alpha (English, Comet, Galena, etc. varieties are up 238% (2,738 acres) since 1973.

3/ Aroma varieties of Fuggles are down but Cascades, Hallertaus, Tettnangs and other varieties are up for an overall average net increase of 50% (2,094 acres).

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Table 3
1/16/79

ALL VARIETIES -- ACREAGE, YIELD & PRODUCTION

State	Acreage			Yield Per Acre(lbs.)			Product.(1,000 lbs.)		
	1976	1977	1978	1976	1977	1978	1976	1977	1978
	------Harvested-----								
Oregon									
Cascades	874	911	925	1,661	1,754	1,785	1,452	1,598	1,651
English	1,984	2,047	2,065	2,086	2,203	1,919	4,138	4,509	3,962
Fuggles	2,324	2,152	2,062	1,345	1,210	1,001	3,126	2,604	2,065
Other 1/	256	364	350	1,152	1,610	1,411	295	586	494
Sub-Total	5,400	5,500	5,400	1,660	1,690	1,510	8,964	9,295	8,154
Washington									
Cascades	2,764	2,724	2,460	1,969	1,962	2,012	5,443	5,344	4,949
English	618	931	2,032	1,490	1,700	1,798	921	1,413	3,653
Other 1/	17,695	17,038	16,849	1,966	1,828	1,858	34,796	31,147	31,307
Sub-Total	21,000	20,600	21,300	1,960	1,840	1,880	41,160	37,904	40,044
Idaho									
Cascades	649	613	420	1,746	1,874	1,798	1,133	1,149	755
English	--	--	36	--	--	139	--	--	5
Other 1/	2,330	2,299	2,215	1,725	1,728	1,845	4,019	3,972	4,086
Sub-Total	3,000	2,900	2,700	1,720	1,770	1,790 2/	5,160	5,133	4,833
California									
Other 1/	1,500	1,500	1,500	1,660	1,630	1,360 3/	2,490	2,445	2,041
TOTAL	30,900	30,500	30,900	1,870	1,796	1,782	57,774	54,777	55,071

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

2/ Over 1,900 if babies excluded.

3/ 1,392 lbs. on actual 1,466 acres.

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 variety figures from HAC records.

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U S. World Production - 1965 to Date

Table 4
1/16/79

	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%)	121.5(47%)	257.7 "
78	1,880	1,510	1,790	1,360	1,782	55.1(23%)	66.7(28%)	116.5(49%)	238.3 "
79									

	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%)	2,730(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								

1/ FAS, USDA.

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.

*Less than ½ of 1%.

SOURCE: SRS, FAS and HAC records.

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Table 5
1/16/79

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%	11,500 2/	29,000 2/		
1979-80									

* Before fire loss.

1/ HAC records.

2/ Projected by HAC at January 1978 Marketing Policy Meeting.

SOURCE: USDA unless otherwise footnoted.

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Table 6
1/16/79

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	95.8	105.0	88.0	93.9	89.6	49,095
1978						
1979						
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						
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							
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.

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

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Table 7
1/16/79

WORLD HOP SURFACES, YIELD & PRODUCTION

Country IHGC	Hectares				Zntrs. per Hectare			Prod. (zntrs. of Hops)			Metric Tons Alpha Acid		
	1976	1977	1978	1979	1976	1977	1978	1976	1977	1978	1976	1977	1978
W. Germany	19,680	19,250	17,622	17,275	28.8	38.4	34.3	567,747	738,736	605,000	1,428	2,253	1,705
France	1,083	1,010	891	820	31.5	33.9	35.4	34,124	34,287	31,500	116	125	95
Belgium	1,068	982	797	750	33.2	36.7	33.8	35,424	36,003	26,900	133	120	86
U.K.	5,925	5,925	5,837	5,810	26.9	24.4	31.9	159,473	144,662	186,400	593	484	724
Ireland	65	65	—	—	18.8	25.8	--	1,220	1,674	—	4	6	--
EEC	27,821	27,232	25,147	24,655	30.7	35.1	33.8	797,988	955,362	849,800	2,274	2,988	2,610
U.S.A.	12,505	12,344	12,508	12,544	41.9	40.3	40.0	524,118	496,930	500,100	1,861	1,789	1,550
Australia	1,086	950	950	950	35.9	44.2	44.2	39,000	42,000	42,000	215	221	210
Yugoslavia	3,373	3,240	3,091	3,172	25.5	27.7	28.6	86,000	89,710	88,500	222	250	274
Spain	1,841	1,803	1,803	1,803	27.8	22.7	23.2	51,206	40,942	41,800	192	143	156
Czech.	10,074	10,200	10,400	10,400	19.3	23.9	19.0	194,227	244,236	198,000	321	488	366
E. Germany	2,130	2,175	2,105	2,250	25.1	27.1	23.8	53,410	58,892	50,000	169	190	135
Poland	2,305	2,328	2,400	2,400	22.1	21.2	16.7	50,840	49,460	40,000	115	128	80
Hungary	481	504	550	550	16.5	20.3	21.5	7,934	10,256	11,800	18	24	20
IHGC*	61,616	60,776	58,954	58,724	29.3	32.7	30.9	1,804,723	1,987,788	1,822,000	5,387	6,221	5,401
Non-IHGC													
Japan	1,307	1,286	1,236	)	34.0	35.6	)	44,400	45,740	)	123	121	)
U.S.S.R.	11,300	11,300	11,300	)	18.1	19.5	)	205,000	220,000	)	410	470	)
Romania	1,100	1,600	1,700	18,900)	12.1	10.6	18.3)	13,200	17,000	339,500)	30	38	783)
Bulgaria	1,220	1,400	1,500	)	15.9	10.7	)	19,400	15,000	)	44	34	)
Others	2,179	2,700	2,800	)	22.3	19.3	)	48,500	52,000	)	143	164	)
Non-IHGC	17,106	18,286	18,536	18,900	19.3	19.1	18.3	330,500	349,740	339,500	750	827	783
TOTAL	78,722	79,062	77,490	77,624	27.1	29.6	27.9	2,135,223	2,337,528	2,161,500	6,137	7,048	6,184
% CHANGE FROM PREVIOUS YEAR								(5.9%)	9.5%	(7.5%)		14.8%	(12.3%)

* Plus Ireland

SOURCE: Hop Section, EEC Commission.

U. S. HOP ADMINISTRATIVE COMMITTEE

Table 8
1/16/79

WORLD HOP ACREAGE, YIELD & PRODUCTION

Country	Acres				Lbs. per Acre			Prod.(Mill.lbs.of hops)			Metric Tons Alpha Acid		
IHGC	1976	1977	1978	1979	1976	1977	1978	1976	1977	1978	1976	1977	1978
W. Germany	48,629	47,567	43,544	42,687	1,288	1,711	1,532	62.6	81.4	66.7	1,428	2,253	1,705
France	2,676	2,496	2,202	2,026	1,405	1,522	1,589	3.8	3.8	3.5	116	125	95
Belgium	2,639	2,426	1,969	1,853	1,480	1,648	1,524	3.9	4.0	3.0	133	120	86
U.K.	14,641	14,640	14,423	14,357	1,201	1,086	1,421	17.6	15.9	20.5	593	484	724
Ireland	161	161	--	--	832	1,242	--	.1	.2	--	4	6	--
EEC	68,746	67,290	62,138	60,923	1,280	1,565	1,508	88.0	105.3	93.7	2,274	2,988	2,610
U.S.A.	30,900	30,500	30,900	31,000	1,870	1,797	1,783	57.8	54.8	55.1	1,861	1,789	1,550
Australia	2,684	2,347	2,347	2,347	1,602	1,960	1,960	4.3	4.6	4.6	215	221	210
Yugoslavia	8,335	8,006	7,639	7,838	1,137	1,237	1,283	9.5	9.9	9.8	222	250	274
Spain	4,549	4,455	4,455	4,455	1,241	1,010	1,033	5.6	4.5	4.6	192	143	156
Czech.	24,891	25,206	25,698	25,698	860	1,067	848	21.4	26.9	21.8	321	488	366
E. Germany	5,263	5,374	5,201	5,560	1,119	1,210	1,057	5.9	6.5	5.5	169	190	135
Poland	5,696	5,752	5,930	5,930	984	956	742	5.6	5.5	4.4	115	128	80
Hungary	1,189	1,245	1,359	1,359	736	884	957	.9	1.1	1.3	18	24	20
IHGC*	152,253	150,177	145,667	145,107	1,307	1,459	1,378	199.0	219.1	200.8	5,387	6,221	5,401
Non-IHGC													
Japan	3,230	3,178	3,054	)	1,517	1,574	)	4.9	5.0	)	123	121	)
U.S.S.R.	27,922	27,922	27,922	)	809	870	)	22.6	24.3	)	410	470	)
Romania	2,718	3,954	4,201	46,702)	552	481	819)	1.5	1.9	37.5)	30	38	783)
Bulgaria	3,015	3,459	3,707	)	697	491	)	2.1	1.7	)	44	34	)
Others	5,384	6,672	6,919	)	984	854	)	5.3	5.7	)	143	164	)
Non-IHGC	42,269	45,185	45,803	46,702	861	854	819	36.4	38.6	37.5	750	827	783
TOTAL	194,522	195,362	191,470	191,809	1,210	1,319	1,245	235.4	257.7	238.3	6,137	7,048	6,184
% CHANGE FROM PREVIOUS YEAR								(5.9%)	9.5%	(7.5%)		14.8%	(12.3%)

* Plus Ireland

SOURCE: Hop Section, EEC Commission.

U. S. HOP ADMINISTRATIVE COMMITTEE

Table 9
1/16/79

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 (1978-79)	West Germany	Yugoslavia	Belgium	France	Others	Total
			Pounds			
Sept.	—	—	—	—	—	—
Oct.	—	—	—	—	92,593	92,593
Nov.	171,958	—	—	—	13,227	185,185
Dec.						
Jan.						
Feb.						
March						
April						
May						
June						
July						
August						
Total						

Imports of Hops - Annual

			(1,000 lbs.)			
1970-71	8,520	3,515	113	796	692	13,637
1971-72	7,549	3,696	58	549	400	12,251
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						

Imports of Hop Extract (Hop Equiv.) - Annual

	Conversion Factor					
1970-71	3.4-1	6	0	0	0	3(U.K.) 9
1971-72	2.7-1	15	0	0	0	2(U.K.) 17
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						

Total Imports - Annual

1970-71	8,526	3,515	113	796	695	13,646
1971-72	7,564	3,696	58	549	402	12,268
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						

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

Table 10

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

1/16/80

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 MAR.-						
						HOPS						
1977-78												
1978-79												
						HOP EXTRACT (ACTUAL)						
1977-78												
1978-79												
						TOTAL (INCL. HOP EQUIV. OF EXT.)						
1977-78												
1978-79												
						-ANNUAL-						
						HOPS						
1972-3	2,213	1,505	1,863	2,814	22	469	1,626	949	1,573	740	2,586	16,360
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
						HOP EXTRACT (ACTUAL)						
1972-3	625	541	-0-	-0-	423	-0-	-0-	603	501	309	1,332	4,334
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
						TOTAL (INCL. HOP EQUIV. OF EXT.)						
1972-3	3,901	2,966	1,863	2,814	1,164	469	1,626	2,577	2,925	1,575	6,185	28,065
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	378	1,546	5,970	25,132

Note: Ext. Conv. Factor is 3.5-1 except 2.7-1 for 1972-73.

SOURCE: FAS, USDA

	1972-73	1973-74	1974-75	1975-76	1976-77	1977-78
	$1,000					
Value of Exports	26,901	26,546	25,920	26,625	29,591	27,008
Value of Imports	12,529	17,192	17,718	16,616	15,522	12,754
Net Fav. Trade Bal.	14,372	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 (1,000 lbs.) 1/16/79

	1976-77			Top	1977-78			Top
	Hops	Extract	1/Total	Ten	Hops	Extract	1/Total	Ten
Canada	3,058	7	3,083	(4)	2,292	8	2,319	(4)
Mexico	983	734	3,552	(2)	435	627	2,632	(3)
N.Am. Sub-Total	4,041	741	6,635		2,727	635	4,951	
Belize	---	2	7		--	2	5	
Costa Rica	4	1	8		--	9	31	
El Salvador	4	4	18		--	18	63	
Guatemala	117	11	155		18	15	69	
Honduras	....	11	39		--	13	44	
Nicaragua	57	1	61		74	2	81	
Panama	....	9	31		--	4	15	
Cent. Am. Sub-Total	182	39	318		92	63	308	
Bermuda	....	---	--		---	1	1	
French West Indies	--	---	--		1	--	1	
Barbados	4	---	4		5	--	5	
Dom. Repub.	33	27	127		87	9	118	
Haiti	--	--	--		1	--	3	
Jamaica	67	24	151		76	18	137	
Trinidad	37	1	41		39	5	57	
Carrib. Sub-Total	141	52	323		208	34	322	
Argentina	47	26	138		28	29	130	
Bolivia	144	12	186		146	21	220	
Brazil	3,138	283	4,128	(1)	4,122	214	4,872	(1)
Chile	49	---	49		65	--	65	
Colombia	--	799	2,796	(5)	212	484	1,906	(5)
Ecuador	--	136	476		--	229	801	
Guyana	22	5	38		22	4	36	
Paraguay	--	11	38		--	29	100	
Peru	539	223	1,319	(7)	---	243	851	(9)
Uruguay	66	10	101		40	20	109	
Venezuela	221	114	620		83	318	1,198	(6)
S.Am. Sub-Total	4,226	1,618	9,889		4,718	1,591	10,286	
Belgium-Lux.	64	11	103		--	1	5	
Denmark	---	---	--		--	1	1	
France	7	29	109		--	--	---	
Ireland	1,208	---	1,208	(8)	883	--	883	(8)
Italy	21	--	21		--	---	---	
Netherlands	---	72	252		--	40	139	
U.K.-N. Ireland	491	90	771		232	--	232	
W. Germany	1,539	75	1,801	(6)	36	---	36	
EC-9 Sub-Total	3,330	267	4,265		1,150	42	1,295	
Austria	....	18	63		---	17	61	
Norway	--	6	21		--	---	---	
Switzerland	....	---	---		--	9	31	
Other Eur.Sub-Total	0	24	84		--	26	92	
Czechoslovakia	546	....	546		--	--	---	
USSR	3,366	51	3,545	(3)	3,058	199	3,753	(2)
E. Eur. Sub-Total	3,912	51	4,091		3,058	199	3,753	

U. S. HOP ADMINISTRATIVE COMMITTEE

Table 11 -Cont.
1/16/79

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

(Continued) -

	1976-77			Top	1977-78			Top
	Hops	Extract	1/Total	Ten	Hops	Extract	1/Total	Ten
Angola	---	19	66		---	22	78	
Brazzaville	--	7	24		---	--	---	
Burundi	--	50	175		---	10	35	
Cameroon	106	---	106		98	4	114	
Ghana	---	6	21		--	--	---	
Kenya	---	38	133		--	--	--	
Liberia	10	4	24		--	4	15	
Mauritius	9	--	9		9	--	9	
Nigeria	198	38	331		366	155	910	(7)
Rep. S. Africa	141	8	169		131	38	264	
Rwanda	---	11	39		--	--	--	
Sierra Leone	---	--	--		32	3	43	
Zaire	---	--	--		--	22	78	
Africa Sub-Total	464	181	1,097		636	258	1,546	
Australia	--	2	7		1	--	1	
Bangladesh	8	--	8		17	--	17	
Hong Kong	--	21	74		--	19	66	
India	--	--	--		1	--	1	
Indonesia	10	--	10		44	5	61	
Israel	--	19	66		--	--	---	
Japan	864	--	864	(9)	839	--	839	(11)
Korea, Rep. of	--	51	179		--	27	95	
Malaysia	46	26	137		--	69	240	
Pakistan	5	--	5		15	--	15	
Philippines	---	237	829	(10)	234	177	854	(10)
Singapore	--	22	77		--	62	216	
Sri Lanka	---	--	--		11	--	11	
Taiwan	1	--	1		154	--	154	
Thailand	--	--	--		--	2	8	
Asia-OceaniaSub-Tot.	934	378	2,257		1,314	361	2,577	
GRAND TOTAL	17,230	3,351	28,959		13,903	3,208	25,132	

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
1/16/79

HOPS
ANALYSIS OF PRECEDING FOUR CROPS

	1975	1976	1977	1978	1979
			1,000 lbs.		
BASE	59,270	59,270	59,270	59,270	59,270
Allotment Percentage	100%	100%	100%	100%	
Reg. Allotment	59,270	59,270	59,270	59,270	
Spec. Fuggle Allot.	1,000	1,000	1,000	1,000	
TOT. ALLOTS. POTENT. AVAIL.	60,270	60,270	60,270	60,270	
Reg.Allots.Not Produced	-4,707(8%)	-3,002(5%)	-4,844(8%)	-4,651(8%)	
Spec.Fug.Allot.Not Used	- 106(10%)	- 279(28%)	- 597(60%)	- 848(85%)	
Allots. Lost by Fire	- 225	- 912	- 149	- 215	
Net Allots. Available	55,232	56,077	54,680	54,556	
Res. Used to Fill Defic.	98	0	0	0	
Res. Sold Normal Outlets	20	686	10	197	
ALLOTS. & RES. ACTUALLY AVAIL. & % SUCH IS OF AMOUNT POTENTIALLY AVAIL.	55,350(92%)	56,763(94%)	54,690(90%)	54,753(91%)	
RECONCIALIATION WITH USDA					
Reserves Not Sold in Normal Outlets	347	256	0	0	
Fire Loss	225	912	149	215	
Unacc. Diff.	(9)	(157)	(62)	103	
Sub-Total	563	1,011	87	318	
TOTAL CROP (USDA)	55,913	57,774	54,777	55,071	
PROD. IN EXCESS OF ALLOT. (RESERVES)	465(1%)	942(2%)	10(*%)	197(*%)	
Used to Fill Deficiencies	98	0	0	0	
RESERVE POOL HOPS	367	942	10	197	
Sold	20	686	10	197	
Balance for Sale	347	256	0	0	

*Less than ½ of 1%.

SOURCE: Hop Administrative Committee records.

U. S. HOP ADMINISTRATIVE COMMITTEE

Table 13
2/13/79

SUPPLY AND DISPOSITION 1973-74 TO DATE
(In 1,000 lbs.)

SUPPLY	1973-74	1974-75	1975-76	1976-77	1977-78	1978-79
Carryin Stocks 1/	30,280	33,720	42,170	50,400	50,480	47,540
Salable Product. 2/	54,108	56,365	55,350	56,763	54,690	54,753
Imports	14,294	14,161	12,485	10,436	10,480	
Total	98,682	104,246	110,005	117,599	115,650	
DISPOSITION						
Brewery Usage	36,978	35,112	33,132	34,344	36,476	
Exported	25,479	25,215	27,933	28,959	25,132	
Carryout Stocks 1/	33,720	42,170	50,400	50,480	47,540	
Balancing Item	2,505	1,749	(1,460)	3,816	6,502	
Total	98,682	104,246	110,005	117,599	115,650	
Hopping Ratio	.238	.222	.204	.200	.209	

BREAKDOWN OF BREWERY CONSUMPTION AND EXPORTS
(In 1,000 lbs.)

Mktg. Year	Ext. Convers. Factor 3/ Dom.	Export	Brewery Consumption As Hops	As Extract (Hop Equiv.)	Total	Exports As Hops	As Extract (Hop Equiv.)	Total
1970-71	3.4-1	3.4-1	25,134	7,582	32,716	14,586	9,918	24,504
1971-72	3.8-1	2.7-1	23,937	10,066	34,003	21,472	10,430	31,902
1972-73	4.0-1	2.7-1	23,598	11,131	34,729	16,360	11,701	28,061
1973-74	4.0-1	3.5-1	26,355	10,623	36,978	15,245	10,234	25,479
1974-75	4.8-1	3.5-1	29,245	5,867	35,112	14,582	10,633	25,215
1975-76	4.2-1	3.5-1	28,257	4,875	33,132	12,541	15,392	27,933
1976-77	3.3-1	3.5-1	29,671	4,673	34,344	17,230	11,729	28,959
1977-78	2.8-1	3.5-1	29,542	6,934	36,476	13,903	11,229	25,132
1978-79								

BREAKDOWN OF FORM IN WHICH CARRYIN (SEPT. 1 STOCKS) WERE HELD
(In 1,000 lbs.)

Sept. 1	As Dry Hops Foreign	Domestic	Pellets Domestic *	As Ext. (Hop Equiv.) Domestic *	Sub-Total Domestic	Total	Reserves
1970	8,080	11,660	--	8,210	19,870	27,950	--
1971	9,960	12,190	--	7,970	20,160	30,120	--
1972	10,640	9,530	--	8,600	18,130	28,770	--
1973	10,740	9,640	--	9,900	19,540	30,280	--
1974	11,450	11,990	3,920	6,360	22,270	33,720	--
1975	12,200	14,660	8,060	7,250	29,970	42,170	540
1976	14,320	17,890	10,310	7,880	36,080	50,400	880
1977	13,090	17,040	13,660	6,690	37,390	50,480	1,170
1978	11,290	15,960	13,330	6,960	36,250	47,540	1,160
1979							

*May occasionally include minor quantities from foreign countries.

1/ Brewer, dealer and grower stocks as of Sept. 1.
2/ Production less fire loss and reserve hops not sold in normal outlets. Includes reserve hops sold.
3/ Beginning Jan. 1, 1972, Domestic Conversion Factor is based on actual pounds of hops used in production of extract as reported by Treasury Dept. Export Conversion Factor is based on USDA Hop Market News Service.

SOURCE: "Selected Hop Stat.," C&MS-FV, October 1970, Hop Market News Reports and HAC records.

BRAUWELT Vol. 117, August 11, 1977

Compiled by Al Haunold, USDA, ARS, Corvallis, OR

Here are the 1977 hop acreages in the Hallertau, the most important hop growing area of Germany according to an article in Brauwelt by varieties:

"The hop acreage in the Hallertau area dropped from 16563 hectares in 1976 to 16290 hectares in 1977. The varietal distribution in 1977 was as follows:

Hallertauer Mittelfrueher	3043 hectares	(7519 acres)	18.7%
Northern Brewer	6067 "	(14992 acres)	37.2%
Brewer's Gold	2295	(5671 ")	14.1%
Hersbrucker	2792	(6899 ")	17.1%
Hueller Bitterer	1640	(4052 ")	10.1%
Record	428	(1082 ")	2.7%

The acreage of aroma varieties therefore did not change appreciably and remained about 46% of total hop acreage (composed of Hallertauer, Hersbrucker, and Hueller Bitterer).

The 1977 production officially weighed in as of December 15, 1977 (Hopfenrundschau Vol. 28, page 454) for all German producing areas is as follows:

Hallertau	639,004 zenter	(70.44 million pounds)	
Jura	21,547 "	2,38 "	"
Spalt	28,905 "	3.19 "	"
Hersbrucker Mountains	8,321 "	0.92 "	"
Tettnang	33,606 "	3.70 "	"
Baden	357 "	0.04 "	"
Rheinpfalz	281 "	0.03 "	"

U. S. HOP ADMINISTRATIVE COMMITTEE

April 1, 1978

GROWER ALLOTMENT BASES AND ANNUAL ALLOTMENTS 1/

EFFECTIVE FOR 1978 CROP YEAR

GROWER	1978 ALLOTMENT BASE & ANNUAL ALLOTMENT (100%) (Lbs.)
WASHINGTON	
ALLWARDT, MONA M. OR CARL DENNIS (c/o MONA ALLWARDT)	214,729
ANDERSON, RAY	33,238
83 ENTERPRISE, INC.(c/o MAX BENITZ, JR.)	80,000*
BATALI RANCH, INC. (c/o JOSEPH & GENE J.)	67,231
BATES, K. P.	80,334
BB - BC HOPS, INC. (c/o BENNETT G. BRULOTTE)	340,097*
BELAIRE, VICTOR W.	224,961
BOISSELLE RANCHES, INC. (c/o RICHARD A.)	687,155*
BRULOTTE, ARNOLD O.	520,697*
BRULOTTE FARMS (ROLAND E., RONALD L. & RICHARD D. d/b/a)	15,000
BRULOTTE FARMS, INC. (c/o ROLAND, RONALD L. & RICHARD D.)	1,177,625*
BRULOTTE, HERVY	162,630
BRULOTTE, LLOYD J.	500,670*
BRULOTTE, LYLE J.	599,609*
BRULOTTE, RICHARD D.	15,000
BRULOTTE, ROLAND E.	15,000
BRULOTTE, RONALD L.	15,000
BRULOTTE, STANLEY H.	200,000*
BRULOTTE (STAN) FARMS, INC. (c/o STANLEY H.)	300,782*
CARIBOU RANCHES, INC. (c/o WILLIAM L. SCHILPEROORT)	172,876*
CARPENTER & CARPENTER (THOM. D. & THOMAS JR. d/b/a)	81,381
CARPENTER, THOM. D.	240.111
CARP-LAND COMPANY (THOM. D. CARPENTER d/b/a)	45,618
CHAMPOUX, ALAN	184,020
CHAMPOUX BROS. (MARVIN E. & JOSEPH T. d/b/a)	294,022
CHARRON COMPANY, INC. (c/o SEBASTIAN CHARRON)	170,511
CHARRON, EDGAR	130,465
CHARRON, JOSEPH E.	403,124
CHARRON, ROBERT	36,500
CHARRON, SEBASTIAN	462,559*
CHARVET, BEN L.	424,830*
CHARVET (EMILE) ESTATE (c/o VIOLET CHARVET)	133,386
CHARVET, ERNEST W.	182,440*

*These growers had retransfers effective April 1, 1978. See last 3 pages for such growers' base for 1979 as of April 1, 1978. Further transfers for 1979 crop authorized through 3/31/79

GROWER	WASHINGTON (CONT'D)	ALLOTMENT BASE & ANNUAL ALLOTMENT (100%) (Lbs.)
CHARVET, EUGENE P., JR.		136,395
CHARVET, EVELYN L.		77,683
CHARVET, FRANCES V.		100,000
CHARVET, GERALD		75,355
CHARVET, JOSEPH P.		305,337
CHARVET, KEITH		61,030
CHARVET, MARCEL		25,752
CHARVET, MAURICE J.		25,455
CHARVET, MICHAEL A.		18,117
DELL, JOHN		40,000
DESMARAIS, G. LEE		312,070
DESMARAIS, RAYMOND F.		151,613
DESMARAIS, STEVE G.		140,779
DESMARAIS (STEVE) RANCH, INC. (c/o STEVE G.)		511,556*
DESSERAULT, DARRELL		145,982
DESSERAULT RANCH, INC. (c/o ALBERT & KENNETH J. DESSERAULT)		473,129*
DESSERAULT, ROBERT		308,472
DION, GERALD		28,223
DOUBLE R RANCH (LEONARD W. & JEROME O. RIEL d/b/a)		299,939
DUFAULT, LEON A.		345,909
FAUCHER, DON		60,000
GAMACHE (AMBROSE) FARMS, INC. (c/o AMBROSE J.)		672,453
GAMACHE (AMOS) FARMS, INC. (c/o AMOS T.)		705,758
GAMACHE, DONALD J.		366,885
GAMACHE, EUCLID		291,902
GAMACHE (JEFF) FARMS, INC. (c/o JEFFERY)		309,774*
GAMACHE, KENNETH		40,000
GAMACHE, LEE J.		119,721
GAMACHE, LESLIE		190,320
GAMACHE RANCHES, INC. (c/o EUCLID GAMACHE)		188,316
GAMACHE, RENE' E.		2,004
GAMACHE, RONALD F.		160,000
GAMACHE (VIRGIL) FARMS, INC. (c/o VIRGIL W.)		813,691
GANNON (L. O.) & SON, INC. (c/o WM. L. GANNON)		364,047
GASSELING (LEO) & SONS, INC. (c/o LEO GASSELING)		424,654*
GASSELING (WM.) RANCHES, INC. (c/o WILLIAM)		722,750*
GREEN ACRE FARMS, INC. (c/o WES MORFORD, JR.)		815,824*
HARRAH FARMS, INC. (c/o JOSEPH E. FAVILLA)		133,443*
HEARRON (E.T.) CO., INC. (c/o THOM. D. CARPENTER)		334,097*

GROWER	ALLOTMENT BASE & ANNUAL ALLOTMENT (100%) (Lbs.)
WASHINGTON (CONT'D)	
HEFFLINGER RANCHES, INC. (c/o LEE HEFFLINGER)	301,741
HERKE & SON (CARL J. & JOSEPH d/b/a)	81,469
HOGUE RANCHES, INC. (c/o WAYNE & MICHAEL HOGUE)	692,410
HOLLINGBERY, O. E., JR.	25,085*
HUBERDEAU, ALBERT	43,825
IMPERIAL HOP FARM (c/o JAMES W. ORKNEY)	167,309
KORESKI, MICHAEL J.	267,909
L & R FARMS, INC. (c/o RONALD MC DONALD)	289,755
LENSEIGNE, ALCIDE R.	140,037*
LENSEIGNE, ALCIDE R. & ALFRED F.	121,116*
LENSEIGNE, ALFRED F.	219,922*
LENSEIGNE, LAWRENCE	193,934
LENSEIGNE, PAUL	200,269
LENSEIGNE, WALLACE	205,634*
LOFTUS (B.T.)RANCHES, INC. (c/o LEOTA MAY LOFTUS)	408,489*
MC DONALD, DAN A., JR.	70,860*
MC DONALD, DAN, SR.	119,556*
MC KELHEER, JOSEPH D.	78,341
MC KELHEER, PATRICK	36,000
MIERAS, VERN M.	47,718
MORRIER, ALBERT	38,021
MORRIER RANCH, INC. (c/o JOSEPH R. MORRIER)	303,519*
NEWHOUSE, ALBERT	23,000
NEWHOUSE, ALFRED R.	65,809
NEWHOUSE FARMS (c/o MELVIN, ALFRED, ALBERT, JOHN & WAYNE)	977,488*
NEWHOUSE, IRVING	253,952*
NEWHOUSE, JOHN	105,500
NEWHOUSE, MELVIN	80,213
NEWHOUSE, WAYNE	50,000
NIGHTHAWK RANCH, INC. (c/o STEVE G. DESMARAIS)	238,628
OASIS FARMS, INC. (c/o WILLIAM A. ROY)	411,603
ORKNEY FARMS, INC. (c/o JAMES W. ORKNEY)	159,130
ORKNEY, JAMES W.	300,740
PATNODE HOPS, INC. (c/o FRANCIS PATNODE)	457,720
PERRAULT FARMS INC. (c/o BERNARD PERRAULT)	492,919
PERRAULT, FRANK	128,466*
PERRAULT, STEVEN M.	72,000*
PERRAULT, WAYNE	92,000*
PUTERBAUGH, R. MARTIN	302,851*

GROWER	ALLOTMENT BASE & ANNUAL ALLOTMENT (100%) (Lbs.)
WASHINGTON (CONT'D)	
REGIMBAL & REGIMBAL (ALAN F. & LAURENT d/b/a)	555,398*
RIEL, DONALD P.	243,856*
RIEL, JEROME O.	98,353
RIEL, LEONARD F.	185,769
RIEL, LEONARD W.	66,813
RIEL RANCHES, INC. (c/o RONALD J. RIEL)	534,211*
ROONEY HOP RANCH (WM. L., DONALD A., FRANK J. & MRS. T.L. (d/b/a)	171,731
ROY, ALCID	352,737
ROY FARMS, INC. (c/o LESTER W. ROY)	1,221,616*
ROY, GERALD S.	36,500
ROY, LESLIE A.	36,500
ROY, STANLEY A.	100,000
ST. MARY, CHARLES A.	100,000*
ST. MARY, CHARLES P.	244,391
SAUVE & SON FARMS, INC. (c/o LOUIS & MICHAEL L. SAUVE)	424,520
SAUVE (IRVIN J.) ESTATE (c/o WILMA S. SAUVE)	313,190*
SCYMANSKI, PETER	902,174*
SEGAL, JOHN B.	401,914*
SHINN & SON (HARLAN L. & EDWARD d/b/a)	1,062,212*
SIMCOE HOP RANCHES, INC. (c/o WM. GASSELING)	60,135
STAUDINGER & MC DONALD (KARL J. STAUDINGER & PAUL W. MC DONALD d/b/a)	25,000*
STRAUSZ, DAVID A.	420,107
SYBOUTS, GERALD F.	312,726
TOBIN (L.&H.) BROS.,INC.(c/o LAWRENCE K. & HENRY J.)	227,344
TOBIN, LAWRENCE K.	130,357
TOBIN, LEONARD	74,034
WYCKOFF FARMS, INC. (c/o CLIFFORD O. WYCKOFF)	798,830*
YAKIMA CHIEF RANCHES (DAN ALEXANDER d/b/a)	2,411,421*
YANCEY, MARVIN	196,974
YOUNG, ISABELLE & JOHN	34,127

GROWER	ALLOTMENT BASE & ANNUAL ALLOTMENT (100%) (Lbs.)
OREGON	
ANNEN BROS., INC. (c/o JOSEPH H.)	387,419*
BERNING, LOUIS G.	315,270*
CAPITOL FARMS, INC. (c/o ROGER A. KERR)	283,770
CENTENNIAL FARMS (JEFF A. WEATHERS & SIBLING)	35,000
COLEMAN FARMS, INC. (c/o JOHN F. COLEMAN)	211,711*
COLEMAN RANCH, INC. (c/o ROBERT T. COLEMAN)	338,627*
COLEMAN, STEPHEN D.	95,000*
CROSBY HOP FARMS, INC. (c/o E. W. CROSBY, JR.)	351,155
DAVIDSON, JAMES E.	244,840*
FAIRFIELD FARMS, INC. (c/o WILLIAM A. COLEMAN)	211,711*
FINNEY LAKE FARM (DONALD C. & CARL W. WEATHERS d/b/a)	105,781
FOBERT, FRANK & BILL	226,725*
GESCHWILL, FRED, HENRY J., & WM. J.	241,552
GOSCHIE, HERMAN, INC.	364,163
GOULET FARMS, INC. (c/o HOMER L. & PHILLIP H.)	454,816*
GREENLEAF HOP FARM, INC. (c/o DONALD F. COLEMAN)	119,789
HORSESHOE LAKE FARMS (JAMES N., SAM, DAVE & JACK SMITH d/b/a)	385,487
JOHNSTON, CHARLES R.	47,304
KERR HOP RANCH (ROGER A. KERR d/b/a)	127,012*
KING, MELVIN A.	135,029
KIRK HOP FARMS, INC. (c/o RICHARD C. KIRK)	368,781*
LEAVY,(JOSEPH) ESTATE (c/o PATRICK LEAVY)	76,967*
MISSION BOTTOM FARMS, INC. (c/o DONALD C. WEATHERS)	247,117
P-M RANCH, INC. (c/o PHILIP E. WOLF, JR.)	162,745
R D FARMS, INC. (c/o RAY DAVIDSON)	39,107
SAN SALVADOR FARMS, INC. (c/o CARL EUGENE SMITH)	112,116*
SCHWABAUER FARMS (KENNETH AND L. J. SCHWABAUER d/b/a)	66,001
SERRES, ADELA & JOSEPH SERRES ESTATE (c/o ADELA & PAUL SERRES)	456,051
SERRES, JOHN	25,455
SMITH, DAVID C.	142,512
STAUFFER BROS. (NORMAN & ROBERT d/b/a)	518,126
SUNNYBROOK HOP YARDS, INC. (c/o CHARLES LATHROP)	526,313
VALLEY HOP FARMS, INC. (c/o ROBERT T. COLEMAN)	291,367
WEATHERS, CARL W.	214,737*
WILMES, WILFRIED	50,358

GROWER	ALLOTMENT BASE & ANNUAL ALLOTMENT (100%) (Lbs.)
IDAHO	
ENROSE FARMS, INC. (c/o VERNON M. BATT)	514,989
GEM HOP COMPANY (HAROLD J. & DOUGLAS G. BATT d/b/a)	441,808
GOODING FARMS, INC. (c/o FRED GOODING)	448,082*
GREENLEAF FARMS, INC. (c/o ROBERT M. BATT)	384,975
NOTUS HOP CO., INC. (c/o VERNON M. BATT)	65,176
OBENDORF, BERNARD	181,120
OBENDORF, ORVILLE	100,000*
RIM RANCHES & R & D, INC. (c/o RAY OBENDORF)	750,571*
SALI, RONALD J.	40,000*
SUN VALLEY FARMS, INC. (c/o CHAS. C. KELLEY)	304,580
SUTER FARMS, INC. (c/o LAURA SUTER)	402,816
WILDER FARMS, INC. (c/o DONALD R. & REED BATT)	401,840*
WILDER HOP COMPANY (WENDELL C. BATT ESTATE & FRED BATT d/b/a)	431,824*
CALIFORNIA	
ROONEY BROS., INC. (c/o PETER M. & EDWARD T.)	388,978
ROONEY, F. L., INC. (c/o BERNARD J. ROONEY)	210,071*
SIGNOROTTI, GEORGE W	260,704
WESTERBERG FARMS (P. F. ESTATE & MIKE d/b/a)	337,990
CALIFORNIA - WASHINGTON - IDAHO	
GOLDEN GATE HOP RANCHES, INC. (c/o A. C. ZUCCHI, SSS, INC.)	2,014,008*
CALIFORNIA - WASHINGTON - OREGON - IDAHO	
JOHN I. HAAS, INC. (c/o FREDERICK J. HAAS)	5,072,417*
TOTAL ALL STATES	59,269,877

1/ For information only. Growers must qualify for their 1978 annual allotments by completing and returning an annual allotment application that will be mailed at a later date to each grower having an allotment base.

FINAL 1978 ALLOTMENTS: after transfers or re-transfer: effective April 4,1978

U. S. HOP ADMINISTRATIVE COMMITTEE

GROWER ALLOTMENT BASES FOR 1979 CROP

AS OF APRIL 1, 1978

WASHINGTON

GROWER	"1979" BASE AS OF 4/1/78 (lbs.)
ALEXANDER, DAN	753,658
83 ENTERPRISE, INC.	-0-
BRULOTTE, ALTA BELLE	72,000
88-8C HOPS, INC.	181,756
BOISSELLE RANCHES, INC.	637,155
BRULOTTE, ARNOLD O.	206,718
BRULOTTE, DORIS	313,979
BRULOTTE FARMS, INC.	942,625
BRULOTTE, LLOYD J.	320,670
BRULOTTE, LYLE J.	420,237
BRULOTTE, STANLEY H.	195,313
BRULOTTE (STAN) FARMS, INC.	163,469
CARIBOU RANCHES, INC.	122,876
CHARRON, SEBASTIAN	405,719
CHARVET, BEN L.	407,343
CHARVET, ERNEST W.	135,544
CLOVER MEADOWS RANCH	534,991
DESMARAIS (STEVE) RANCH, INC.	481,556
DESSERAULT RANCH, INC.	453,129
EVERGREEN HOP RANCHES	176,211
EVERGREEN WAREHOUSES, INC.	70,000
GAMACHE (JEFF) FARMS, INC.	289,774
GASSELING (LEO) & SONS, INC.	281,384
GASSELING (WM.) RANCHES, INC.	622,750
GREEN ACRE FARMS, INC.	765,824
HARRAH FARMS, INC.	127,443
HEARRON (E.T.) CO., INC.	254,097
HOLLINGBERY, O. E. JR.	346,816
LAURENT, RICHARD W.	31,506
LENSEIGNE, ALCIDE R.	91,037
LENSEIGNE, ALCIDE R. & ALFRED F.	211,116
LENSEIGNE, ALFRED F.	178,922
LENSEIGNE, WALLACE	180,634
LOFTUS, (B.T.) RANCHES, INC.	225,786
LOFTUS, LEOTA MAY	60,797
MC DONALD, DAN A. JR.	145,860
MC DONALD, DAN, SR.	179,556

GROWER	WASHINGTON (CONT'D)	"1979" BASE AS OF 4/1/78.
MORRIER RANCH, INC.		283,519
NEWHOUSE FARMS		877,488
NEWHOUSE, IRVING		133,952
NORTHERN FARMS, INC.		158,341
PERRAULT, FRANK		178,466
PERRAULT, STEVEN M.		-0-
PERRAULT, WAYNE		42,000
PUTERBAUGH, R. MARTIN		242,851
REGIMBAL & REGIMBAL		445,398
RIEL, DONALD P.		120,359
RIEL (DON) & SONS		123,497
RIEL RANCHES, INC.		288,000
ROBILLARD, LEO		36,896
ROY FARMS, INC.		1,172,016
ST. MARY, CHARLES A.		-0-
SALI, KASPER		159,372
SAUVE (IRVIN J.) ESTATE		-0-
SAUVE, WILMA S.		328,190
SCYMANSKI, PETER		1,102,174
SEGAL, JOHN B.		301,914
SHINN & SON		527,221
STAUDINGER & MC DONALD		-0-
STEGEMAN, MICHAEL E.		17,487
WYCKOFF, CLIFFORD D.		507,099
WYCKOFF FARMS, INC.		-0-
YAKIMA CHIEF RANCHES		1,848,763
	OREGON	
ANNEN BROS., INC.		353,419
B. C. FARMS		34,000
BERNING, LOUIS G.		300,270
BUDREAU, LUCILLE		37,868
C N R FARMS, INC.		100,000
COLEMAN, WILLIAM A.		113,619
COLEMAN, JOHN F.		98,092
COLEMAN RANCH, INC.		325,627
COLEMAN, STEPHEN D.		85,000
COLEMAN FARMS, INC.		98,091
DAVIDSON, JAMES E.		151,940
FAIRFIELD FARMS, INC.		113,620

GROWER		"1979" BASE AS OF 4/1/78.
	OREGON CONT'D)	
FOBERT, FRANK & BILL		168,857
GOULET FARMS, INC.		30,000
GOULET, HOMER L.		262,632
GOULET, PHILLIP H.		162,184
KERR HOP RANCH		137,012
KIRK HOP FARMS, INC.		358,781
LEAVY (JOSEPH) ESTATE		50,967
SAN SALVADOR FARMS, INC.		122,116
SERRES, PAUL J.		50,000
WEATHERS, CARL W.		179,737
	IDAHO	
GOODING FARMS, INC.		408,082
OBENDORF, ORVILLE		90,000
RIM RANCHES & R & O, INC.		775,571
SALI, RONALD J.		-0-
WILDER FARMS, INC.		441,840
WILDER HOP COMPANY		441,824
	CALIFORNIA	
ROONEY, F. L., INC.		160,071
WESTERBERG FARMS		212,990
	CALIFORNIA - WASHINGTON - IDAHO	
GOLDEN GATE HOP RANCHES, INC.		2,694,008
	CALIFORNIA - WASHINGTON - OREGON - IDAHO	
JOHN I. HAAS, INC.		6,281,427

Leading Brewers' Estimated 1978 Sales

The continued acceleration of sales growth by Anheuser-Busch, Inc. and the Miller Brewing Co. (combined they command approximately 43 per cent of the U.S. total) and changes in the rankings of others of the top 12 brewers were among the significant developments reflected in 1978 sales figures released recently by U.S. brewers.

Climbing from its 24,218,000 barrels of 1977 to a 1978 total of 31,274,000 — a 29.1 per cent increase — Miller reduced Anheuser-Busch's lead from approximately 12,400,000 barrels to about 10,335,000 barrels.

The St. Louis brewer increased 13.6 per cent to 41,609,891 barrels, an all-time one-year record for U.S. brewers.

G. Heileman Brewing Co. moved from seventh to sixth place increasing 6,245,000 barrels to 7,112,000. Olympia dropped from sixth to seventh with a 2.5 per cent barrelage decline.

Other gainers were Coors which climbed by some 124,000 barrels; Stroh which topped its 1977 performance by 3.5 per cent; C. Schmidt & Sons, Inc., which moved from its No. 11 ranking of 1977 to 10th place on a 12.9 per cent jump that reflected new brand introductions and increased support of Rheingold Brewery and Erie Brewing Co. brands and the Genesee Brewing Co. which held 12th place with an increase of 200,000 barrels.

Declining were the Jos. Schlitz Brewing Co., Pabst Brewing Co., F. & M. Schaefer Brewing Co. and Carling National Breweries, Inc. which dropped from 10th to 11th place on a barrelage loss of more than 800,000 barrels.

The U.S. industry total was more than 165,000,000 (figure not official as yet), up from the 1977 all-time record of 156.7 million. No figures were available from the Falstaff Brewing Corp. or General Brewing Co.

NAME OF BREWERY	Est'd 1978 Sales: Bbls.	1977 Sales: Bbls.
Anheuser-Busch, Inc.	41,609,891	36,640,000
Miller Brewing Co.	31,274,000	24,218,000
Jos. Schlitz Brewing Co.	19,600,000	22,130,000
Pabst Brewing Co.	15,350,000	16,003,000
Adolph Coors Co.	*12,566,000	12,284,000
G. Heileman Brewing Co.	7,112,000	6,245,000
Olympia Brewing Co.	6,662,000	6,831,000
The Stroh Brewery Co.	6,328,599	6,114,000
F. & M. Schaefer Brewing Co.	3,930,000	4,664,000
C. Schmidt & Sons, Inc.	3,792,000	3,474,000
Carling National Breweries, Inc.	3,464,000	4,348,000
Genesee Brewing Co.	3,000,000	2,800,000

*Based on 53-week fiscal year December 26, 1977—December 31, 1978.

World Beer Production 1973/79 and World Hop Requirements (in 1000 Ztr., 1 Ztr. = 50 kgs)

	1973	1974	1975	1976	1977	1978	Estimate 1979
Beer-Production in million Hl	735	775	805	826	850	873	895
Hop Requirements with hop dosage of	140 gr/hl 2058	140 gr/hl 2170	130 gr/hl 2093	150 gr/hl 2478	130 gr/hl 2210	140 gr/hl 2444	130 gr/hl 2327
Excess Production Deficit	367	109	164	343	108	282	110
Stock	1348	1457	1621	1278	1386	1104	994

Statistics provided by Lupofresh, Inc., New York, N.Y.

U.S.D.A. 1978 Hop Inspection Report

AT THE request of the hop growers' organizations, the hop brokerage trade, universities and other interested parties, the United States Department of Agriculture, Federal Grain Inspection Service, has reported the total number of bales of hops inspected by the Federal-State hop inspection service each year.

Table I gives the final results as of October 31, 1978. The total number of bales inspected and reported to the Field Office of the Federal Grain Inspection Service at Portland was 277,942 bales. Last year there were 279,249 bales reported.

There were seven Federal appeals. Federal results compared favorably with State results.

There was an average leaf and stem content of 1.48 per cent on the 1978 crop **(Table II).** Last year's crop averaged 1.49 per cent leaf and stem content.

The production of seedless hops increased from 143,504 bales in 1977 to 197,277 bales in 1978, which represents an increase of 27.3 per cent.

Table I

Summary of Hop Inspections in 1978

	Total No. of Bales of Hops Inspected to 10-31-78
California	10,016
Idaho	24,566
Oregon	40,482
Washington	202,878
	277,942

Table II

Summary of Leaf and Stem and Seed Content Distribution in the 1978 Hop Crop

	Washington	Oregon	Idaho	California	Total
% Leaf and Stem					
0	24,940	2,480	5,440	674	33,534
1	96,520	9,270	10,142	8,105	124,037
2	62,928	14,336	6,129	1,087	84,480
3	16,657	9,734	1,730	150	28,271
4	1,557	2,624	652	—	4,833
5	276	1,275	—	—	1,551
6	—	763	473	—	1,236
7	—	—	—	—	—
8	—	—	—	—	—
Weighted %	1.38	2.19	1.34	1.07	—
% Seed					
0	160,942	1,753	24,566	10,016	197,277
1	28,368	2,660			31,028
2	8,700	1,899			10,599
3	2,295	646			2,941
4	254	2,086			2,340
5	405	883			1,288
6	227	834			1,061
Over 6	1,687	29,721			31,408

Imports Continue Steady Growth

IMPORT BEERS are continuing their healthy gains in the U.S. marketplace. This was indicated in sales figures for January 1-October 31, 1978 in *The Import Report* published by the National Association of Alcoholic Beverage Importers Inc.

The all-countries total for the 10-month period of 1978 was 90,747,601 gallons, up 33 per cent from the 68,032,209 gallons of the corresponding period of 1977.

The market leader, The Netherlands, gained 47 per cent — from 27,763,630 gallons to 40,713,715 gallons. Canada, No. 2, increased 28 per cent — from 19,909,434 gallons to 25,473,318 gallons. Germany, No. 3, went from 9,215,070 gallons to 10,210,914 gallons, a gain of 11 per cent. Fourth-ranked Mexico moved up from 4,206,681 gallons to 5,397,185, an increase of 28 per cent.

The United Kingdom, No. 5, climbed by 59 per cent, from 1,227,320 gallons to 1,951,259. Ireland, No. 6, had a 19 per cent gain — 1,373,594 to 1,635,036. Australia, No. 7, went from 995,786 gallons to 1,316,096, a gain of 32 per cent. Japan, No. 8, gained by 26 per cent — 616,794 gallons to 777,474. The Philippines, No. 9, moved from 670,360 gallons to 719,975, a seven per cent increase. Denmark, No. 10, went from 364,883 gallons to 585,048 — a 60 per cent jump. The only decline listed was a four per cent drop for 11th-ranked Norway — 596,694 gallons to 572,811.

1978: ANNUAL WEATHER SUMMARY

TEMPERATURE

	Max	Min	Mean	High	Low	1978
Jan.	46.6	37.2	41.9	54	27	
Feb.	51.7	40.0	45.9	62	30	
March	59.2	40.4	49.8	76	29	
April	57.8	42.2	50.0	75	32	
May	63.6	44.7	54.1	85	31	
June	75.0	51.1	63.1	92	44	
July	80.7	52.7	66.7	99	43	
Aug.	80.0	53.2	66.6	103	45	
Sept.	69.9	49.6	59.8	80	40	
Oct.	67.1	40.4	53.8	81	28	
Nov.	48.9	30.9	39.9	63	18	
Dec.	43.0	29.6	36.3	53	14	
Mean			52.3			

High 103 Date Aug 9, 1978 Low 14 Date Dec. 30 & 31, 1978

Record High ~~107~~ 107 Date July 1946 Record Low -14 Date Dec 12 & 13, 1919

PRECIPITATION AND SKY CONDITIONS

	Rain	Snow	R Days	Cldy Days	Pt Cldy D.	Clr Days
Jan.	7.34	0	25	24	5	2
Feb.	4.28	0	19	21	5	2
March	2.15	0	12	20	6	5
April	4.94	0	22	18	4	8
May	3.61	0	18	14	8	9
June	.94	0	8	12	9	9
July	.29	0	3	11	7	13
Aug.	2.34	0	13	13	7	11
Sept.	3.40	0	14	16	8	6
Oct.	.98	0	5	10	6	15
Nov.	3.14	1.0	12	16	3	11
Dec.	4.23	1.9	18	23	3	5
Total	37.64	2.9	169	198	71	96
Dept. Norm 39.06	-1.4		+21	+69	-59	-10

Wettest Day Jan 6, 1978 Amount 1.52 Record 24 Hrs. 4.28 Date June 8, 1965

HOP BREEDING

Exchange of Germplasm

Germplasm distributed in 1978

A large amount of hop germplasm was distributed free of charge to domestic and foreign interests (Table 1). U.S. growers, particularly from Oregon, obtained considerable numbers of diploid and triploid males for planting in commercial yards.

Genetic and breeding material was sent to East Germany, Yugoslavia, West Germany, India, England and South Africa.

A test of eight early flowering triploid male genotypes was established in a commercial Fuggle yard at the Roger Kerr ranch near Salem, Oregon (see also Table 15). Planting stock of heat-treated prunus-free Bullion 10A (USDA 21056) and Brewer's Gold (USDA 21116) was distributed to several Oregon and Washington growers for propagation in commercial plantings (Table 1).

Sixty six breeding lines from 1973 crosses (high alpha acid selections) and 10 lines from 1975 crosses (Cascade progeny) were sent to Prosser, Washington for planting in an observation nursery. In addition, Hersbrucker-E from England, Styrian, Spalter, and 13 females (wild American genotypes from the Corvallis collection) were sent to Prosser for maintenance in a mildew-free environment. Hüller Bitterer (USDA 21097) was found to be heavily infected with prunus necrotic ringspot virus in the spring of 1978 and five potted plants were transferred to Dr. Skotland's program in Prosser for virus indexing and clean-up. The remaining Hüller Bitterer plants were destroyed in the field, but six additional plants are being kept in the greenhouse in isolation.

Germplasm received at Corvallis

The German aroma variety Hersbrucker-E (USDA 21179) was obtained from Wye College, England (E = England) for planting in our hop variety collection (Table 2). Two female selections from Idaho (Galena, USDA 21182) and the high alpha line Idaho 34-5 (USDA 21183) were planted at Grants Pass, Oregon from baby crowns supplied by Dr. Romanko, Idaho. An unknown male seedling resembling Comet, that had been used to pollinate Comet at Romanko's test plots in July 1977, was obtained for our germplasm collection (USDA 21184M). (The cross on Comet involving the unknown Comet-like male is discussed in detail in the 1977 report, page 36.)

Virus-free Hersbrucker-G (G = Germany) and Spalter (USDA Accession #21185 and 21186) were obtained from the West German Hop Research Institute at Hüll in 1978. Mr. B.M. Robinson, hop breeder for South African Breweries Limited, provided planting stock of the early maturing aroma variety Southern Brewer (USDA 21187) and the early maturing high-alpha variety N.P. 2/55 for testing in our plots. C.E. Zimmermann, USDA-SEA, Prosser, Washington, supplied 56 genotypes for testing at Corvallis (Table 2). Most of this material originated from crosses involving virus-infected and virus-free male and female genotypes, particularly USDA 65009, Pride of Ringwood, Comet, Northern Brewer, and the males 63012M, 63015M, and 64028M, respectively.

Accession numbers assigned or eliminated in 1978

A total of 14 new accession numbers were assigned in 1978 (Table 3). These included genotypes from Parma, Idaho (Galena, and I 34-5), Hersbrucker-G and

Spalter from West Germany, Southern Brewer and N.P. 2/55 from South Africa and the Comet-like male from Idaho (see 1977 USDA report, page 36). In addition, four early flowering triploid males from the USDA polyploid program at Corvallis received accession numbers as did three high-alpha selections from the 1970 crossing program (7005-194, 7006-311, and 7006-408). The triploid males are scheduled for off-station testing in a commercial Fuggle yard in Oregon (see Table 15) and the three high-alpha selections will be increased and planted in limited off-station observation trials in Oregon and Washington.

No accession numbers were eliminated in 1978.

Crosses made in 1978

Four crosses were made this year involving two early flowering males and the tetraploid Fuggle USDA 21003 (Table 4). In reality, only two different crosses are involved but the two tetraploid Fuggle plants differed drastically in vigor and, therefore, seeds from them will be kept separate. In addition, root tip samples for cytological screening of the two tetraploid plants (Smith yard, Locations 243:25; 243:26) will be obtained to check whether both plants were actually tetraploids.

A total of over 4,000 seeds was obtained which will be germinated in late winter and a nursery will be field-planted in the spring of 1979 to develop an early maturing triploid high-yielding aroma variety.

Table 1 : Hop Germplasm distributed in 1978.

Recipient	Date sent	Variety	Amount (propagules)	Reason[1/]
Bill Anderson, Univ. Minnesota, Waseca, Minn., 56093	March 23	56013	10	World Food Crops - demonstration
Wayne Anderson, Corvallis, OR	March 23	19058M	3	Males for increase; L bloom
		51114M	3	M bloom
James Benson, Univ. Idaho Sandpoint, ID 83864	April 4	21097	5	Hüller Bitterer, off-station testing
Louis Berning, Mount Angel, OR	May 31	21061M	15 pots	Males for comm. planting: L-VL bloom
		21088M	5 "	" L "
		21090M	5 "	" L "
		64037M	5 "	" E-M "
		21089M	5 "	" L "
		19041M	6 "	" M "
		19039M	6 "	" M "
		64032M	6 "	" E-M "
		64033M	5 "	" E-M "
		21017M	8 "	" M "
		21059M	8 "	" L "
		21116	200	heat treated BG, increase
Dr. Karl Borde, VEB, Leipzig 701, E. Germany	May 10	56013	5	Cascade, variety collection
		21040	5	Columbia -"-
		21041	5	Willamette, -"-
Mrs. W. Clark, Conyers, GA	March 23	56013	8	hobby - gardening
Robert Coleman, Gervais, OR	July 13	19040M	8 pots	males for comm. planting: M bloom
		21132M	10 "	L "
		19005M	7 "	L "
		19172M	5 "	E "
		63011M	8 "	M "
		19039M	5 "	M "
		21102M	10 pots	Tripl. males to comm. Ca. yd; M bloom
		21175M	10 "	M "
		21176M	10 "	M "
		21177M	10 "	M "
		21178M	10 "	M "
Herman Goschie, Silverton, OR	June 11	21102M	15 pots	Tripl. males, yield stimulation, M bloom
		21106M	5 "	" "
		21175M	15 "	" "
		21176M	16 "	" "
		21177M	14 "	" "
		21178M	18 "	" "
	May 9	21116	1000	vf BG, commercial planting
	Oct. 18	21049	600	Styrian, comm. planting
		21179	300	Hersbrucker-E, comm. planting

Table 1 : continued.

Recipient	Date sent	Variety	Amount (propagules)	Reason
J. I. Haas Inc., Independence, OR	June 20	21102M	15 pots	Tripl. males, to Bu + BG yards, M bloom
		21176M	15 "	" "
		21177M	15 "	" "
		21178M	20 "	" "
J. I. Haas Inc., Yakima, WA	March 6	21056	6	Bullion 10A, prunus free, for increase
Emile Harold, Auburn, Ala. 36830	April 12	56013	20	Cascade, hobby gardening
Roger Kerr	Oct. 17	21189M	10 pots	Tripl. males, to Fu yd, M bloom
		21190M	10 "	" E "
		21191M	10 "	" E "
		21175M	10 "	" M "
		21192M	10 "	" E "
		21177M	10 "	" M "
		21178M	10 "	" M "
		21102M	10 "	" M "
Dr. Jan Kišgeči, Novi Sad, Yugoslavia	March 30	21040	5	Columbia, variety collection
		21041	5	Willamette, "
		64035M	5	Downy mildew res. male
		64037M	5	"
Dir. Hans Kohlmann, Wolnzach, W. Germany	March 30	21040	10	Columbia, variety collection
		21041	10	Willamette, "
Craig Lathrop, Grants Pass, OR	March 30	21056	50	Bullion 10A, prunus free
		21116	50	Brewer's Gold, "
		64100	17	Bullion
		19001	50	Brewer's Gold
		7006-311	50	experimental high-alpha line
		21182	25	Galena, new ID high-α variety (Sel. I43-16)
		21183	25	Idaho high-alpha expth. line (Sel. I34-5)
Dr. John McIntyre, Conn. Ag. Exp. Sta., New Haven, CT 06504	March 5	19001	10	Brewer's Gold, demonstration plots
		56013	10	Cascade, "
		21040	10	Columbia, "
S. M. Bakshi, Mohan Meakin Breweries, Srinagar, India	March 2	62013	20	Comet, variety trial
		56013	20	Cascade, "
Dr. R. A. Neve, Wye College, England	Jan. 27	68052	5	Petham Golding, variety identification
Gerald Pawlikowski, Hyattsville, MD 20782	March 23	56013	10	Cascade, study of ess. oil biosynthesis
		64100	10	Bullion, "
B. M. Robinson, So. African Brew. Blanco, South Africa	Jan. 27	21180	10	Sel. 7003-143, variety testing
		21181	10	Sel. 7003-243, "
J.I.Haas Inc. Salem,OR.	Apr.21	21116	100	heat treated B.Gold,increase

Table 1: continued.

Recipient	Date sent	Variety	Amount (propagules)	Reason
Dr. R. R. Romanko, Univ. of Idaho, Parma, ID, 83660	April 28	7006-311	200	high-α, off-station testing
	April 4	21094	100	off-station testing
		21095	100	"
		21040	59	Columbia, off-station testing
		21041	22	Willamette, "
		48209	60	Fuggle H, "
		21097	5	Hüller Bitterer, "
Paul Serres, Woodburn, OR	March 30	21116	300	Brewer's Gold, prunus free, increase
Philipp Wolf, Gervais, OR	March 13	21056	375	Bullion 10A, commercial planting
C. E. Zimmermann, Prosser, WA 99350	March 10	21116	200	Brewer's Gold, prunus free, off-station testing
		MC-1	35	Morford's Early Cluster, potted plants
		56013	10	Cascade, nuclear stock
	April 4	7504-16	4	Cascade crosses, observation plot
		-130	4	" "
		-151	4	" "
		7506-06	4	" "
		-08	4	" "
		-111	4	" "
		-179	4	" "
		-234	4	" "
		-253	4	" "
		7507-53	4	" "
	April 26	7301-01	2	Sel. from 73-Nursery, for 2-hill OB
		-03	2	"
		-34	2	"
		-183	2	"
		7302-29	2	"
		-146	2	"
		7303-07	2	"
		-19	2	"
		7306-05	2	"
		-40	2	"
		-42	2	"
		-43	2	"
		-44	2	"
		-91	2	"
		-139	2	"
		-148	2	"
		-182	2	"
		7307-23	2	"
		-51	2	"
		7308-34	2	"
		-48	2	"
		7310-39	2	"
		7311-31	2	"
		-32	2	"

Table 1 : concluded.

Recipient	Date sent	Variety	Amount (propagules)	Reason[1/]
C.E. Zimmermann, cont'd.	April 26	7311-66	2	"
		-68	2	"
		-78	2	"
		-95	2	"
		-108	2	"
		-152	2	"
		-177	2	"
		7312-06	2	"
		-09	2	"
		-15	2	"
		-23	2	"
		-27	2	"
		-36	2	"
		-41	2	"
		-78	2	"
		-83	2	"
		-111	2	"
		-129	2	"
		-134	2	"
		7313-09	2	"
		-29	2	"
		-32	2	"
		-43	2	"
		-53	2	"
		-83	2	"
		-92	2	"
		-110	2	"
		7314-11	2	"
		-12	2	"
		-44	2	"
		-58	2	"
		7315-63	2	"
	June 7	21179	50 pots	Hersbrucker-E, variety + virus testing
		21049	12 "	Styrian, "
		21186	8 "	Spalter, "
		60039	2 "	Montana 1-1, GP maintenance
		60029	2 "	Colo 3-1, "
		60021	2 "	N. Mex 3-1, "
		60032	2 "	Colo 5-1, "
		60027	2 "	Colo 2-2, "
		60037	2 "	Wyo 2-1, "
		60038	2 "	Wyo 3-1, "
		60035	2 "	Colo 7-2, "
		60033	2 "	Colo 6-1 "
		21140	2 "	N. Mex 2-2 x Ut 525-2, ♀♂, "
	July 27	60020	2 pots	N Mex 2-4, Germplasm maintenance
		21021	1 "	BG x Ariz 1-2 "
		60024	1 "	Colo 1-2, "
		21097	5 "	Hűller Bitterer, virus indexing & cleanup

[1/] Early (E), medium (M), later (L), very late (VL)

Table 2: Germplasm received at Corvallis in 1978.

Supplier	Date received	Variety	Amount	Remarks: (vf = virus free)
R. A. Neve, Wye College, England	Jan. 11	21179	4	Hersbrucker-E, baby crowns for variety collection
R. R. Romanko, Parma, ID, 83660	March 29	21182	50	Sel. 43-16, Galena, (BG x OP), baby crowns
		21183	50	Sel. 34-5; BG x OP; baby crowns, both are high-α; for Grants Pass observation plots (Lathrop Farms)
		21184M	3	unknown , y. lvs., probably Comet ♀ or Comet S ♂, used in Cr. 7729
C. E. Zimmermann, Prosser, WA 99350	April 19	W203-583	2	21093 (vf NB) x vf 63015M; to 2-hill OB, myd
		W401-33	2	65009 x 63012M, "
		W402-49	2	65009 x vf 63012M, "
		W404-05	2	65009 x 63015M; "
		W405-12	2	65009 x vf 63015M; "
		-33	2	" , "
		-61	2	" , "
		-62	2	" , "
		-67	2	" , "
		-68	2	" , "
		-70	2	" , "
		-71	2	" , "
		-82	2	" , "
		-83	2	" , "
		W406-01	2	vf 65009 x 63015M, "
		-45	2	" "
		-65	2	" "
		-67	2	" "
		-101	2	" "
		-102	2	" "
		W407-23	2	vf 65009 x vf 63015M, "
		W408-12	2	65009 x 64028M, "
		-22	2	" "
		W410-10	2	vf 65009 x 64028M, "
		-16	2	" "
		-20	2	" "
		W412-20	2	6619-04 x 63015M, "
		W417-20	2	6619-04 x vf 64028M, "
		W418-04	2	vf 6619-04 x 64028M, "
		-06	2	" "
		-15	2	" "
		W419-23	2	vf 6619-04 x vf 64028M "
		W004-26	2	PrRi x 63012M, East Greenhouse
		W101-686	2	62013 x 63012M, East Greenhouse
		W204-124	2	21093 (vfNB) x 63015M, East Greenhouse
		W401-30	2	65009 x 63012M, East Greenhouse
		W403-22	2	vf 65009 x vf 63012M, East Greenhouse
		W407-71	2	vf 65009 x vf 63015M, East Greenhouse

Table 2 : concluded.

Supplier	Date received	Variety	Amount	Remarks: (vf = virus free)
C.E.Zimmermann cont'd	April 19	W410-09	2	vf 65009 x 64028M, East Greenhouse
		W411-07	2	vf 65009 x vf 64028M, East Greenhouse
		W416-02	2	6619-04 x 64028M, East Greenhouse
		vf 65009	2	heat treated, v. free, East Greenhouse
Ing. Hans Kohlmann	May 25	21185	20	Hersbrucker-G, heat treated, PNRSV free, German aroma hop
		21186	20	Soalter, German aroma hop
Barry M. Robinson, So. African Brew. Hop Farms	July 25	21187	6	Southern Brewer, 1/2 Fuggle, α = 9.5, yield 7-8 b/A, early
		21188	3	NP2/55, excpt'l high-α line, early, α 11.1, yield 13 bales/acre
C. E. Zimmermann Prosser, WA 99350	July 20	W401-01	2	65009 x 63012M, East Greenhouse
		-26		"
		W402-15		65009 x vf63012M
		-49		"
		-105		"
		W404-06		65009 x 63015M
		W405-22		65009 x vf63015M
		-78		"
		-92		"
		W406-22		vf65009 x 63015M
		-74		"
		W407-36		vf65009 x vf63015M
		-50		"
		W408-10		65009 x 64028M

Table 3 : New Accession Numbers Assigned in 1978.

Accession Number	Location	Source	Name or Pedigree	Remarks
21182	239:1-10 301:21-25	Parma, ID	Galena	Sel. 43-16;(BG x OP); new Idaho variety early, high α; 12-14; β 5-8, good storage
21183	325:21-25	Parma, ID	Sel. 34-5	BG x OP; vigorous, Gr. Pass offstation tests, late, good storage
21184M	Greenhouse	Parma, ID	unknown	prob. Comet ♂ or Comet seedling, fertile male yellow lvs, used for Cross 7729
21185	Greenhouse	Hüll, W. Germany	Hersbrucker-G	Hersbrucker Spät, heat treated, PNRSV free German aroma hop
21186	"	"	Spalter	German aroma hop
21187	"	South Africa	Southern Brewer	(FuN - OP) x (FuN - OP); early, α 9.5, 7-8 B/A From the English Fuggle-N
21188	"	"	NP2/55	PrRi x (Ha - BH 11/2 x BH 2/98); early, α 11.1,13 B/A excellent yield
21189M	105:11-12	7008-06M	6751-51 x OP	Triploid ♂, medium matur., vigorous, from Cr. 7008 (56008 x OP^2), DM res. in 7E GH tests (20 can test)
21190M	107:11-12	7008-17M	"	" , early matur., " , " ,DM res.
21191M	108:11-12	7008-28M	"	" , " , " , " ,DM res.
21192M	101:13-14	7008-91M	"	" , " , " , " ,DM res.
21193	51: 7-8 315:16-20	7005-194	65009 x 63015 M (BG x EG-XS)x(BG^2 x EKG-BavS)	alpha 11-14, beta 5, good storage, CoF 22, aroma. Yield questionable, DM resistant
21194	43: 9-10 238: 1-10	7006-311	65009 x 64035 M (BG x EG-XS) x ZS	alpha 11-15, beta 4-5, good storage, CoF 26, DM susc.?, yield questionable
21195	210:28-32 309:21-25	7006-408	- " -	sister sel. of 21194. alpha 8-12, beta 4-5, vigorous, yield fair - exc., good storage

Note: The more detailed pedigree of 21188 is as follows:

Pride of Ringwood x [(Ha x (Ha-OP x Ha - OP)]

The two genotypes designated BH 11/2 and BH 2/98 are OP seedlings of Hallertauer mittelfrueh, developed in South Africa

See also following page -- letter of B.M. Robinson.

THE SOUTH AFRICAN BREWERIES HOP FARMS
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DISTRICT GEORGE. C P

5th September, 1978

Dr. Al Haunold,
Research Geneticist,
Dept. of Crop Science,
Agricultural Hall 37,
Oregon State University,
CORVALLIS. Oregon 97331.
U.S.A.

Dear Al,

Thanks for your letter of 18th August and I am glad to learn that the hops I sent arrived safely. I must apologise that the NP2/55 plants were so small.

Al, how could you think I would rename Professor Salmon's 'Northern Brewer', I don't indulge in genetical plagiarism!

I will give you the background of the two cultivars:-

Fuggle N ♀ Open Pollinated
F 51 ♀

Fuggle N ♀ Open Pollinated
F.1 ♂

AF2/9 (Southern Brewer) Reg. No. Z.A. 77038

Hallertau 18/35 ♀
BH 11/2 ♂

DH 5/47 ♀
BH 2/98 ♂

Pride of Ringwood ♀
HH 2/101 ♂

NP 2/55 1975

SOUTHERN BREWER is an early variety with consistent yields of 1600 - 1800 Kg/Ha. and an average alpha-acid of 9.46%. (USDA Acc.No. 21187)

NP2/55 is an early variety which has yielded up to 3000 Kg/Ha. at an alpha-acid of 11.13%. (USDA Acc.No. 21188)

I have planted your two varieties 7003-143 and 7003-243, they had developed into nice strong plants in quarantine, and will keep you posted on their development from time to time.

Thank you for your offer, but I already have Savinjski Golding here from Toni Wagner, I think that my gene pool lacks good aroma males more than anything else.

2/.....

personal communication (B.M.Robinson) Sept. 1979.

BH 11/2 and BH 2.98 are open pollinated seedlings of Hallertauer mf developed in South Africa.

Table 4: Crosses made in 1978: Seed pretreatment started January 9, 1979.

Cross No.	Location of female	Pedigree	Seeds		Remarks
			Number	Weight g	
7801	243:25	21003 x 19172M; FuT x (Cat's Tail x Fu-FuS)	730	2.1561	early, tripl. vigor, Fu type
7802	243:26	" "	318	0.6759	"
7803	243:25	21003 x 63015M; FuT x (BG^2 x EKG - BavS)	2,055	6.4185	early, tripl., alpha, vigor
7804	243:26	" "	1,344	3.3609	"

Intermediate Evaluation

Advanced 10-hill Seedless Observation Nursery (Smith yard)

29 advanced selections and controls were machine-harvested from this test in 1978. Yield levels fluctuated considerably among varieties, ranging from a high of nearly 3,000 lbs/acre for Hybrid-2 to less than 500 lbs/acre for the Czechoslovakian aroma variety Saazer. The latter showed conspicuous virus symptoms throughout the growing season and also had very poor regrowth in the spring.

Heat-treated Bullion 10A (USDA 21056) again had significantly higher cone production and alpha acid content as compared to the regular Bullion (USDA 64100). A comparison between heat-treated Brewer's Gold and regular Brewer's Gold cannot be made directly from this test since USDA 21116 is a baby planting (first year on the string) and USDA 19001 is a plot of well established Brewer's Gold plants at least 10 years old. Heat treatment again seemed to show little advantage for Cascade or Fuggle (Table 5).

The aroma variety Styrian had yield and alpha acid levels similar to Fuggle whom it also resembled in most agronomic traits including maturity. The two new English cultivars, Wye Challenger and Wye Northdown had disappointing yields and alpha acid levels, while Wye Target had excellent cone production and alpha acid content. The latter, however, appeared to be extremely susceptible to downy mildew since numerous spikes were observed in the spring and downy mildew cone infection occurred shortly before harvest. The Yugoslavian variety Ahil had good yield levels and alpha acid content, but showed significant leaf bronzing as it approached maturity, similar to the Fuggle.. Aurora, another new Yugoslavian variety, had poor yields but acceptable alpha acid levels.

The three new Yugoslavian varieties, Dunav, Neoplanta, and Vojvodina (considering they were in their first mature year) had acceptable yield levels but lower than expected alpha acid content (Table 5). All three matured late at Corvallis (mid-September). Laboratory tests later confirmed that all three had surprisingly good storage stability of their resins.

Columbia and Willamette (first mature year in this location) had good yield and alpha acid levels. The two Cluster-related selections, 21094 and 21095, had disappointing yield levels in 1978. The quality of 21095 also appeared to be off, with considerably more beta acid than alpha acid. In greenhouse tests (see Plant Pathology section, page 77) both were found to be susceptible to downy mildew crown infection. This surprising situation, however, had never before been observed in the field even with heavy downy mildew infection in adjacent plots.

The early maturing Fuggle-related triploid USDA 21091 produced over 2,400 lbs/acre with 5% alpha and 4% beta acids in this test. The harvest date of August 23, however, may have been somewhat too early since the cones contained only about 17% dry matter as compared to over 20% for Fuggle harvested the same date. In the second year of commercial field testing at the Schwabauer Ranch, 21091 produced slightly over 6 bales/acre (1,303 lbs). (See also information sheet on page 70). The commercial yield average for Fuggle in 1978 in Oregon was only 1,000 lbs/acre (HAC Table 3), indicating that 21091 may indeed have a somewhat higher yield potential than Fuggle. There appeared to be some soil problems as well as persistent quackgrass infestation at this test location. Two additional tests with USDA 21091 will be planted at different Willamette Valley locations in 1979.

Advanced 5-hill Seedless Observation Nursery (Smith yard)

Most of the 32 entries in this nursery were not machine-harvested in 1978. Yields followed by "e" are visual estimates and quality data of these entries are from 5-cone hand samples.

The two USDA selections, 21180 and 21181, which were sent to South Africa as germplasm exchange (see also Table 1 and 77 Rep. p.335 again had excellent yield levels. USDA 21180 also maintained a medium-high alpha level. The triploid 21098 had outstanding cone production (over 2,700 lbs/acre) but the poor storage stability of the resins in this line limits its commercial potential. Most other lines in this nursery are backup material primarily for the high alpha acid selection program, although the 1978 alpha levels and the alpha production of most lines was less than outstanding. Exceptions are selections 7004-03, 7004-75, 7006-296 and 7006-408. Some of these lines were obviously hurt by downy mildew infection early in the season and also in the cone stage at harvest time (Table 6).

Seedless 2-hill Variety Collection (Smith yard)

Important named hop varieties from different countries are grown in this observation nursery and many were machine-harvested in 1978 (Table 7). Yield levels, although generally low, must be treated with caution since data were calculated from 2-hill plots. The only outstanding genotypes in this nursery were the English variety Density (USDA 62052), the Australian variety Pride of Ringwood, the New Zealand variety Calicross, and the Yugoslavian variety Ahil. The latter also had the second highest alpha acid content in this test (10%). Aurora, which had the highest alpha acid content, had very poor cone yields and, consequently, poor alpha acid production per acre.

Table 5: Hop Varieties and Selections Grown in the 10-Hill Advanced Seedless Observation Nursery (Smith Yard), Corvallis, 1978.
Pruned March 27; Trained May 9.

Acc. or Sel. No.	Location Row:Hill	Name	Spring[1] Regrowth	Cross Wire First	Cross Wire Most	Flowering First	Flowering Most	Harvest Date	Cone Weight	Dry Matter	Yield[2]	Quality α	Quality β	Quality α-ratio	Remarks
				June		July		Aug.	mg	%	lbs/A	%	%		
21092	202:1-10	Cascade (heat treated)	G	18	24	13	20	9/15	101	19.9	2159	6.0	4.5	57	some DM/C
48209	203: "	Fuggle H	VG	14	20	6/30	13	23	85	20.5	1331	6.0	3.0	66	shatter
21016	204: "	Fuggle N (heat Treated)	VG	14	20	1	12	23	112	20.3	1224	5.4	2.9	64	
64100	205: "	Bullion	G	8	18	6	15	28	168	23.6	2201	10.6	5.4	66	
21056	206: "	Bullion 10A (prunus free)	VG	7	21	3	16	28	161	24.0	2653	12.1	5.7	67	2 sleepers
56013	208: "	Cascade	G	18	7/1	10	16	9/15	149	21.0	2124	6.1	5.4	53	3 sleepers
19001	209: "	Brewer's Gold	G	20	7/6	10	18	9/15	147	25.5	1706	9.8	5.1	65	5 sleepers
21054	210: "	Co x(BG x Fu-Colo 2-1)	G	12	20	6/30	8	23	104	21.4	1930	9.0	4.0	69	early, DM spikes
21055	212: "	"	P	16	7/6	1	12	23	221	21.3	1024	13.1	4.6	74	7 sleepers, shatter, DM
21116	213: "	Br. Gold (prunus free)	G	18	7/4	8	18	9/15	232	25.4	1152	10.2	5.3	65	
21049	214: "	Styrian	VG	5	14	6/30	10	23	149	21.1	1246	4.2	2.5	62	VE ,1 yr old
21043	215: "	Wye Challenger	P	24	7/6	12	20	9/15	140	24.8	789	6.2	4.4	58	2 sleepers
21044	216: "	Wye Northdown	P	14		6/30	12	23	278	23.9	825	9.5	6.3	60	E, 2 sleepers
21112	217: "	Wye Target	P-G	6	22	1	15	28	276	21.7	2133	11.1	4.4	71	E, 3 sleepers
21050	218: "	Ahil	VG	14	22	8	18	23	150	20.0	1979	11.2	4.6	70	leaf bronzing
21053	219: "	Aurora	P	18	7/6	12	20	9/15	155	24.6	836	11.4	4.3	72	4 sleepers, leaf bronzing
21080	220: "	Bačka	VP	18	7/6	18	28	9/18	146	20.6	821	3.9	7.4	34	DM/crown, VL, 9 sleepers
21081	221: "	Dunav	VG	5	12	1	15	9/15	145	21.5	1664	6.2	3.5	63	leaf bronzing
21082	222: "	Neoplanta	VP	22	7/4	18	25	9/15	117	20.8	1638	7.7	3.9	66	10 sleepers
21083	223: "	Vojvodén-a	VP	18	7/4	18	25	9/18	108	21.8	1510	8.4	4.4	65	10 sleepers
21078	224: "	Record	P-G	18	7/4	12	20	28	174	22.0	1984	8.4	6.3	57	DM spikes
64107	225: "	Northern Brewer	G	24	7/6	8	15	23	264	23.3	597	9.0	3.7	70	
21040	226: "	Columbia	G	12	22	14	22	9/18			2229	8.4	4.1	67	1 sleeper, Triploid
21041	227: "	Willamette	P-G	12	20	14	20	9/18	92	20.1	1834	5.9	3.8	60	leaf bronzing, 2 sleepers,Tripl.
21077	228: "	Saazer	P	7/6	7/15	10	18	28	189	25.8	448	6.8	4.5	59	virus, DM, water fleck, 6 sleepers
21167	229: "	Hybrid-2	G	12	22	15	25	9/18	116	19.3	2997	7.9	6.9	53	VL, DM/c
21094	225:12-16	YC x 7K491-OP	P	12	7/6	10	25	9/18	122	19.7	1418	7.2	6.7	51	2 sleepers, some DM
21095	240: "	"	VG	14	24	8	16	9/18	168	21.7	1237	2.5	9.5	20	low α
21091	237:23-27	FuT x RV-FuS	VG	18	22	6/30	10	8/23	195	16.9	2432	5.0	4.0	55	Triploid

[1] visual rating, P = poor; G = good; VG = very good; rated 5/16-78

[2] Yield calculation: green wt. per 5 hill plot x 0.0853175

Yield calculations: $\frac{\text{green wt/plot} \times 774}{\text{\# pl./plot} \times 453.6 \times 4}$

factors for 5 hill plot: x 0.0853175
4 hill plot: x 0.1066468
3 hill plot: x 0.1421958
single hill: x 4265873

Table 6: Hop Selections Grown in the 5-Hill Advanced Seedless Observation Nursery (Smith Yard), Corvallis, 1978.
Pruned March 27; Trained May 9.

Acc. or Sel. No.	Location Row:Hill	Name	Spring[1] Regrowth	Cross Wire First	Cross Wire Most	Flowering First	Flowering Most	Cone Weight	Dry Matter	Yield[2]	Quality α	Quality β	Quality α-ratio	Remarks[3]
				June		July		mg	%	lbs/A	%	%		
7003-03	212:12-16	65009 x 19046M	VG	12	18	15	20			1800 e	4.8	5.3	47	some DM, ruffled cone
-15	213: "	"	G	20	30	18	25			1400 e	7.0	3.3	67	some DM, YF2, water fleck
-32	222: "	"	VG	16	22	18	22			2000 e	5.9	2.6	69	DM3
-38	227: "	"	G	12	20	6/30	15			1400 e	4.8	5.5	46	TC
-66	229: "	"	VG	14	22	15	25			2000 e	4.4	4.7	48	
-75	230: "	"	VG	18	22	15	22			1800 e	6.3	5.3	54	
-79	231: "	"	VG	14	24	15	22			1600 e	4.4	6.1	41	TC, water fleck
-81	233: "	"	G	14	24	15	22			1800 e	3.9	4.8	44	
6771-21	236:12-16	FuT x RV-FuS	VG	5	14	6	12			2000 e	4.2	2.8	60	Tripl, med. early
21180	242: "	65009 x 19046M	VG	14	22	15	24	132	21.7	2193	9.5	8.7	52	
7003-176	202:17-21	"	VG	22	24	18	25			1600 e	6.7	7.0	48	bronze leaves
21181	204: "	"	G	14	24	12	22	199	22.8	2159	6.5	6.6	49	
7003-250	205: "	"	VG	14	20	3	12			2000 e	7.2	5.2	58	aroma
7004-03	212:17-21	65009 x 19182M	VG	12	15	10	20			2200 e	9.3	4.6	67	
-75	221: "	"	VG	18	24	12	20			1600 e	9.5	3.5	72	
7005-70	238:17-21	65009 x 63015M	VG	10	14	10	16			2000 e	6.4	4.6	57	TC
6761-16	205:23-27	FuT x FuS	P-G	22	7/6	15	25			1800 e	4.4	2.5	63	Triploid
7005-182	207: "	65009 x 63015M	G	14	7/10	15	20			1400 e	7.4	4.7	61	
-201	209: "	"	P	22	7/6	15	25			1800 e	6.0	5.1	54	sleeper
-205	210: "	"	G	14	24	12	18			1600 e	5.4	3.5	60	
-232	211: "	"	VG	18	20	10	16			1800 e	6.4	2.8	69	YF1
65009	228:23-27	BG x EG-XS	G	18	7/10	15	22	188	21.5	2119	10.5	9.0	53	DM4, TC
7006-296	230: "	65009 x 64035M	VG	12	20	8	15			2200 e	9.9	5.1	65	DM3, TC
21098	232: "	19001 x 21153M	VG	12	16	6/30	8	194	19.2	2719	7.7	5.0	60	Triploid
21099	240: "	65104 x 6751-98M	G	12	24	6/28	10			1400 e	8.0	5.8	58	Tripl, early, DM3
7006-398	206:28-32	65009 x 64035M	G	18	7/1	18	25	212	24.4	845	13.0	8.7	59	DM4,aroma
-406	209: "	"	VG	12	20	12	18			1600 e	7.5	3.0	71	DM3
-408 *	210: "	"	P	18	24	15	22			2400 e	8.0	3.9	67	DM3, TC, DM/cones, sleeper
-456	216: "	"	P-G	18	10	15	25			1800 e	3.9	2.5	60	very late
7007-175	223:28-32	64100 x 64035M	VG	12	18	10	15			2200 e	6.5	3.3	66	E, TC, tip chlorosis
-206	230: "	"	P-G	18	7/8	12	22			1500 e	4.8	1.9	71	DM3
-339	241: "	"	G	18	24	15	20			1600 e	11.8	5.3	69	

1/ P= poor to VG= very good, rated 5/16-78

2/ e= estimated; or calculated for 5-hill plot: x 0.0853175

see yield calculation formulas in Table 5.

3/ DM from 0 to 4; TC= tight cone, YF= yellow fleck

* New Accession No. 21195 assigned in 1978. (See table 3, page 39)

Table 7: Hop Varieties Grown in the Seedless Variety World Collection, Smith Yard, Corvallis, 1978. Pruned, March 27; Trained May 9.

Acc. or Sel. No.	Location Row:Hill	Name	Spring[1] Regrowth	Cross Wire		Flowering		Harvest Date	Cone Weight	Dry Matter	Yield[2]	Quality			Remarks[3]
				First	Most	First	Most					α	β	α-ratio	
				June		July		Aug.	mg	%	lbs/A	%	%		
21014	247:1-2	Hallertauer m.f.	VP	7/2	7/4	12	18	29	131	23.0	512	5.1	5.3	48	sleeper
21015	248: "	Tettnanger	P	30	7/8	12	18	29	134	25.0	256	5.3	4.3	55	
61019	246:3-4	Yugoslavia Golding	VG	12	18	4	10	29	113	21.0	1728	5.7	3.3	63	early
61020	247: "	Savinja Golding	P	14	20	4	15	29	129	22.2	1386	5.9	2.9	67	
61021	248: "	Swiss	VP	24	7/4	12	18	29	156	23.5	661	5.8	5.7	50	sleeper
62051	244:5-6	Janus	P-G			6/30	8				400 e				DM/cones, v. early
62052	245: "	Density	G	14	20	4	10	29	119	20.9	2197	5.2	3.7	58	DM3, Late, picked green
62053	246: "	Defender	G	24	30	8	20				1400 e				YF2
64107	247: "	Northern Brewer	G	22	7/4	8	13	29	233	24.4	1024	9.6	4.2	69	
66050	244:7-8	Alliance	VG	20	24	12	20	29	110	22.6	1471	5.7	2.0	73	early
66051	245:7-8	Progress	VG	20	30	13	20	29	123	22.1	1536	7.0	2.7	72	early, wilt resistant
66052	246: "	Pride of Ringwood	G	7/1	7/10	20	28				2000 e	6.0	5.3	52	v. late, DM4
66054	248: "	Calicross	VG	12	20	15	20				2400 e	4.2	3.7	53	DM3, late
66055	249: "	First Choice	P-G	7/2	7/20	20					600 e				virus
66056	244:9-10	Smooth Cone	P-G	7/6	7/20	22	28				1600 e	3.7	2.9	55	
68052	246:9-10	Petham Golding	P	7/6	7/20	8	12				1000 e				
21043	247: "	Wye Challenger	P	30	7/15	15	22	9/18	94	22.4	917	7.9	5.4	59	sleeper
21044	248: "	Wye Northdown	P	30	7/15	15	25	9/18	177	21.9	469	9.0	6.7	57	sleeper
21050	249: "	Ahil	VG	18	24	8	16	29	114	21.4	2218	10.0	4.3	70	leaf bronzing, med. early
21051	244:11-13	Apolon	P								300 e				sleeper, virus
21052	245:11-13	Atlas	P	7/20	7/25						600 e				late
21053	246: "	Aurora	G	28	7/8	10	22	9/18	115	23.1	569	11.4	4.5	71	
21049	247: "	Styrian	VG	12	24	6	12	28	142	22.8	1194	4.7	2.5	65	one weak plant
21077	248: "	Saazer	P	18	20	28					250 e				sleeper

[1] P= poor to VG= very good, rated 5/16/78

[2] e= estimate; calculation factor for 2 hill plot: 0.2132937

[3] DM= downy mildew, from 0 to 4; YF= yellow fleck

Yield calculations: green wt/plot x 0.2132927

Seedless 5-hill Observation Nursery (Willamette Yard)

This experimental area, now in its second mature year, was intended to be the major area for preliminary yield testing of breeding material. The relatively close proximity to male plants in the main yard and lack of sufficient windbreaks, however, caused a seed set in excess of 6% for some cultivars.

Table 8 presents data for major domestic and foreign hop varieties grown in 5-hill plots at the Willamette yard. Yield levels are generally lower than in the seedless Smith Yard but Cascade, Bullion 10A, prunus-free Brewer's Gold, Wye Target, and Neoplanta had excellent cone production. Alpha acid levels above 10 were found in Bullion 10A, Comet, Aurora, and Wye Target. The cone production of Styrian was similar to that of Fuggle N with slightly lower alpha acid content. Heat-treated Brewer's Gold, Bullion 10A, and Northern Brewer had significantly higher alpha acid content than their non-heat-treated counterparts, but the slight differences observed for heat-treated Cascade and Fuggle N are probably not significant. The three new Yugoslavian varieties, Dunav, Neoplanta and Vojvodina had lower than expected alpha acid content, a situation also found at the Smith Yard test location in 1978.

The second portion of the Willamette yard consisted of breeding material at an intermediate stage of advancement, primarily selections from the 1970 and 1971 nurseries (Table 9). Yield levels were more variable than those for the identical material in the Smith Yard (Table 6). Outstanding yields were produced by selections 7013-130 (an early aroma-type triploid), USDA 21098 (a triploid), selection 6771-21 (a late maturing Fuggle-derived triploid), selection 6903-107 (a late maturing Cluster selection), selection 7003-81, USDA 21180 (with high alpha plus beta), selections 7003-284, 7004-75 (excellent alpha), 7005-22, 7005-40, 7005-70 (early, good alpha), 7005-232, 7006-408 (good alpha and storage), and the two Idaho selections I 31-11A (excellent alpha) and I 33-6 (aroma). Selection 7006-408 appears to have good yield potential, alpha acid content, and storage stability and was assigned a USDA accession number for preliminary off-station trials in Washington in 1979 (see also Table 3, p. 39).

The remainder of this yard was planted in 1977 to high alpha selections from the 1973 nursery which are now in their first mature year at this location (Table 10). Yield levels among some lines of this material have been disappointing,primarily due to higher than anticipated downy mildew infection. Alpha acid content of many lines, however, was outstanding in 1978. Excellent yield and alpha acid production was found for selections 7301-03, 7301-34, 7303-19 (all crosses on Comet), and selections 7311-152 and 7313-32 (from crosses on USDA 21055). Progeny of Northern Brewer crosses (USDA 64107) failed to perform satisfactorily both in cone production and alpha acid content. Some selections also showed severe virus symptoms.

The highest alpha acid content of the selections from the 1973 nursery Table 10) was found in the progeny of USDA 21055, and especially in selections from crosses 7311 to 7315. Two selections, 7312-09 and 7312-41 had alpha acid content of 17.4% and 16.2%,respectively, but their cone production of 1,002 and 835 lbs. per acre was disappointing.

Female Selections from the 1976 Nursery (Cascade progeny)

84 female genotypes were selected from the Cascade progeny grown in the 1976 nursery after two mature years of field testing (Table 11). These selections from crosses 7504, 7505, 7506, and 7507 will be planted in a 5-hill seedless

location in 1979. The male parents of these crosses were chosen primarily from previous performance data on storage stability, alpha and beta acid content, and co-humulone content. All four male parents in previous analyses had an alpha/beta ratio near 1 (similar to known European aroma-cultivars) as well as low co-fractions (see 1975 USDA report, pages 26-28 and Table 5 , 1975 Report).

A number of selections,primarily from crosses 7504 and 7506, had excellent cone yields, occasionally coupled with excellent alpha acid levels (Table 11). However, only a small number of lines could be analyzed for co-humulone content (co-fraction analyses by the pyrolysis method) due to time limitations. It is clear that this trait has relatively high heritability as judged from the number of genotypes with low or very low co-fractions in their alpha acids. Some co-fractions were exceptionally low (for example, selection 7505-33) which perhaps may be an artifact.

Seeded bale samples of 10 selections were sent to Kirin Brewery, Japan, for hand and laboratory evaluation as aroma hops, but no feedback has been received to date from Kirin. 22 selections (Table 14) from this nursery were sent to Prosser, Washington in the spring of 1978 for preliminary field observation. Hopefully, after several additional years of field testing at one or more locations, a high yielding aroma line with European quality characteristics, low co-humulone content, and good storage stability can be selected.

Male Germplasm Selections from the 1976 Nursery

A total of 20 selections from the Cascade crosses 7504, 7505, 7506, and 7507 of the 1976 nursery was saved for planting in a 2-hill observation nursery (Table 12). Most male selections had outstanding vigor and early maturity as judged by their time of pollen shedding. Such males are urgently needed in commercial Oregon Fuggle yards as pollinators but only few early flowering males are available at the present time from our germplasm collection.

Some male selections from this material, particularly from cross 7506, also had high alpha acid content. Some early flowering males with a low alpha ratio (Table 12) were also saved (selections 7504-86M, -104M; 7506-162M, -182M). Some male selections also had indications of above average storage stability of their resins, one of the reasons why these crosses were made in the first place. However, it now appears that two of the four males used for these crosses, namely 19058M and 64036M, have less than adequate storage stability. Only USDA 21136M and, perhaps, also 21137M have excellent storage stability as measured by the 3-hour crush test for hop storage and a high value for safe period (see computer printout of 1978 males-- page 172).

Progeny Testing of Selected Males on a Uniform Tester.

The variety Cascade was chosen as uniform tester for evaluating the genetic potential of male genotypes from our germplasm collection by progeny testing. Crosses made in 1977 were germinated in early 1978 and 50 seedling plants (when available) of each cross were field-planted in the spring (Table 13). Data on seed set, seed germination, segregation for sex, agronomic performance such as maturity, disease resistance, cone size, sidearm length, cone yield, and quality traits will be evaluated over a two-year period on mature plants beginning in 1979.

Triploid Pollinators for Hop Yield Stimulation

Eight triploid males were found to be suitable pollinators for medium-early, medium, or late flowering female hop varieties in Oregon, based on three years of field testing (Table 15). All genotypes had good to very good pollen production

and all are resistant to downy mildew (based on a 21-can greenhouse test in 1978, p.77) Earlier field observations also showed that these genotypes carried sufficient downy mildew resistance for planting in the Willamette Valley of Oregon.

These eight males will be released as pollinators in 1979 and planting stock will be made available to interested growers.

Prosser Selections Grown in Oregon

A number of selections from the hop varieties development program in Prosser, Washington (C.E. Zimmermann) were grown near Corvallis in 1978. Selections listed in Table 16 were grown in 5-hill seedless observation plots for the second year in the Willamette yard and those in Table 17 were two-year-olds grown in 2-hill observation plots in the seeded yard. All selections represent progeny from crosses on Yakima Cluster (65102), Pride of Ringwood (66052), Comet (62013), heat-treated Northern Brewer (21093), USDA 65009, and the breeding line 6619-04 (Brewer's Gold X Fuggle - Fuggle seedling).

Only one selection from the seedless yards, (W7006-16), will be continued for another year. Of the 2-hill observation plots, 23 genotypes will be continued for another year at Corvallis (Table 17). Some of these marked DISCARD under the column headed "Prosser", will also be discarded from the Prosser program. One line, W404-49, had excellent yield potential and above average alpha acid content at Corvallis and, therefore, will be advanced to a seedless location in 1979.

Another group of high yielding, high alpha lines was received from Prosser during the summer of 1978 (Table 18). These plants were kept in greenhouse pots for the remainder of the year and will be transplanted to a seedless 5-hill test location in 1979. These genotypes are genetically related to those listed in the previous paragraph and they represent progeny from USDA 65009 and breeding line 6619-04, respectively. The new Idaho variety Galena (USDA 21182) was also included in this group, but Galena had already been planted at one test location in the Willamette yard near Corvallis.

A third group of experimental lines from Prosser, related to the previously discussed breeding material (except for the two Idaho selections I 35-29A and I 47-17) will be made available forOregon testing in 1979 (Table 19). This material is also genetically related to the lines discussed in previous paragraphs, but based on preliminary quality analyses, these lines will be considered primarily as aroma varieties.

Idaho Selections Grown in Oregon

Idaho selections from Dr. R.R. Romanko's program at Parma, Idaho were grown for the second mature year in either a 5-hill seedless or a 2-hill seeded test location near Corvallis. Some of the advanced Idaho lines in the 5-hill seedless test (Table 20) had excellent yield levels (selections I 31-11A; I 33-6), that substantially exceeded those of the Brewer's Gold, Bullion, or Cascade controls. I 31-11A also had an excellent alpha acid content. This line reportedly has excellent storage stability of its resins. Galena (I 43-16), which will be released for commercial production in Idaho and now has the USDA accession #21182, had poor cone yields in Oregon primarily due to downy mildew infection in the spring. However, Galena had excellent alpha acid content. Some symptoms similar

to verticillium wilt were also noticed in this genotype. Another Idaho selection (I 34-5), which is also under consideration for variety release in Idaho (USDA accession #21183), had yields and alpha acid content similar to the Bullion control. This line reportedly is an aroma hop with compact cones and good pickability, but it also suffered from heavy downy mildew infestation in Oregon in 1978. At Prosser, this line was one of the best yielders in 1978.

Data from another group of 19 Idaho selections grown in the seeded yard as two-year-olds in 1978 are summarized in Table 21. Some lines had yields and alpha production comparable to the Brewer's Gold and Bullion controls, but downy mildew crown-and-cone infection was a major problem in 1978. Selections marked with an asterisk in the table will be discarded and the remainder will be continued for another year.

Table 8: Seedless 5-Hill Observation Nursery (Willamette Yard): Established Varieties. 1978: Pruned March 28; Trained May 11.

Acc. or Sel. No.	Location Row:Hill	Name	Spring Regrowth [1]	Cross Wire First	Cross Wire Most	Flowering First	Flowering Most	Harvest Date	Cone Weight	Dry Matter	Yield [2]	Quality α	Quality β	α-ratio	Remarks [3]
				June		July		Aug.	mg	%	lbs/A	%	%		
19001	302:1-5	Brewer's Gold	VG	12	20	8	15	9/19	155	23.0	1493	8.7	5.0	63	
48209	303: "	Fuggle H	G	14	22	4	10	24	155	19.7	529	5.0	2.6	65	
21016	304: "	Fuggle N, pr. free?	VG	12	20	4	10	25	141	19.8	930	5.6	2.8	66	
56013	305: "	Cascade	VG	18	24	10	16	9/7	166	19.9	2141	5.4	4.6	54	
21092	306: "	Cascade, prunus free	VG	15	24	4	16	9/7	150	20.9	1954	5.7	5.3	51	
64100	307: "	Bullion	VG	10	20	8	15	30	168	22.3	1408	9.5	4.9	65	
21056	308: "	Bullion 10A, pr. free	G	16	20	10	16	30	124	20.6	2116	11.8	2.8	80	
21040	309: "	Columbia	P	7/6	7/20	25		9/7	140	19.4	1280	6.8	4.0	62	sleeper
21041	310: "	Willamette	P	7/10		25		9/7	143	21.9	1152	5.2	3.4	60	sleeper
64107	312: "	Northern Brewer	P	7/10		15	22	25	145	20.6	491	8.5	3.5	71	sleeper
21093	313: "	No. Brewer, prunus free	P	22	7/15	6/30	15	24	230	21.9	1400	9.7	3.9	71	sleeper
21078	317: "	Record	VG	18	24	10	15	30	119	22.2	1054	7.6	4.8	61	Vert. wilt
62013	318: "	Comet	VG	8	18	10	14	9/7	323	20.4	1450	11.1,	5.5	66	DM3
21167	321: "	Hybrid-2	G	7/6	7/18	14	22				1000 e	7.8	5.9	56	v.late, DM/cones
65101	322: "	Talisman	G	7/4	7/18	10	20					6.4	4.1	61	DM/cones
65103	323: "	E-2	VG	8	22	6/20	4	25	177	20.7	906	7.0	4.7	59	DM/cones
66052	324: "	Pride of Ringwood	VG	20	7/6	25	30				900 e	5.1	4.2	54	v.late, DM2, DM/cones
66054	325: "	Calicross	G	14	24	10	20	9/7	222	22.3	1269	7.6	6.1	54	DM3
21014	326: "	Hallertauer m.f.	P	22		3	10	25	107	19.9	725	5.2	5.1	50	sleeper
21015	327: "	Tettnanger	G	10	24	2	28	25	155	23.1	355	4.9	4.8	50	
21043	328: "	Wye Challenger	G	10	7/6	14	20	30	142	22.6	1100	6.7	4.3	60	
21049	329: "	Styrian	VG	14	22	4	10	25	135	20.1	964	4.6	2.5	64	
21053	330: "	Aurora	G	18	7/6	14	18	25	170	21.4	900	10.8	4.2	71	
21116	302:6-10	Br. Gold, prunus free	VG	8	18	8	20	9/19	121	23.7	2451	9.4	5.1	65	
21112	303: "	Wye Target	VG	14	20	2	15	25	220	20.8	2560	11.6	4.4	72	early, 2 weak plants
21081	305: "	Dunav	VG	14	30	8	16	30	173	21.4	691	7.1	3.4	67	leaf bronzing, top crop
21082	306: "	Neoplanta	P	30	7/1	15	25	9/19	161	22.2	2000	8.4	4.5	65	sleeper
21083	327: "	Vojvodenia	P-G	22	30	12	15	30	119	20.7	1280	7.4	3.3	69	
21113	328: "	Lubelska	G	10	7/2	1	8	24	173	23.6	313	5.0	4.1	54	early
21114	329: "	Nadwislanska	G	22	7/4	1	12	25	131	21.8	213	5.1	4.5	53	

[1] P = poor to VG = very good, rated 5/16-78

[2] e = estimate; calculation factor for 5-hill plot (20 vines) = 0.0853175

Yield calculations like table 5.

[3] DM from 0 to 4 rated in May; DM/cone at harvest

Table 9 : Seedless 5-hill Observation Nursery (Willamette Yard): Breeding Material, 1978.
Pruned March 28; Trained May 11.

Acc. or Sel. No.	Location Row:Hill	Name	Spring[1/] Regrowth	Cross Wire First	Cross Wire Most	Flowering First	Flowering Most	Harvest Date	Cone Weight	Dry Matter	Yield[2/]	Quality α	Quality β	Quality α-ratio	Remarks[3/]
				June		July		Aug.	mg	%	lbs/A	%	%		
7102-12	309:6-10	21003 x 19170M	VG	12	24	8	16				1600 e	3.6	2.5	59	triploid
-25	313: "	"	VG	10	18	1	8	25	210	19.5	1041	6.0	5.2	53	triploid, aroma,V.wilt, E
-26	314: "	"	VG	14	22	12	20	30	126	18.4	1928	4.1	3.4	54	triploid, Vert. wilt
21055	316: "	Co x (BG x Fu-Colo 2-1)	P	24		10	20	25	153	19.8	1248	14.4	4.1	77	sleeper
21054	317: "	"	P	30		12	16								DM/cone, sleeper
7013-130	321:6-10	21053 ⊗	G	22	24	6/30	8	25	168	18.4	2790	8.0	5.1	61	early aroma, triploid
7312-36	323: "	21055 x 21109M	VG	18	22	10	20	9/19	232	24.4	938	11.8	3.8	75	top crop,GH: DM-Resistant
-83	325: "	"	P	20	7/6	15	30	9/19	146	23.7	572	13.5	4.4	75	DM3, sleeper
-134	326: "	"	P	20	7/6	14	25	9/19	169	21.6	1422	11.0	4.5	70	sleeper, GH:DM-Resistant
65009	303:11-15	BG x EG - XS	VG	18	24	14	22	9/19	156	20.6	1800	9.3	7.8	54	
21091	305:11-15	FuT x RV - FuS	G	22	7/4	6	10	25	89	17.1	1314	3.6	3.3	52	virus, triploid, E,
21094	306: "	YC x 7K491 - OP	G-P	12	24	10	16	9/19	147	20.5	1481	7.4	7.0	51	sleeper
21095	307: "	"	VG	10	22	10	16	9/19	161	22.9	1017	6.2	5.1	54	
21098	309: "	19001 x 21153M	VG	12	20	6/30	10	9/19	232	21.7	2140	6.0	4.5	57	triploid
21099	310: "	65104 x 6751-98M	VG	12	18	6/20	2	25	172	20.1	1655	9.1	7.5	54	DM/cone, v.early, aroma
6771-21	313: "	FuT x RV - FuS	VG	12	22	10	16				2600 e	2.6	1.6	61	triploid, exc. yield
6903-107	314: "	65102 x 64037M	G	14	20	12	25				2400 e	2.6	3.2	44	late, DM/cones
7003-03	318: "	65009 x 19046M	VG	18	22	18	25				1800 e	3.6	4.0	47	small cones
-15	319: "	"	VG	12	22	15	22	9/19	160	24.3	1717	9.8	4.7	67	
-38	322: "	"	G	16		10	16	30	144	18.7	1795	8.4	8.1	50	DM4, med. early
-66	323: "	"	VG	15	22	12	22	31	85	19.6	1804	7.0	7.1	49	
-75	324: "	"	G	12	20	12	22				1800 e	6.4	4.7	58	tight cone, DM2
-79	325: "	"	VG	20	30	10	20	31	252	18.4	1617	5.9	7.9	42	lg. cone, sparse, DM3
-81	326: "	"	G	20	24	14	20				2400 e	4.0	4.7	45	DM2, DM/cones
21180	329: "	"	VG	20	24	14	25	31	145	17.8	2269	8.1	8.7	48	DM2
7003-176	330: "	65009 x 19046M	G	22	30	14	25				1800 e	5.6	6.6	45	slip-down, small cones,YF1
21181	302:16-20	"	G	20	24	10	18	9/19	159	22.1	1954	5.6	6.2	47	sleeper
7003-250	303: "	"	VG	18	24	12	20	31	163	18.6	1766	8.9	7.1	55	aroma
-284	304: "	"	VG	18	22	14	22	31	170	20.1	2112	5.4	11.3	32	
7004-75	307: "	65009 x 19182M	VG	12	24	8	12	31	156	21.0	2215	10.2	4.0	71	small cone, TC
7005-22	309: "	65009 x 63015M	G	20	28	15	20	31	189	19.4	2175	10.0	3.7	72	
-40	310: "	"	VG	18	22	20	28				2400 e	4.5	2.6	62	small cones, late, YF 1
-149	311: "	"	P	7/2	7/6	15	28				2000 e	3.5	1.4	72	sleeper
-70	312: "	"	VG	8	12	2	15	31	142	19.9	2668	8.8	7.5	54	early
21193	315: "	"	P	22	7/10	12	20	9/19	228	22.1	981	11.9	4.6	72	sleeper
7005-201	319: "	"	P	30	7/10	18	28	31	130	17.0	2058	8.0	6.3	55	sleeper
-205	320: "	"	VG	20	7/8	12	20	31	105	18.4	1884	11.6	5.3	68	water fleck
-232	321: "	"	VG	22	30	10	16	31	130	17.5	2550	7.7	4.0	66	

Table 9: concluded.

Acc. or Sel. No.	Location Row:Hill	Name	Spring Regrowth[1]	Cross Wire First (June)	Cross Wire Most (June)	Flowering First (July)	Flowering Most (July)	Harvest Date (Aug.)	Cone Weight (mg)	Dry Matter (%)	Yield[2] (lbs/A)	Quality α (%)	Quality β (%)	Quality α-ratio	Remarks[3]
7006-95	322:16-20	65009 x 64035M	VG	12	20	2	15	31	215	21.1	1728	7.0	9.9	41	DM-2
-61	323: "	"	P	20	7/10	15	22	31	138	20.0	1180	5.8	2.1	73	CoF 20, storage
-273	325: "	"	P	24	7/4	18	25				1400 e	7.4	1.9	79	TC
-382	326: "	"	P	22	7/6	10	25	31	147	19.3	1404	8.5	3.8	69	TC, DM-2
-278	328: "	"	P	24	7/22	20	26	31	163	19.9	1770	7.5	4.2	64	DM-2
-296	330: "	"	VG	12	24	2	12	31	286	23.2	1600	12.2	6.6	65	DM-4, sparse set
I43-16	301:21-25	Galena	G	20	7/4	6	10	9/1	151	23.7	821	12.3	8.4	59	Vert. wilt
7006-398	306:21-25	65009 x 64035M	P-G	18	7/4	14	22	9/1	190	21.1	1107	13.6	7.5	64	sleeper
-408*	309: "	"	VG	12	18	4	15	9/1	95	19.0	2730	10.4	5.5	65	small cones
7006-445	311: "	"	VG	18	24	14	20	9/1	173	20.0	2069	8.2	5.5	59	white hops
-450	312: "	"	VG	10	20	14	22	9/1	157	22.4	1296	13.0	5.3	72	TC, sparse, DM-2
-456	313: "	"	P-G	20	30	14	25	9/1	159	21.6	1735	6.6	3.5	65	slip-down, sleeper, late
7007-175	317:21-25	64100 x 64035M	VG	10	18	8	12	9/1	115	20.7	1135	7.1	4.0	63	small cones, TC
-206	318: "	"	P-G	10	22	2	10				1800 e	5.7	3.6	61	TC, sleeper
-339	321: "	"	G	14	24	14	20	9/1	182	23.1	1877	13.1	6.5	66	2% ♂
W7006-16	322: "	65009 x 64035M	VG	10	22	10	20	9/1	289	22.8	1674	11.9	4.8	71	TC
I31 -11A	323: "	BG x OP	G	20	7/2	18	25	9/19	159	22.1	2240	11.2	5.3	67	late, bronze leaves
I33-6	324: "	"	P	18	7/2	10	20	9/1	136	20.6	3071	6.7	4.2	61	DM/cones,poor pick,late
21183	325: "	"	P	24	7/10	15	20				1400 e	9.3	4.2	68	TC, late
7101-96	309:26-30	21003 x 64035M	G-P	10	22	15	22	9/1	91	18.6	1747	4.3	2.8	60	
-98	310: "	"	G-P	18	22	15	22				1800 e	2.7	2.1	56	small cones
-99	311: "	"	VG	14	20	12	20	9/19	126	21.0	1348	5.1	2.4	67	early
-118	313: "	"	G	14	20	8	15	9/1	122	20.5	1408	3.7	3.0	54	early
-175	315: "	"	G	12	20	14	22	9/7	131	19.1	1580	3.5	2.6	57	

[1] poor (P) to very good (VG)

[2] e = estimated

[3] DM = downy mildew from 0 to 4, YF = yellow fleck, TC = tight cone

Yield calculations like Table 5.

* new USDA Accession No. 21195 (see T. 3, page 39)

Table 10. Agronomic and Quality Data of Selections from the 1973 Nursery, Grown in a Seedless 5-hill Observation Nursery (Willamette Yard) in 1978. Pruned: March 25; Trained May 2.

Acc. or Sel. No.	Location Row:Hill	Name	Spring Regrowth[1/]	Cross Wire First	Cross Wire Most	Flowering First	Flowering Most	Harvest Date	Cone Weight	Dry Matter	Yield[2/]	Quality α	Quality β	Quality α-ratio	Remarks[3/]
				June		July		Sept.	mg	%	lbs/A	%	%		
7301-01	322:26-30	62013 x 21108M	VG	10	20	12	22				1200 e	3.2	2.1	60	small cones
-03	323: "	"	G	8	16	10	18	7	237	20.6	1920	11.4	6.4	63	shatter, DM/cones
-34	324: "	"	VG	8	18	10	18	7	126	17.9	1902	12.7	4.1	75	shatter, DM/cones, DM4
-183	325: "	"	VG	8	16	6	13	7	126	20.1	1263	10.2	2.7	78	shatter, DM4
7302-29	326: "	62013 x 21109M	P	18	7/6	10	20	7	137	22.5	1443	11.0	2.8	79	DM/cones, slipdown, sleeper
-146	327: "	"	G-P	22	7/10	12	18				1200 e	8.8	3.8	69	sleeper
7303-07	328: "	62013 x 21110M	VG	18	22	6	12	7	303	23.1	873	10.7	3.7	74	lg. cones
-19	329: "	"	VG	20	30	6	13	7	404	23.4	2097	13.3	3.6	78	tight cones, DM3
7306-05	330: "	64107 x 21108M	VG	20	7/2	10	20				600 e	8.8	4.6	65	DM3, poor
-40	301:31-35	"	P	30	7/6	15					400 e	4.0	1.7	70	sleeper, Vert.wilt, hard pick
-42	302: "	"	P	7/6		14					400 e	8.3	3.6	69	TC, easy pick, sleeper
-43	303: "	"	G	12	24	12	20				1000 e	6.8	2.4	73	tight cone
-91	305: "	"	G	18	7/2	10	20				1000 e	6.0	1.9	76	sleeper, top crop
-139	306: "	"	G-P	20	24	18	26	6	128	18.6	1322	7.7	3.7	67	sleeper
-148	307: "	"	P	12		2	20	6	142	22.3	1262	7.0	5.6	55	sleeper, small cones
-182	308: "	"	G	22		18	22				1200 e	8.0	5.0	61	TC, easy pick, virus
7307-23	309:31-35	64107 x 21109M	P	24	7/4	22	28	6	93	21.2	969	8.4	3.3	71	sleeper
-51	310: "	"	P-G	7/2	7/10	18	24				400 e	6.6	2.0	76	sleeper
7308-34	311:31-35	64107 x 21110M	P	22	7/8	10	15	6	200	22.0	1315	8.0	3.7	68	DM3, sleeper
-48	312: "	"	G		10						400 e	4.3	1.6	72	TC, virus, DM3
7310-39	313:31-35	64107 x 21070M	G	24		8	12	6	170	23.8	572	10.1	4.4	69	
7311-31	314:31-35	21055 x 21108M	G	14	18	8	15	6	352	24.4	921	13.5	4.1	76	sleeper
-32	315: "	"	G-P	18	24	15	20	6	144	24.8	674	12.7	3.4	78	sleeper
-66	316: "	"	P	20		25					1200 e	7.7	6.0	56	sparse set, TC
-68	317: "	"	P	12		12	20				400 e	13.1	3.9	77	sleeper
-78	318: "	"	P	7/8		25					600 e	8.9	2.4	78	sleeper, late
-95	319: "	"	P	20		22	26				1200 e	11.2	3.1	78	sleeper
-108	320: "	"	P	20	7/2	12	20				800 e	11.4	3.5	76	sleeper
-152	321: "	"	VG	12	22	10	15	6	218	21.9	2048	14.5	3.8	79	tight cone, DM2
-177	322: "	"	P-G	8	22	2	25	6	193	21.1	883	12.1	3.7	76	TC, sparse, sleeper

Table 10: concluded.

Acc. or Sel. No.	Location Row:Hill	Name	Spring[1] Regrowth	Cross Wire First	Cross Wire Most	Flowering First	Flowering Most	Harvest Date	Cone Weight	Dry Matter	Yield[2]	Quality α	Quality β	Quality α-ratio	Remarks[3]
				June		July		Sept.	mg	%	lbs/A	%	%		
7312-09	324:31-35	21055 x 21109M	G	22	7/4	14	20	6	276	23.3	1002	17.4	5.1	77	DM/cones, alpha
-15	325: "	"	VG	22		14	28	6	128	17.9	1109	10.2	4.4	69	late
-23	326: "	"	P-G	20		12	20				800 e	7.2	3.3	68	sleeper
-27	327: "	"	P-G	14	24	10	20	6	194	19.9	1013	10.3	5.6	65	sleeper
-41	328: "	"	P	7/1		10	20	6	248	23.6	835	16.2	5.7	73	sleeper, DM4, virus
-78	329: "	"	P	30		22	28				600 e	8.8	5.3	62	sleeper, late
-129	344:1-5	"	G	18	22	2	10	8/30	246	26.3	834	13.5	6.0	69	
7313-09	331:1-5	21055 x 21110M	P	22	7/8	10	18	8/30	239	22.4	697	13.0	5.3	70	sleeper
-32	333: "	"	VG	11	20	12	20	8/30	129	17.4	2232	12.2	4.6	72	DM/cones, aphids
-43	334: "	"	G	11	20	12	20	8/30	242	20.6	1642	10.2	3.5	74	DM/cones, Vert. wilt
-53	335: "	"	VG	10	12	10	15	8/30	143	21.2	1536	10.9	4.5	70	
-83	336: "	"	VG	16	20	6/30	6	8/30	317	24.2	1152	15.7	6.3	71	early
-92	337: "	"	G	10	7/4	10	16				1400 e	3.9	4.9	44	DM/cones
-110	338: "	"	VG	11	18	4	12	8/30	171	26.5	1392	11.3	4.3	72	early; aroma, DM4
7314-11	339:1-5	21055 x 21111M	P	24	20	14	20				1000 e	8.9	3.4	72	sleeper
-44	341: "	"	VG	7/4	7/20	18	15				800 e	11.2	3.8	74	
-58	342: "	"	G	22	7/2	8	14				800 e	8.6	5.8	59	large cones
7315-63	343:1-5	21055 x 21070M	VG	12	20	2	10	8/30	191	21.5	2033	13.7	4.3	76	

1/ poor (P) to very good (VG)

2/ e = estimate

3/ Downy mildew (DM) from 0 to 4, crown infection

Table 11: Female selections from the 1976 Nursery (Cascade progeny), for planting in a seedless yield test. Pruned March 30; trained May 4, 1978.

Acc. or Sel. No.	Location Row:Hill	Pedigree	Yield[1] lbs/A	1977 Quality α %	1977 Quality β %	1977 Quality ratio	1978 Quality α %	1978 Quality β %	1978 Quality ratio	CoF[2]	Storage[3] HSI_6	Remarks
7504-02	7:84	56013 x 19058M;Ca x EG-XS	2986	7.3	6.4	53	7.3	5.3	57	24	0.45	
-04	:86	" "	2504	10.0	5.5	64	8.0	5.2	60	15	0.56	
-14	8:62	" "	3413	8.3	4.4	65	7.7	4.5	63	35	0.72	DM resistant
-16	:64	" "	2432	7.3	3.3	69	5.9	5.4	52	27	0.42	Kirin evaluation
-26	:74	" "	3071	10.2	5.4	65	6.7	5.3	56		0.48	
-31	:79	" "	2773	6.6	5.7	57	9.0	6.5	58		0.55	tight, small cone
-33	:81	" "		7.3	3.8	65	3.6	2.6	58		0.45	vigorous
-34	:82	" "	2943	7.5	8.7	46	6.0	7.3	45		0.59	tight cone
-44	:92	" "	2000	6.1	5.3	53	6.0	5.1	54	15	0.63	lg. cones, DM/crown
-56	9:70	" "	1800	8.0	3.6	68	7.3	3.9	65		0.90	
-57	:71	" "	4138	10.2	4.3	70	7.8	4.9	61			tight cones
-58	:72	" "	2474	9.5	3.0	76	6.0	4.2	58		0.36	
-73	:87	" "	2000	8.0	5.3	60	6.1	5.5	52		0.65	tight cones
-81	10:61	" "	2687	7.1	3.0	70	7.5	3.4	68		0.80	
-83	:63	" "	2517	6.1	2.2	72	7.0	2.4	74		0.51	small cones
-95	:75	" "	2218	7.8	4.0	66	8.9	5.0	63		0.34	small cones
-99	:79	" "	2200	8.1	4.8	62	8.1	7.4	52		0.40	tight cones
-102	:82	" "	1834	7.9	6.3	55	10.2	6.7	60		0.59	exc. pick
-108	:88	" "	2474	7.2	3.6	66	5.9	5.1	53		0.68	small cones
-111	:91	" "					7.8	5.6	57		0.45	large cones
-113	:93	" "	2517	8.6	5.9	59	6.3	8.0	44		0.49	
-122	11:68	" "	2900	7.7	4.3	64	6.3	4.4	59		0.56	
-127	:73	" "	2773	7.4	4.5	62	6.2	5.4	53		0.53	
-130	:76	" "	2687	9.4	4.3	68	8.4	5.5	60	14	0.48	red stem, Kirin eva
-137	:83	" "	2900	8.0	4.6	63	7.0	5.8	54		0.46	
-151	12:63	" "	2432*	8.3	4.3	66	9.9	4.2	70	13	0.48	tight c., aroma, Ki
-205	13:83	" "	2560	10.7	4.2	72	7.0	6.2	52		0.49	rich
-216	:94	" "					8.5	4.4	66		0.30	red stem, hard pick
-231	14:75	" "	2000	7.5	4.7	61	7.8	4.8	62		0.45	tight c., aroma
-250	:94	" "	2303	9.0	4.5	66	8.8	4.1	68		0.72	tight cone
-258	15:68	" "	3199	7.7	4.1	65	6.9	4.7	59		0.54	
7505-17	16:61	56013 x 64036M:Ca x ZaS		8.0	5.3	59				19		large cones
-23	:67	" "		5.3	5.5	48				13		
-24	:68	" "	2260	6.8	2.2	75	7.1	3.1	69		0.49	tight cone
-25	:69	" "	3455	5.1	5.4	48	6.0	6.5	47	15	0.52	
-26	:70	" "	2432	6.2	5.0	55	7.6	4.1	64	17	0.47	
-28	:72	" "	2474	8.4	6.1	57	5.2	6.1	46		0.52	
-29	:73	" "	2943	4.6	2.0	69	7.5	6.0	55		0.67	
-31	:75	" "	2304	8.4	4.6	64	5.4	4.8	52			
-33	:77	" "		5.8	5.7	50	4.7	5.4	46	9	0.38	hard pick, v. low Co
7506-06	17:63	56013 x 21136M; Ca x [(BGxEG-XS)x ZaS]	2304	7.9	3.3	70	7.6	3.9	66	19	0.71	Kirin evaluation
-07	:64	" "	2000	7.1	4.1	63	8.0	4.8	62	13	0.50	
-08	:65	" "	3327	8.6	5.8	59	10.2	5.8	63	14	0.54	Kirin evaluation
-15	:72	" "	2000	9.3	3.3	73	8.1	3.4	70		0.73	early, small cones
-16	:73	" "	2000	8.2	5.4	60	10.1	5.2	66		0.49	
-20	:77	" "	2000	8.9	5.0	63	11.0	6.4	63		0.73	
-26	:83	" "	2000	8.4	4.8	63	9.8	4.4	68		0.52	

Table 11: concluded:

Acc. or Sel. No.	Location Row:Hill	Pedigree	Yield[1] lbs/A	1977 Quality α %	1977 Quality β %	1977 Quality ratio	1978 Quality α %	1978 Quality β %	1978 Quality ratio	CoF[2]	Storage[3] HSI_6	Remarks
7506-38	18:61	56013 x 21136M	2000	9.8	4.8	67	8.7	4.8	64		0.79	
-41	:64	" "	2200	8.9	4.1	68	9.2	3.5	72		0.55	
-47	:70	" "	2200	9.4	4.7	66	10.9	4.2	71		0.56	early,DM res,tight c.
-58	:81	" "	2200	7.4	4.2	63	8.7	4.5	66		0.53	
-68	:91	" "	2730	8.1	5.7	59	6.9	7.0	49		0.79	tight c., late
-72	19:61	" "		7.1	6.0	54	8.8	3.8	69		0.51	no DM, tight cones
-83	:72	" "	2000	7.4	2.4	75	8.3	2.8	74		0.62	high α/β
-107	20:62	" "	2943	5.6	3.4	61	6.3	2.9	68		0.56	
-109	:64	" "	3413	11.2	4.7	70	7.9	5.3	59		0.66	intersex ♂♀
-111	:66	" "	2200	8.9	4.4	66	8.1	5.3	60	31	0.49	Kirin evaluation
-123	:78	" "	2500	7.0	4.6	60	7.1	4.7	60	34	0.90	easy pick
-124	:79	" "	2500	6.5	3.0	68	7.6	4.1	64		0.61	large tight cone
-131	:86	" "		12.0	4.9	71	7.0	4.4	61		0.34	easy pick, DM res.
-135	:90	" "	2000	11.6	5.4	68	10.3	4.9	67		0.83	high alpha
-141	21:62	" "	2200	10.7	5.4	66	10.1	4.2	70		0.69	
-149	:70	" "	2500	6.5	2.6	71	6.6	2.2	74		0.57	tight cone
-156	:77	" "	2500	7.4	4.3	63	8.7	4.0	68		0.72	early, tight cones
-175	22:62	" "	1962	8.9	3.5	72	6.7	2.9	70		0.73	early
-179	:66	" "	2474	9.4	4.0	70	8.3	4.3	65	34	0.72	Kirin evaluation
-200	:87	" "	2474	7.3	3.3	69	9.3	3.8	71		0.53	tight cone
-211	23:64	" "	2730	6.8	2.7	71	7.0	3.8	64		0.51	DM resistant
-220	:73	" "	2218	9.9	4.3	69	11.3	4.4	72		0.60	tight cone
-231	:84	" "	2090	7.1	5.5	56	10.2	6.5	61		0.64	
-232	:85	" "	2474	8.0	3.4	70	8.2	3.1	72		0.85	
-234	:87	" "	1877*	9.3	4.2	68				18		Kirin eval., DM in 78
-245	24:64	" "	2000	10.7	5.5	66	9.5	4.9	65		0.86	tight cone
-253	:72	" "	2200	8.4	4.6	64	8.4	4.3	65	15	0.54	Kirin evaluation
-257	:76	" "	2005				7.3	2.6	73		0.60	
7507-05	:89	56013 x 21137M; Ca x [(BGxEG-XS)x ZaS]		7.3	6.4	53				12		DM/crown
-07	:91	" "		6.0	2.0	75				13		early
-10	:94	" "	2005	6.3	2.9	68	5.6	3.9	58	15	0.58	
-15	25:65	" "	3029	9.0	6.5	58	10.7	6.2	63		0.43	no DM,no mites,stor.
-17	:67	" "	1834	7.1	3.4	67	7.1	3.2	68		0.54	tight c.. no DM
-23	:73	" "	2986	8.8	4.9	64	10.2	5.4	65		0.55	tight cone
-53	26:69	" "	1800	8.5	5.5	60	8.9	5.5	61	23	0.87	tight cone, Kirin eval
-62	:78	" "	2218	9.5	6.9	57	10.0	6.7	59		0.51	
-96	27:78	" "	2133	8.2	4.2	66	7.8	5.9	56		0.30	tight cone
-109	:91	" "	1920	8.3	5.1	61	7.9	5.4	59		0.57	
-120	28:68	" "	2048	7.9	3.6	68	9.1	3.9	69		0.46	tight cone
56013 5 locations		Cascade, control	1738	5.6	4.7	54	6.1	4.6	59	27	0.79	

[1] calculated from a single hill, machine picked, September 1978

[2] cofraction, estimate of cohumulone

[3] HSI_6 - 6 month storage at room temperature: VG = under 35; Good = 35-40; Fair = 41-60; Poor = over 60

* 1977 yield, plant not harvested in 1978.

Table 12 : Male selections from the 1976 Nursery (Cascade crosses), 1978; for planting inthe Germplasm nursery. Pruned March 30, trained May 4, 1978.

Accession or Sel. No.	Location Row:Hill	Pedigree	1977 α	1977 β	1977 ratio	1978 α	1978 β	1978 ratio	Remarks 2/
7504-40M	8:88	56013 x 19058M; Ca x EG - XS	50.4	38.3	57	42.8	54.7	43	early
-86M	10:66		35.3	39.2	47	34.2	36.8	48	early
-104M	:84		19.6	53.4	27	13.7	52.1	20	early
-124M	11:70		12.4	9.6	56	13.8	14.2	49	early
-230M	14:74		35.8	31.5	53				early ,DM/crown
7506-14M	17:71	56013 x 21136M; Ca x [(BGxEG-XS) x ZS]	49.8	15.5	76	60.0	16.6	78	early, alpha
-31M	:88		33.1	22.1	60	35.1	21.6	61	
-57M	18:80		32.4	22.4	59	39.0	19.8	66	early ,DM/crown
-79M	19:68		41.1	17.6	72	47.5	17.2	73	alpha ,DM resistant
-81M	:70		46.1	20.8	69	50.1	21.6	69	alpha
-85M	:74		52.0	20.0	72	50.2	32.3	60	early, alpha
-96M	:85		50.8	23.9	68	46.4	24.3	65	alpha
-100M	:89		51.0	28.9	64	43.1	28.4	60	alpha
-161M	21:82		47.7	31.2	60	40.6	33.7	54	early, storage
-162M	:83		34.2	38.8	47	32.2	45.7	41	early, storage, DM res.
-182M	22:69					22.1	44.9	33	early, DM res.
-207M	:94					35.0	27.3	56	early
-235M	23:88		43.0	29.6	59	31.1	31.9	49	early, storage
7507-107M	27:89	56013 x 21137M; Ca x [(BGxEG-XS) x ZS]	43.6	21.2	67	34.8	18.6	65	alpha, storage
-117M	28:65		43.8	27.6	61	32.6	48.1	40	early
19058M	1/	EG x XS; control	22.6	49.2	32	25.3	47.4	34	poor storage ?
64036M	28:81	Zattler seedling; control	37.3	31.7	54	21.2	35.1	37	poor storage ?
21136M	28:82	(BG x EG - XS) x ZS; control				37.3	31,7	54	excellent storage

1/ Average of 2 hills, Loc. No. 7:82; 28:80

2/ early flowering (pollen shedding) - about July 8-10

Table 13: Seedlings grown in the 1978 Nursery for progeny testing of selected males on a Cascade tester. Planted 5/19/78.

Sel. No.	Location	Pedigree	Genetic trait of ♂ 1/		
			Alpha	Beta	
7701-01 to 50	1:39 to 3:20	56013 x 19005M	10	65	
7702-01 to 50	3:21 to 4:36	x 19008M	4	25	CoH 28
7703-01 to 50	4:37 to 6:18	x 19009M	25	50	CoH 28, Early
7704-01 to 50	6:19 to 7:34	x 19010M			α/β = 1
7705-01 to 21	7:35 to 8:21	x 19036M	20	55	Early
7706-01 to 50	8:22 to 9:37	56013 x 19037M	25	50	CoH 32
7707-01 to 33	9:38 to 10:36	x 19040M			α/β = 1, DM res.
7708-01 to 50	10:37 to 12:18	x 19041M	30	45	
7709-01 to 50	12:19 to 13:34	x 19046M	12	60	poor storage
7710-01 to 50	13:35 to 15:16	x 19058M	30	45	CoH 23
7711-01 to 50	15:17 to 16:32	56013 x 19062M	40	35	
7712-01 to 18	16:33 to 17:16	x 19170M	30	45	Early
7713-01 to 50	17:17 to 18:32	x 19172M			α/β = 1, Early
7714-01 to 50	18:33 to 20:14	x 19173M	25	45	
7715-01 to 50	20:15 to 21:30	x 21060M	30	45	
7716-01 to 02	46:45 to 46:46	56013 x 21071M	58	20	
7717-01 to 39	21:31 to 23:14	x 21087M			DM res., Early
7718-01 to 50	23:15 to 24:30	x 21130M	22	55	DM res., Early
7719-01 to 19	24:31 to 25:15	x 51114M	20	50	CoH 26
7720-01 to 05	25:16 to 25:20	x 60013M	45	25	CoH 55
7721-01 to 50	25:21 to 26:36	56013 x 60023M			α/β = 1, CoH 45
7722-01 to 35	26:37 to 27:37	x 60026M	40	35	many glands, E
7723-01 to 37	27:38 to 28:40	x 63015M	58	25	CoH 25, storage
7724-01 to 44	28:41 to 30:16	x 64035M	45	25	CoH 20, storage
7725-01 to 50	30:17 to 32:30	x 64101M	45	25	storage
7726-01 to 50	32:31 to 34:42	56013 x OP, control			
7727-01 to 50	34:43 to 37:32	48209 x OP, control			
7728-01 to 50	37:33 to 39:42	64100 x OP, control			
7729-01 to 142	39:43 to 46:44	62013 x 21184 M	43	21 2/	CoH 35

1/ E = early, CoH = Cohumulone, DM res. = downy mildew resistant, stor. = good storage

2/ 1977 analysis. See 1977 USDA Report p. 36.

TABLE 14: Female Selections from the 1976 Nursery (Cascade progeny) after 2 years of field testing--1978
Pruned: March 30 ; trained May 4. (FOR PLANTING AT PROSSER, WASHINGTON, SPRING, 1979)

Accession or Sel. No.	Location Row: Hill	Pedigree	1978 Yield	1977 α	1977 B	1977 ratio	1978 α	1978 B	1978 ratio	Remarks 2/
7504-04	7:86	56013 x 19058M; Ca x EG-XS	2500	10.0	5.5	64	8.0	5.2	60	CoF 15
-16	8:64		2432	7.3	3.3	69	5.9	5.4	52	CoF 27, Kirin evaluatio
-26	:74		3071	10.2	5.4	65	6.7	5.3	56	
-31	:79		2773	6.6	5.7	53	9.0	6.5	58	TC
-57	9:71		4138	10.2	4.3	70	7.8	4.9	61	TC
-83	10:63		2517	6.1	2.2	72	7.0	2.4	74	Vigorous
-99	:79		2200	8.1	4.8	62	8.1	7.4	52	Vigorous, TC
-122	11:68		2900	7.7	4.3	64	6.3	4.4	59	Vigorous
-130	:76		2687	9.4	4.3	68	8.4	5.5	60	CoF 14; vig; red stem; Kirin
-205	13:83		2560	10.7	4.2	72	7.0	6.2	52	Vigorous
7505-26	16:70	56013 x 64036M; Ca x ZS	2432	6.2	5.0	55	7.6	4.1	64	CoF 17
7506-06	17:63	56013x21136M; Ca x [(BGxEG-XS)xZS]	2304	7.9	3.3	70	7.6	3.9	66	CoF 19, vigor, Kirin
-08	:65		3327	8.6	5.8	59	10.2	5.8	63	CoF 14,TC,Kirin
-20	:77		2000	8.9	5.0	63	11.0	6.4	63	Rich
7506-47	18:70	56013 x 21136M	2200	9.4	4.7	66	10.9	4.2	71	Early, rich, TC,DM res.
-111	20:66		2200	8.9	4.4	66	8.1	5.3	60	CoF 31, vigor, Kirin
-141	21:62		2200	10.7	5.4	66	10.1	4.2	70	
-156	:77		2500	7.4	4.3	63	8.7	4.0	68	V. early, TC
-179	22:66		2474	9.4	4.0	70	8.3	4.3	65	CoF 34, vigor,TC,Kirin
-253	24:72		2200	8.4	4.6	64	8.4	4.3	65	CoF 15, DM res, Kirin
7507-15	25:65	56013 x 21137M Ca x [(BGxEG-XS)xZS]	3029	9.0	6.5	58	10.7	6.2	63	Vigor, stor., DM +Mite Res.
-23	:73		2986	8.8	4.9	64	10.2	5.4	65	Vigor, TC
56013	1/	Cascade control	1738	5.6	4.7	54	6.8	4.6	59	CoF 27

1/ Average of 5 hills, Loc. No. 7:81; 15:77; 16:90; 24:83; 28:79

2/ CoF = cofraction; TC = tight compact cone; DM = downy mildew field observations

TABLE 15: TRIPLOID POLLINATORS FOR HOP YIELD STIMULATION.

GENOTYPE	PEDIGREE †	POLLEN SHEDDING		DOWNY MILDEW REACTION ‡
		Time	Quantity	
21102M	FuT x Fu-FuOP	med. early	good	R
21104M	FuT x FuOP	late	good	MR
21105M	FuT x RV-FuOP	late	good	R
21106M	FuT x EG-BavOP	medium	very good	R
21175M	[XS x (Fu x EG-ECS)] x OP^2	med. early	very good	R
21176M	"	medium	very good	R
21177M	"	medium	very good	R
21178M	"	med. early	good	R

† FuT = tetraploid Fuggle; Fu = Fuggle; RV = Red Vine; EG = Early Green; Bav = Bavarian
ECS = Early Cluster Seedling; XS = Unknown Seedling; OP = Open-Pollinated

‡ Rootstock (crown) infection: R = resistant; MR = moderately resistant

The following triploid males from the above table were planted in a commercial Fuggle Yard (R.Kerr), Oct 26, 1978:

21102M ; 21175M ; 21177M ; 21178M

Another four early flowering triploid males were also planted at the Kerr location at the same time:

21189M ; 21190M ; 21191M ; 21192M see planting plan next page.

Table 16: Agronomic and quality data of hop selections from Prosser, WA, grown in the seedless Willamette Yard, Corvallis, Pruned: March 28; trained; May 11, 1978.

Sel. No.	Location Row:Hill	Pedigree	Spring regrowth	DM[1]	Maturity[2]	Yield	Quality α	Quality β	Quality ratio	1979 Disposition[3] Corvallis	Prosser	Remarks
						bales/A	%	%				
W901-13	301:11-15	65102 x 64032M	poor	0	VL					Disc.	Cont.	poor, too late
W004-26	311: "	66052 x 63012M	v. good	0	VL					Disc.	Cont.	top crop, late
W101-238	312: "	62013 x 63012M	v. good	2	M					Disc.	GP	DM/cone, poor se
-686	315: "	"	poor	0	VL					Disc.	GP	poor set
W204-053	316: "	21093 x 63015M	v. good	2	M					Disc.	Disc.	top crop, poor
-235	317: "	"	v. good	1	VL	8	3.6	2.6	58	Disc.	Disc.	too late
-124	320: "	"	poor	0	L					Disc.	Disc.	
-174	328: "	"	v. good	2	M					Disc.	Disc.	poor, YF2 (virus
W7006-16	322:21-25	65009 x 64035M	v. good	1	M	8 1/2	11.9	4.8	71	Cont.	?	good cone type

[1] Downy mildew: 0 (best) to 4

[2] M = medium, L = late, VL = very late

[3] Disc = discard; cont = continue, GP = germplasm

Table 17: Agronomic and quality data of hop selections from Prosser, WA, grown in the seeded (main) yard, Corvallis, OR. 1978. Pruned: March 28; trained: May 11.

Sel. No.	Location Row:Hill	Pedigree[1]	Quality α %	Quality β %	Quality ratio	1979 Disposition[2] Corvallis	Prosser	Remarks
W101-204	29:61-62	62013 x 63012M				Discard	GP	poor, arms break
W202-139	:63-64	vf 21093 x vf 63015M				Discard	Disc.	v. poor
W203-180	:65-66	"				Discard	Disc.	v. poor
-189	:67-68	"				Discard	Disc.	v. poor
-583	:69-70	"	4.7	1.9	71	Continue		good vigor
W204-041	:71-72	vf 21093 x vf 63015M				Discard	Disc.	v. poor
W403-007	:73-74	vf 65009 x vf 63012M				Lost	Disc.	
-022	:75-76	"				Lost	Adv. OB	
W404-15	:77-78	65009 x 63015M	7.1	3.7	65	Continue	Disc.	good vigor
-20	:79-80	"				Lost	?	
-22	:81-82	"	6.9	4.2	61	Continue	Cont.	good vigor
-25	:83-84	"	8.3	5.7	59	Discard	Disc.	hard pick, good
-28	:85-86	"				Discard	Disc.	v. poor
-35	:87-88	"				Discard	Cont.	v. poor
-36	:89-90	"	5.5	3.0	64	Continue	Cont.	v. good, DM/cones, 10 B/A
-49	:91-92	"	8.0	4.1	65	Continue	Disc.	v. good, 10 B/A, hard pick
W405-33	:93-94	vf 65009 x vf 63015M	5.1	5.0	50	Discard	Disc.	good
-46	30:61-62	"				Discard	Disc.	v. poor
-49	:63-64	"				Discard	Cont.	v. poor
-61	:65-66	"				Discard	Disc.	v. poor
-67	:67-68	"				Discard	Disc.	v. poor
-70	:69-70	"				Discard	Cont.	v. poor
-71	:71-72	"				Continue	Cont.	high alpha
W401-33	:73-74	65009 x 63012M				Continue	Cont.	baby
W402-49	:75-76	65009 x vf 63012M				Continue	Cont.	baby
W404-05	:77-78	65009 x 63015M				Continue	Cont.	baby
W405-12	:79-80	65009 x vf 63015M				Continue	?	baby
-62	:81-82	"				Continue	?	"
-68	:83-84	"				Continue	Disc.	"
-82	:87-88	"				Continue	Cont.	"
-83	:89-90	"				Continue	Cont.	"
W406-01	:91-92	vf 65009 x 63015M				Discard	Disc.	"
-45	:93-94	"				Continue	Cont.	"
-65	31:61-62	"				Continue	Adv. OB	" , high alpha
-67	:63-64	"				Continue	Adv. ST	" , "
-101	:65-66	"				Discard	Disc.	"
-102	:67-68	"				Discard	GP	" , wrong α/β
W407-23	:69-70	vf 65009 x vf 63015M				Discard	Disc.	"
W408-12	:71-72	65009 x 64028M				Discard	Disc.	baby
-22	:73-74	"				Continue	Cont.	"
W410-10	:75-76	vf 65009 x 64028M				Discard	Disc.	"
-16	:77-78	"				Discard	Disc.	"
-20	:79-80	"				Continue	Adv. OB	" , high alpha
W412-20	:81-82	6619-04 x 63015M				Discard	?	"
W417-20	:83-84	6619-04 x vf 64028M				Discard	Disc.	"
W418-04	:85-86	vf 6619-04 x 64028M				Continue	Cont.	"
-06	:87-88	"				Continue	Cont.	" , high alpha
-15	:89-90	"				Continue	Adv. OB	"
W419-23	:91-92	vf 6619-04 x vf 64028M				Continue	Cont.	" , high alpha

[1] vf = virus free

[2] GP = germplasm; Adv.OB= advance to observation plot; ST= short trellis

Table 18: High-yielding high-alpha lines from Prosser, WA, planted at Corvallis, OR.

Sel. No.	1978 location Corvallis[1/]	Pedigree	Quality[2/] α	Quality[2/] β	Remarks
W 401-14		65009 x 63012M; (BGxEG-XS) x (BGxUt526-4)	10	5	virus inf x vi
-30	Greenhouse	" "	10	9	
-226		" "	12	5	
W 402-50		65009 x vf 63012M; "	12	5	virus inf x v.free
-105	Greenhouse	" "	10	7	
-179		" "	14	4	
W 403-09		vf 65009 x vf 63012M; "	12	4	virus free x vf
W 404-06	Greenhouse	65009 x 63015M; (BGxEG-XS) x (BG^2xEKG-BavS)	13	6	virus inf x vi
W 405-07		65009 x vf 63015M; "	12	6	virus inf x vf
W 407-54		vf 65009 x vf 63015M "	13	6	virus free x vf
-36	Greenhouse	" "	10	3	
W 412-18		6619-04 x 63015M;(BG^2xFu-FuS)x(BG^2xEKG-BavS)	11	4	virus inf x vi
-92		" "	11	4	
-152		" "	12	5	
W 416-02	Greenhouse	6619-04 x 64028M;(BG^2xFu-FuS)x(BG^2xEKG-BavS)	14	5	virus inf x vi
21182	301:21-25	Galena; BG x OP	12	7	virus status ?

1/ Lines with no location, not grown at Corvallis.

2/ 1978 Prosser data.

Table 19 : High-yielding experimental aroma lines from Prosser, WA, planted at Corvallis, OR. (Information on pedigree from C.E.Z. report to USBA for 1975, page 2)

Sel. No.	1978 Plot No. Corvallis[1]	Pedigree	Quality[2] α	Quality[2] β	Remarks
I35-29A	46:19-20	Brewer's Gold x OP	5	5	
I47-17	49:19-20	Cascade x OP	8	8	
W203-099		21093 x vf 63015M; vf NB x (BG^2xEKG-BavS)	6	4	virus free x v.f.
W401-16		65009 x 63012M; (BGxEG-XS) x (BGxUt526-4)	8	7	virus inf x v.i.
-65		" "	6	5	
-75		" "	7	5	
-82		" "	6	3	
-154		" "	9	5	
-192		" "	8	4	
-231		" "	8	5	
-270		" "	6	6	
-274		" "	7	9	
W402-30		65009 x vf 63012M; "	6	6	virus inf x vf
W403-22	[3]	vf 65009 x vf 63012M; "	8	4	virus free x vf
-89		" "	8	5	
W404-33		65009 x 63015M; (BGxEG-XS) x (BG^2xEKG-BavS)	10	4	virus inf x vi
W405-68	30:83-84	65009 x vf 63015M; "	8	4	virus inf x vf
W406-16		vf 65009 x 63015M; "	8	4	virus free x vi
-57		" "	9	6	
W412-31		6619-04 x 63015M; (BG^2xFu-FuS) x (BG^2xEKG-BavS)	9	6	virus inf x vi
W415-80		vf6619-04 x vf 63015M; "	9	3	virus free x vf
W417-12		6619-04 x vf 64028M; (BG^2xFu-FuS) x (BG^2xEKG-BavS)	8	3	virus inf x vf
W421-20		68052 x vf 63012M; Peth.Gold.x(BG x Ut526-4)	6	4	virus ? x vf
-23			10	4	
-35			11	4	
-38			10	4	
-43			11	3	
-44			6	6	
-50			10	4	
-52			7	4	

[1] Lines with no plot No.; not grown at Corvallis in 1978, but will be planted in 1979.

[2] 1978 date from Prosser.

[3] Lost at Corvallis in 1978.

Table 20 : Idaho hop selections grown in the seedless Willamette Yard, Corvallis, OR in 1978.
Pruned: 3-28-78; trained: 5-11-78.

Accession or Sel. No.	Location Row:Hill	Pedigree	Spring regrowth[1]	Downy mildew[2]	Cross wire First	Cross wire Most	Flowering First	Flowering Most	Harvest Date	Cone weight	Dry matter	Yield	Quality α	Quality β	α-ratio	Remarks[3]
			5-16		June		July		Sept.	mg	%	lbs/A	%	%		
19001	302:1-5	Brewer's Gold,control	VG	0	12	20	8	15	19	155	23.0	1493	8.7	5.0	63	
56013	305: "	Cascade, control	VG	0	18	24	10	16	17	166	19.9	2141	5.4	4.6	54	
64100	307: "	Bullion, "	VG	0	10	20	8	15	8-30	168	22.3	1408	9.5	4.9	65	
21182	301:21-25	Galena; (143-16)	G	0	20	7-4	6	10	1	155	23.7	821	12.3	8.4	59	Vert. wilt
131-11A	323: "	Brewer's Gold x OP	G	1	20	7-2	18	25	19	159	22.1	2240	10.0	7.6	58	bronze lf, tight cone, YF2, VL
													11.2	5.3	67	2 analyses
133-6	324: "	"	P	0	18	7-2	10	20	1	136	20.6	3071	6.7	4.2	61	DM/cones, poor pick, L
21183	325: "	(134-5) "	P	2	24	7-10	15	20	–			1400e	9.3	4.2	68	VL, tight cone, aroma

[1] VG = very good; P = poor

[2] 0 (best) to 4

[3] YF = yellow fleck, L = late, VL = very late

Table 21: Experimental lines from Idaho, grown seeded (Main Yard) in 1978. Corvallis, OR.
Pruned: 3-28-78; Trained: 5-10-78

Accession or Sel. No.[1]	Location Row:Hill	Name or Pedigree	Spring regrowth[2] 5-18	DM[3]	Cone set	Harv. date Sept.	Yield lbs/A	Quality α %	Quality β %	Quality α-ratio	Remarks
19001	31:1-2	Brewer's Gold, control	VG	0	G	20	1056	8.9	4.2	67	
64100	35:3-4	Bullion, control	G-P	0	G	20	1312	9.2	4.8	65	
I4-4*	40:19-20	Early Cluster x OP	VP								lost in 1978
I14-24A*	41: "	58112 x OP	P	0	G			4.1	2.8	59	tight cone
I21-17A	42: "	Hallertauer x OP	P	0	G			9.2	3.8	70	DM/cones
I21-26A*	43: "	"	VP	0	G			3.9	4.6	46	DM/cones
I32-13	44: "	Brewer's Gold x OP	G-P	2	G	20	1120	8.8	3.7	70	yellow fleck 2
I34-52	45:19-20	Brewer's Gold x OP	G	2	P	20	640	7.3	3.6	66	
I35-29A	46: "	"	G	0	G						bad DM/cone, not analyzed
I42-39*	47: "	"	G-P	4	P						DM/cones, "
I43-24A	48: "	"	P	0	G			5.7	5.6	50	
I47-17	49: "	Cascade x OP	VP	0	P						
I48-29A*	50:19-20	Cascade x OP	G	2	G						bad DM/cones, not analyze
I49-8A*	51: "	"	P	3	P						" , "
I51-8A	52: "	"	VG	0	VG			6.6	3.5	65	
I51-19A*	53: "	"	P	2							bad DM/cones, not analyze
I55-12A	54: "	"	P	0	G			4.7	2.9	61	
I37-21*	55:19-20	Brewer's Gold x OP	G-P	0	P						not analyzed
I43-11	49:21-22	"	G	2	G			6.9	4.6	60	large cones
I36-40*	50: "	"	VP	3	VP						not analyzed
I30-15	51: "	"	VP								lost in 1978

[1] Selections with asterisk (*) will be discarded spring 1979.

[2] G = good, VG = very good, P = poor, VP = very poor

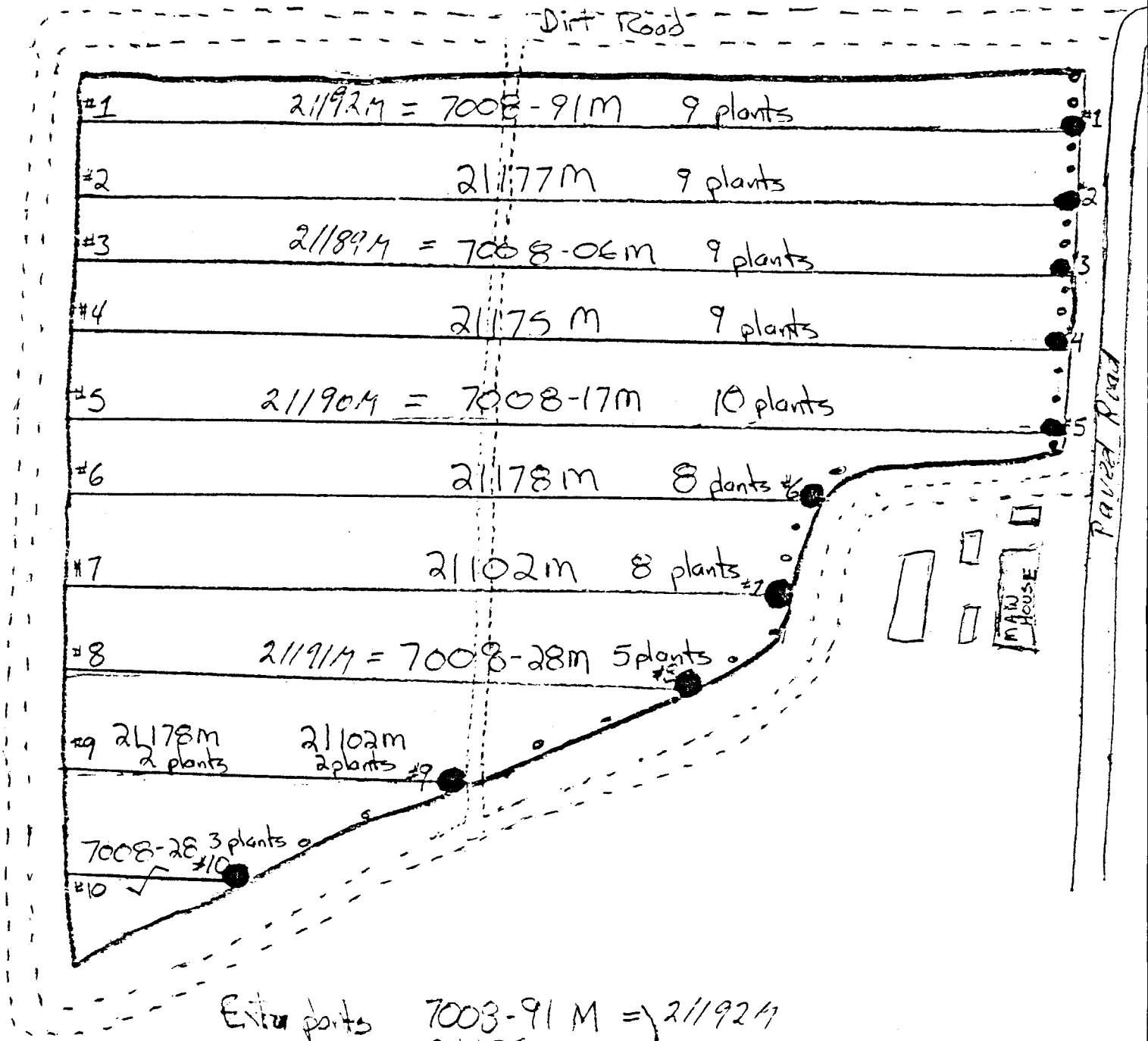
[3] 0 (best) to 4

↑N

Roger Kerr Hop Yards

planted Oct. 26, 1978

Testing of Triploid Males as pollinators



Extra parts

7003-91 M = 21192M
21175 m
7008-06M = 21189M
21177 m

} ONE OF EACH

Hop Variety testing at Grants Pass, Oregon.

Fifty baby crowns of Galena (USDA 21182), formerly Idaho Sel. No. 43-16 and USDA 21183 (formerly Idaho Sel. 34-5), were obtained in the spring and planted at Grants Pass, Or. for preliminary field observations. In addition, rhizomes of heattreated Bullion 10A (USDA 21056), regular Bullion (64100), heattreated Brewers Gold (21116), and regular Brewers Gold (USDA 19001) were also planted at this location. There appears to be a need for a high alpha hop at Grants Pass.

The variety Comet regularly produces high alpha at Grants Pass, but is not fully satisfactory in cone production.

The experimental plots were visited on July 20, 1978.

At that time Bullion 64100 looked the best, followed by Bullion 10 A.

The two Brewers Gold lines did not look as good as any Bullion line, and 21116 actually showed some Split leaf Blotch and some Yellow Fleck symptoms, indicative of Prunus Necrotic Ringspot Virus.

The two Idaho lines has poor stand, particularly 21183, and downy mildew spikes. Neither line showed outstanding vigor or yield potential, but since they were baby plants, not too many conclusions can be drwan at this time.

The two USDA Cluster-related lines 21194 and 21195, which were planted one year earlier (see 1977 USDA report), looked very good, although 21094 had slight yellow fleck symptoms.

INFORMATION SHEET FOR USDA HOP VARIETY 21091
(SELECTION NO. 6771-19)

PEDIGREE: Tetraploid Fuggle female crossed with a male having Fuggle and Red Vine parentage: 3/4 Fuggle, triploid.

MATURITY: Early, harvest about August 25 in Oregon.

YIELD AND QUALITY:

	Yield lbs/A	Alpha %	Beta %	Oil %	
1969, single plant	-	9.0	4.7	-	
1970, 10 "baby" plants	700	8.6	4.0	1.7	
1971, 10 mature plants	2,560	8.4	4.2	2.3	
1972, 10 " "	2,390	5.8	4.8	-	
1973, 5 " "	3,229	5.7	5.1	-	
1974, 5 " "	1,967	6.3	5.2	-	
1975, 5 " "	2,912	5.8	4.8	1.07	
1976, 5 " "	1,770	4.2	4.7	-	
1977, 5 " "	2,116	6.5	4.7	-	
* 1978, 5 " "	2,432	5.0	4.0	-	Smith Yd.
* 1978, 5 " "	1,314	3.6	3.3		Will. Yd.
1978, 2.64 acres	1,303				commercial

* 2 exptl. locations in 1978. Off-station trial at Schwabauer's, Hubbard, OR

PICKING: Very clean, better than most varieties, no shatter

DRYING-BALING: Heavy strig may influence drying time

CONE TYPE: Large, dense and heavy

LUPULIN: Normal, plentiful

AROMA: Mild, somewhat spicy

STORAGE STABILITY: Medium, keeps well at 3° C

OTHER INFORMATION:

Preliminary hand evaluation of baby 1970 crop by Anheuser-Busch, mixed reaction. Favorable comments by five of six USBA evaluators in 1971. Poor commercial potential at Prosser plots. 3.1% seed under heavy pollen load. Growers want an early triploid Fuggle type. A-B recommended off-station commercial tests and will conduct brewing evaluation. First commercial brewing tests with 3,439 lbs. from the 1978 crop, produced on 2.64 acres at the Schwabauer Ranch.

Additional 1978 data:

Plot at Schwabauer : 2.64 acres, harvested Aug. 30, 1978
Total yield: 3439 lbs-- 1303 lbs/acre

18 bales obtained and shipped to Anheuser Busch Inc. for brewing
(kept in cold storage at Hubbard, OR. until shipped)

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									

HSI_6 hop storage index, 6 mos. common storage

CoF co-fraction, indication of co-humulone content

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 11.0	4.6 4.6	981 lbs/A 1855 lbs/A DM/cones tight cones	14.9	5.6		10.1	5.2	P/FCP necrosis, terminal cone	11.5	4.2	
1977	12.3 12.1	4.4 4.5	bale 1429 lbs/A cones HSI_6 0.44; 78% rem; v. good storage	10.8	4.6	HSI_0 0.29 HSI_6 0.41	10.8 11.4	4.9 4.7	12 1/4 #, adv., cont. fair vig. 71% rem good stor.	11.1	6.3	74% rem. vigor A, arm lgth A, clustering A, cone size A, good storage
1976	12.6 12.6	4.9 4.5	821 lbs/A, good HSI_6 0.37; 83% rem v. good storage	13.3 14.4	5.0 5.8	69% rem. good vigor good yield	13.3	5.0	16#, GCP loose, good vig. good yield			
1975	11.8	3.7										
1974	—	—										
1973	12.0	3.6	CoF22, good storage aroma									
1972	11.2	4.2										

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

New USDA Accession Number in 1979: 21194

Selection 7006-311; Pedigree: 65009 x 64035M; (BG x EG - XS) x ZS

Year	Corvallis			Yakima (J.I.H.)			Prosser			Idaho A = best
	α,	β,	Remarks	α,	β,	Remarks	α,	β,	Remarks	
1978	12.4 13.4	4.8 5.3	3b/A, poor, DM 1920 lbs/A, tight cones	12.1	3.5	HSI_0 0.25				
1977	13.4 10.7	4.5 3.9	bale 927 lbs/A, Poor, short arms cones HSI_6 0.32, 86% rem, v. good storage	10.2	5.0	HSI_0 0.25 HSI_6 0.55	11.2 10.8	4.8 4.5	HSI_0 0.28 Late, 14#, adv, Bis	vigor A, arm length B, clustering C, cone size A, good storage
1976	14.5	5.5	P. yield, fair vigor HSI_6 0.57; 55% rem good storage	15.6	5.5	vigor fair, G yld, HSI_6 0.36 v. good storage	15.9	5.7	poor vigor, poor yield, M cone, Late PCP, 12 1/2#	
1975	16.8	5.8								
1974	—	—								
1973	11.0	5.0	CoF 26							
1972	10.6	3.8	HSI_6 0.63							

New USDA Accession Number in 1979: 21195

Selection 7006-408: (BG x EG - XS) x ZS; 65009 x 64035M

Year	Corvallis			Yakima (J.I.H.)			Prosser			Idaho
	α,	β,	Remarks	α,	β,	Remarks	α,	β,	Remarks	
1978	8.0	3.9	12b/A, DM3, sleeper, DM/cones	12.3	4.9					not planted
	10.4	5.5	2730 lbs/A, VG							
1977			poor, YF2	8.5	5.2	HSI_0 0.26 HSI_6 0.38	6.8	5.6	12 3/4#, poor vigor	"
							7.0	5.9	HSI_6 0.32	
1976	12.1	5.8	912 lbs/A, VL, poor vg storage HSI_6 0.37	9.0	5.1	VG vig, heavy set; exc. HSI_6 0.48, good yield	9.1	5.4	11#, fair vig. PCP, fair yield	"
1975	11.5	5.0	1600 lbs/A est. sleeper	12.0	5.1	rel yld 4(out of 10) HSI 0.35				"
1974	12.4	4.6	good, exc. pick							
1973	11.3	3.2	good, aroma, exc pick							
1972	10.1	4.1								

UNITED STATES DEPARTMENT OF AGRICULTURE
SCIENCE AND EDUCATION ADMINISTRATION
Washington, D. C. 20250
and
OREGON AGRICULTURAL EXPERIMENT STATION
OREGON STATE UNIVERSITY
Corvallis, Oregon 97331

NOTICE OF RELEASE OF HOP GERMPLASM WITH HIGH ALPHA-ACIDS CONTENT

The Science and Education Administration and the Oregon Agricultural Experiment Station announce the release of hop germplasm line USDA 21055 that has, and transmits in breeding, a very high content of alpha-acids.

USDA 21055 originated from a cross made in 1968 by Alfred Haunold between the female cultivar Comet and the male seedling selection 6616-35M. Both the male and the female parents had indigenous North American germplasm in their pedigrees derived from wild hop collected in Utah and Colorado by C. E. Horner. Quality analyses conducted by S. T. Likens during 1969-1977 confirmed the consistently high level of alpha-acids in USDA 21055 and its progenies.

In replicated plots, cone yields of USDA 21055 averaged 1,380 kg/ha (1,231 lbs./A) from 1974-1977. This yield level is too low to be commercially attractive under current hop marketing conditions. However, alpha and beta acid content averaged 14.7% and 5.7% respectively as compared to the high alpha acid cultivar Brewer's Gold which had 9.4% alpha and 4.8% beta during the same period. Lupulin content of USDA 21055 averaged 28% of total cone weight. Co-humulone content of the alpha acids ranged from 42-45%. Essential oils averaged 2% of dry cone weight.

The alpha and beta resins of USDA 21055 possess above average storage stability. After 6 months of storage at room temperature, USDA 21055 retained from 68-80% of its alpha acids as compared to about 40% retained in a comparable Brewer's Gold sample under identical storage conditions.

USDA 21055 matures medium late (early September) in the Willamette Valley of Oregon. It has deeply lobed leaves like its wild North American ancestors. Its stem is coarse and is covered with rows of hooked hairs which also are found on the leaf petiole. The shoots can be easily trained in the spring and they grow to the top of the trellis at a rate comparable to that of commercial hop cultivars. Laterals grow to about 70-100 cm (2-3½ feet) in length. Flowering occurs from early to mid-July. Occasionally a few sterile male flowers are found. Cone set is sparse with poor clustering. Dry seedless cones average about 200 mg. in weight.

USDA 21055 is resistant to crown and cone infection by downy mildew. It also appears to be resistant to strains of Verticillium wilt found in Oregon and Washington. During one year, a stem canker of unknown cause was observed in Washington. Tests conducted in 1972 showed USDA 21055 to be free from Prunus necrotic ringspot virus and no virus symptoms have been subsequently observed.

Due to its poor clustering and sparse cone set, yields of USDA 21055 are too low for commercial hop production. However, it is an excellent germplasm source for superior alpha acid content, high lupulin content, and good storage stability of the resins. As judged from tests of five crosses involving USDA 21055, the genotype transmits its desirable quality traits to its progeny with moderately high frequency.

The Oregon Agricultural Experiment Station, Corvallis, Oregon 97331, will maintain planting stock of USDA 21055. A few rhizomes will be supplied to hop breeders and research institutions upon written request to the Director, Oregon Agricultural Experiment Station, Corvallis, Oregon 97331. Recipients of USDA 21055 are expected to make appropriate acknowledgement when this germplasm contributes to a new variety or hybrid.

The date agreed for joint release and publicity is October 16, 1978.

Director, Oregon Agricultural Experiment Station	May 8, 1978 Date
Deputy Director, Federal Research	5/16/78 Date

1978: HOP PATHOLOGY.

1978: 20-can downy mildew test:

GENOTYPE	HEALTHY	LIGHT	MODERATE	SEVERE	TOTAL	DISEASE INDEX	RESISTANCE RATING	REMARKS
21060M ✓	21	4	0	1	26	.27	~~R~~	Pith only
21102M ✓	19	1	0	0	20	.05	~~R~~	Pith only
21177M ✓	9	13	0	0	22	.59	~~R~~	Pith only
19039M ✓	20	0	0	0	20	0	~~R~~	
21178M ✓	15	9	0	0	24	.38	~~R~~	Mostly pith; 3 in cortex, too
7312-83 ✓	0	5	18	0	23	1.78	I	Solid pith rot
21070M ✓	2	0	18	0	20	1.8	~~I~~	Terminal shoot dead due to immune reaction
21090M ✓	21	0	0	0	21	0	~~R~~	
21061M ✓	9	14	0	0	23	.61	~~R~~	Pith only; wide but broken
65102ck ✓ YC	1	2	0	20	23	2.69	~~S~~	
21090M ✓	20	5	0	0	25	.20	~~R~~	Pith only
21059M ✓	9	13	3	0	25	.76	~~R~~	Pith only in light; immune reaction in moderate
62053 ✓	25	8	1	0	34	.29	~~R~~	Pith only in light; immune reaction in moderate
21123M ✓	25	5	1	0	31	.23	~~R~~	Pith only in light; immune reaction in moderate
66051 ✓	15	8	0	0	23	.35	~~R~~	Pith only
21089M ✓	12	12	0	0	24	.50	~~R~~	Pith only
21088M ✓	17	10	0	0	27	.37	~~R~~	Pith only
21082Neo ✓	10	7	5	0	22	1.22	~~I~~	Pith in moderate heavily damaged
7008-28 = 21191M ✓	18	4	0	0	22	.18	~~R~~	Pith only very light

GENOTYPE	HEALTHY	LIGHT	MODERATE	SEVERE	TOTAL	DISEASE INDEX	RESISTANCE RATING	REMARKS
21112 Target	15	10	0	0	25	.40	R	Pith only
21083 Voj	14	8	3	0	25	.56	R	Pith only
7008-06M=21189M	20	1	0	1	22	.05	R	Pith only
21044	12	3	0	0	15	.20	R	Pith only
21080 Backa	11	11	0	0	22	.50	R	Pith only
21097HB	17	7	0	0	24	.29	R	Pith only
7008-17=21190M	23	0	0	0	23	0	R	Rhizome heals poorly
7008-91=21192M	19	3	2	0	24	.29	R	Pith only in light; immune reaction in moderate
7312-134	18	5	0	0	23	.22	R	Pith only
21043	8	10	1	2	21	.86	R	Light in pith-sometimes only infected at point of contact, moderate was immune reaction; severe-dead.
48209Fuggle	3	22	0	0	25	.88	R	Pith only
21081 Dunav	5	18	3	0	26	.92	R	Mainly pith
7005-194=21193	19	2	0	0	21	.10	R	Pith only very slight
21077Saazer	16	7	0	0	23	.30	R	Pith only
7312-36	13	0	0	0	13	0	R	
21106M	2	19	1	0	22	.95	R	Light-pith only; moderate pith and immune
21175M	10	12	0	0	22	.54	R	Of light, 1 pith only, 11 slight immune reaction in cortex
21094	0	0	0	21*	21	3.00	S	Nearly all inoculated shoots dead; weak laterals developed

GENOTYPE	HEALTHY	LIGHT	MODERATE	SEVERE	TOTAL	DISEASE INDEX	RESISTANCE RATING	REMARKS
21095	0	0	0	20*	20	3.00	S	Nearly all inoculated shoots dead; weak lateral developed
21176M	5	17	0	0	22	.77	R	Mostly slight immune; some with streaky pith
21105M	1	20	0	0	21	.95	R	All with pith infection some with mild immune
21104M	0	8	5	7	20	1.95	I	Moderate, have immune reaction
64035M	3	17	1	1	22	1.0	I	Pith only in light
21091	5	18	0	0	23	.78	R	Pith only
21055	20	0	1	0	21	.10	R	Tip dead and tissue discolore not immune reaction

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 - .94
I .95 - 2.1
S 2.2 - 3.0

* Verified by CE.it

AGRICULTURAL RESEARCH SERVICE — WESTERN REGION

OF UNITED STATES DEPARTMENT OF AGRICULTURE

Horticultural Crops Research Unit
Room 1067, Cordley Hall
Department of Botany and Plant Pathology
Oregon State University
Corvallis, Oregon 97331

January 16, 1978

Subject: Proposed ELISA research in the "New Ideas" program

To: Dr. H. L. Puterbaugh
Asst. to Deputy Administrator, ARS
Program Planning and Review Staff
BARC West
Beltsville, MD 20705

Through: Dr. S. N. Brooks, AD
OR-WA Area
219 Agricultural Sciences Bldg.
Phase II
Washington State University
Pullman, WA 99164

and

Dr. H C Cox, RD
Western Region
USDA-ARS
2850 Telegraph Avenue
Berkeley, CA 94705

A proposal for adapting enzyme-linked immunosorbent assay (ELISA) to a number of problem viruses of small fruits and hops is attached for consideration in the "New Ideas" program in ARS. Dr. C. E. Horner and I believe that this technique will permit us to move to new levels of precision in the detection of small quantities of the sap-transmissible viruses of small fruits and hops. We hope that this proposal will allow our lab to become a focus of ELISA research for this part of the country. Several ARS and CSRS workers have already visited our laboratory to learn ELISA techniques, and we hope this trend will grow with the expanded work which we have proposed in the attachment.

At the same time we are concerned that ELISA work in ARS be cooperative rather than competitive. We have been in contact with Dr. William Rochow of ARS at Cornell University as each group developed its separate "New Ideas" proposal. We endorse his proposal (reference copy attached) as one that dovetails nicely with ours, the one emphasizing ELISA applications to perennial plants, the other (Rochow's) to detecting plant viruses in aphids.

Sincerely yours,

R. H. Converse
RL, Horticultural Crops Unit

Enclosure

cc: Dr. William Rochow , Dr. C.E. Horner

ARS Ideas Program

1. Title: Detection and diagnosis of viruses in small fruits and hops by means of enzyme-linked immunosorbent assay (ELISA).

2. Location, Unit and Principal Scientists: Corvallis, OR, Horticultural Crops Unit and Field Crops Breeding and Production Unit, R. H. Converse and C. E. Horner.

3. Need for the Work: The new ELISA system is 100 to 1000 times more sensitive than currently used agar gel serological detection procedures for plant viruses. It has not been applied to viruses in these crops in the U.S. except for a preliminary successful study of tomato ringspot in raspberry by Converse (PDR in press). Viruses like prunus ringspot in Rubus or in hops are detected with difficulty by present techniques and only at certain times of the year. Application of ELISA techniques to these viruses should make detection and diagnosis possible in these crops at any time of year. Tobacco streak virus, black raspberry latent virus, raspberry bushy dwarf virus in small fruits, and hop mosaic virus and some other sap-transmissible hop viruses cause diseases in these crops which are hard to detect and identify by present techniques. ELISA methods should make detection a year-round routine procedure in these cases.

4. Expected Results: When ELISA sera have been prepared for the above viruses and detailed procedures have been worked out for ELISA detection of each virus in each test host, it will be possible to evaluate the presence of these viruses in many research situations where this is now difficult or impossible. Detection of these viruses in plant breeding material and in cultivars for commerce is a major objective. Study of the relationships, rate and timing of spread of these viruses will be possible by ELISA methods on a quantitative basis from micro-samples for the first time. Epidemiological and control studies, which have not heretofore been conducted because of a lack of suitable methodology, can now be undertaken.

5. Plans: Where needed, prepare high-grade antisera against important strains of the small fruit and hop viruses listed above. Prepare ELISA reagents from these antisera. Develop methods of applying ELISA procedures to individual virus-host combinations from the above group. Apply these procedures to relationship studies, distribution studies, and to evaluate control procedures for these viruses.

6. Potential Benefits: Successful adaptation of ELISA methods to the routine detection and diagnosis of the above viruses in small fruits and hops will lead 1) to the availability of more virus-negative plant material at the plant breeding level (where many of these viruses are currently being seed-transmitted), 2) to the release of cultivars free from these viruses (for example, the detection of hop mosaic virus is at present so uncertain that it is difficult to establish a clean stock program in hops for this virus), and 3) to a better assessment of the occurrence of these viruses in the field under various control regimes, leading ultimately to improved control procedures. We also expect that our concentration on ELISA virus detection procedures in conjunction with the proposed ELISA specialization for aphid vectors of plant viruses by Dr. Rochow of ARS will provide ARS with locations where these techniques may be demonstrated to other ARS researchers.

7. Resources Involved: There is already a working ELISA laboratory in Converse's program. Skilled personnel is what is principally required to expand the ELISA work to new viruses. With the concurrence of Oregon State University, we propose increased funding of $42,000 in FY78 to Converse's project to add a person under cooperative agreement with Oregon State University to conduct the above research at a salary of $14,500/yr plus 17% fringe benefits plus 12% second year increase, and $6,000 for equipment, supplies, casual labor, and travel. We would suggest scheduling to have the person on the job by Oregon State University under ARS cooperative agreement by July 1, 1978 and plan to conclude the work by July 1, 1980.

Dr. Converse, USDA, SEA, WR, OSU, Bot. Dept. Campus March 17, 78.

Dear Dick,

Here is some background information about the hop material slated for virus testing.

Fuggle, USDA 48209
Cascade, USDA 56013 both have prunus plus other viruses, such as mosaic etc.

Comet, USDA 62013. Skotland has never found prunus in that cultivar and thinks Cmmet may be resistant (perhaps even immune) to PNRSV

crosses to be used (seedlings transferred to your house on 3-16-78:

Cross 7701	Cascade cross
7704	
7709	
7714	
7715	
7718	
7721	
7722	
7728	open pollinated Bullion

I made these crosses last year on Cascade. Thus the mother is identical, the male parent is different, according to the crossing list enclosed. Cross 7728 is an open pollinated Bullion, one of my controls in this experiement.

Cross 7729 is from Idaho, I made it on a known Comet female with pollen of a male plant that resembled Comet in many respects. I am still not convinced that sex reversal of Comet has occurred, but we have the seedlings now. At any rate, I would be curious to see if the PNRSV resistance shows up in that material.

Under "pedigree" in the table I have listed both our USDA accession number and the actual pedigree as far as it is known. Ca is Cascade, Fu is Fuggle, Arizona and Colo are indigenous American hop genotypes collected by Jack over 10 years ago. You are welcome to the detailed pedigree key if you like, Jack has a copy, or I could write it out for you.

Thank you for your cooperation.

Al H Arnold Ph. 4715

cc to CE Horner

Table 5: Crosses made in 1977. Seed pretreatment started December

Cross Number	Location of female	Pedigree	Seeds Number	Seeds Weight	Remarks
				g	
7701	211:1-10	56013 x 19005M; Ca x LCS	1048	3.1824	seed viability and progeny testing
7702	"	" x 19008M; Ca x (Semsch x 8-2 BYd)	542	2.1681	" "
7703	"	" x 19009M; Ca x Fu-FuS	817	2.1223	" "
7704	"	" x 19010M; Ca x RV-FuS	1632	4.1122	" "
7705	"	" x 19036M; Ca x LC-FuS	434	1.4650	" "
7706	"	56013 x 19037M; Ca x FuS-FuS	746	1.8113	" "
7707	"	" x 19040M; Ca x FuS-FuS	355	1.2734	" "
7708	"	" x 19041M; Ca x EG-XS	653	1.7580	" "
7709	"	" x 19046M;Ca x LCS-FuS	1331	4.4294	" "
7710	"	" x 19058M; Ca x EG-XS	499	2.3443	" "
7711	"	56013 x 19062M; Ca x EKG-BavS	1035	2.9820	" "
7712	"	" x 19170M; Ca x [XS x (EKG x EG-KGS)]	1103	4.5663	" "
7713	"	" x 19172M Ca x (CatsT x Fu - FuS)	634	2.8211	" "
7714	"	" x 19173M; Ca x SSp-LCS	617	2.7698	" "
7715	"	" x 21060M; Ca x [(LGpS x Fu-FuS) x EG-XS]	1057	3.5564	" "
7716	"	" x 21071M; Ca x (BG^3 x EKG-BavS)	248	0.8202	" "
7717	"	" x 21087M; Ca x Yu 3/3	2397	8.5106	" "
7718	"	" x 21130M; Ca x YC-ZS	1609	4.5070	" "
7719	"	" x 51114M; Ca x [(LhS x GCI-FuS)x(Semsch x 8-2 BYd)	2324	10.4432	" "
7720	"	" x 60013M; Ca x Arizona 1-2	928	2.2228	" "
7721	"	56013 x 60023M; Ca x Colo 1-1	1502	5.8864	" "
7722	"	" x 60026M; Ca x Colo 2-1	1593	4.5057	" "
7723	"	" x 63015M; Ca x (BG^2 x EKG-BavS)	1372	5.4596	" "
7724	"	" x 64035M: Ca x ZS	1095	5.1726	" "
7725	"	" x 64101M; Ca x XS	1440	2.4085	" "
7726	13:3	56013 x OP; Cascade x open pollinated	2064	6.2522	" "
7727	10:1	48209 x OP; Fuggle H x open pollinated	1922	5.9370	" "
7728	3:5	64100 x OP; Bullion x open pollinated	1093	4.9909	" "
7729	Notus, ID	62013 ⊗ Comet x self pollinated	541	3.3130	1 yellow leaves, presumably Comet, ♀, selfed; seed supplied by R.Rom.

UNITED STATES DEPARTMENT OF AGRICULTURE
SCIENCE AND EDUCATION ADMINISTRATION

FEDERAL RESEARCH
WESTERN REGION

Horticultural Crops Research Unit
Room 1067, Cordley Hall
Department of Botany & Plant Pathology
Oregon State University
Corvallis, Oregon 97331

May 5, 1978

Subject: Report on ELISA serological testing of hop seedlings and cultivars

To: C. E. Horner and A. Haunold

Ten populations of hop seedlings received from Al Haunold as germinating seedlings, plus four hop cultivars were tested for the presence of 1) prunus necrotic ringspot virus (Prunus strain 15B, German (Casper) antiserum) and 2) hop mosaic virus (East Malling Research Station -EMRS- antiserum) by the ELISA method.

Two young leaves were taken from each sampled hop plant in my greenhouse (21, West Range). Leaves were mixed with standard PBS, PVP, Tw20, Alb ELISA buffer 1:50 (w:v) and were homogenized in a Polytron homogenizer. Single plants were sampled for the hop cultivars; the seedlings were pooled in lots of 5, 10, and 20, as indicated on the data sheet.

In the absence of known virus-free hops (although meristemmed Wye Target has just been received from EMRS for a future standard), healthy cucumber was used as a healthy control. PNRSV15B and apple mosaic virus (Fulton ATCC), both in cucumber, were also used as reference viruses.

ELISA reactions were stopped with 3 M NaOH after 1 hr and well absorbances (2 wells per treatment) were determined with a spectrophotometer at A 405. There was good agreement between most duplicate well sets.

Twice healthy background level is often used as the breaking point to separate positive from negative reactions. On this basis, Cascade 56103 was the only hop tested that was positive for Prunus necrotic ringspot. In the case of HMV, Comet was definitely positive (A_{405} = 7.10). Healthy cucumber was .15, so values above .30 could be considered positive. Two hop seedling populations (7714 and 7718) fell into this category and should be retested on a plant by plant basis to confirm this preliminary finding. The response of hop seedlings to ApMV antiserum should also be studied.

If some 7714 seedlings are positive for HMV, we must assume that their virus levels are much lower than the level of HMV in comparable Comet leaves. If only 1 plant is HMV-infected in each batch of 5 7714 seedlings, the average A_{405} of such plants would be 2.9 (but 7.4 for 7718), compared to 7.1 for Comet. Perhaps plant age or virus strain differences could account for this discrepancy in 7714 data. More studies are needed on this point.

Sincerely yours,

R. H. Converse
Plant Pathologist, USDA
and Professor, OSU

ELISA TEST NOS. 75 and 76 READINGS FOR HOP VIRUSES

R. H. Converse SEA-FR
May 5, 1978

absorbances at A_{405}

Haunold cross or cultivar	No. plants pooled in sample	PNRSV15B			hop mosaic virus		
		1	2	Avg.	1	2	Avg.
7714 (a)	5	.37	.39	.38	.46	.41	.44
7714 (b)	5	.35	.36	.36	.71	.61	.66
7714 (c)	5	.35	.29	.32	.56	.51	.54
7714 (d)	5	.47	.38	.43	.70	.66	.68
7728	10	.27	.26	.27	.22	.21	.22
7704	10	.26	.35	.31	.22	.17	.20
7709	10	.21	.20	.21	.18	.19	.19
7722	10	.20	.18	.19	.15	.14	.15
7701	20	.33	.30	.32	.20	.19	.20
7721	20	.23	.25	.24	.24	.23	.24
7715	20	.35	.22	.29	.14	.15	.15
7729	20	.36	.46	.41	.27	.24	.26
7718	20	.37	.37	.37	.38	.35	.37
Cascade 56103 (Horner)	1	6.30	6.45	6.34	.19	.13	.16
Fuggle (Horner) ?	1	.22	.17	.20	.30	.28	.29
Comet (Horner)	1	.39	.28	.34	6.85	7.35	7.10
Wye Target (Horner)	1	.33	.34	.34	.19	.21	.20
PNRSV15B cucumber	1	9.20	--	9.2	.16	--	.16
ApMV ATCC cucumber	1	.46	--	.46	.14	--	.14
healthy cucumber	1	.32	--	.32	.15	--	.15
buffer	---	.26	.25	.26	.22	.22	.22

Notes on ELISA 78 and 79 5/9-78

*

1. Prunus necrotic ringspot virus 15B.
Cascade 56103 was strongly positive (as in a previous test). Fuggle was rated as healthy A_{405} = 0.16 and twice healthy background A_{405} = 0.32.

On that basis, cross 7714 batch d had one plant positive A_{405} = 0.41 and one borderline A_{405} = 0.32, and the rest negative. For cross 7729, all 20 individually tested seedlings were negative.

Crosses 7714 batch d and 7729 were chosen for retest because they were somewhat higher than background when bulk-tested in ELISA 75. Now 7714-d-1 requires retesting by ELISA and bioassay to determine if PNRSV has been seed-transmitted.

2. Hop mosaic virus.
Comet was strongly positive and Cascade and Fuggle were again negative (A_{405} = 0.16).

If we then assume $A_{405} \geq 0.32$ as a positive reading for HMV, 7714-d was positive (3/5 seedlings) and 7714-c was positive (4/4 seedlings). 7714 batches a and b had 1/5 positive seedlings each, a 9/24 or 38% HMV seed transmission in 7714. Cross 7718-17 was a possible positive and should be retested. Cross 7722 was negative. Clearly, the possibility that Cross 7714 is transmitting HMV to about 1/3 of the seedlings should be followed up by additional ELISA tests and by parallel bioassay on Chenopodium and Nicotiana, as outlined by Bock.

*Note: virus 15 B is not the hop strain, but the apple strain of PNRSV.

-4p

Follow-up studies of Prunus Necrotic ringspot virus (PNRSV 15B) and hop mosaic virus (HMV) in hop seedlings from Dr. Haunold
ELISA tests 78 and 79 - 5/9/78 - R. H. Converse

Hop cv. or cross (1:50 in buffer)	Plant No.	ELISA absorbance reading (A_{405}) with antiserum to PNRSV 15B (1:500, 1:500)	AV	HMV (1:1000, 1:1000)	AV
Cascade 56103	---	3.2		.17	
Comet		---		3.43	
Fuggle		.16		.14	
buffer		.09		.07	
7714 (batch d)	1	.41	.31±.08	1.06	.68±.44
	2	.32		.97	
	3	.29		.98	
	4	.23		.25	
	5	.27		.15	
7729	1	.22			
	2	.19			
	3	.13			
	4	.14			
	5	.11			
	6	.27			
	7	.09			
	8	.13			
	9	.10			
	10	.08			
	11	.18			
	12	.19			
	13	.11			
	14	.09			
	15	.06			
	16	.16			
	17	.07			
	18	.17			
	19	.16			
	20	.13	.14±.05		
7714 (batch a)	1			.33	.20±.09
	2			.20	
	3			.11	
	4			.23	
	5			.11	
7714 (batch b)	1			.16	.27±.22
	2			.29	
	3			.16	
	4			.10	
	5			.66	
7714 (batch c)	1			.71	.86±.20
	2			.67	
	3			1.02	
	4			1.04	

Follow studies cont'd.

Hop cv. or cross (1:50 in buffer)	Plant No.	ELISA absorbance reading (A_{405}) with antiserum to PNRSV 15B (1:500, 1:500) AV	HMV (1:1000, 1:1000)	AV
7718	1		.06	.11±.10
	2		.06	
	3		.05	
	4		.05	
	5		.09	
	6		---	
	7		.06	
	8		.05	
	9		.06	
	10		.07	
	11		.16	
	12		.07	
	13		.08	
	14		.05	
	15		.10	
	16		.15	
	17		.43	
	18		.26	
	19		.16	
	20		.06	
7722	1		.06	.06±.01
	2		.05	

Results of ELISA testing for apple mosaic virus (ApMV)

(East Malling serum 1:1000/1:1000) from hops (ELISA No. 86) -- R. H. Converse

Source 1:20 dilutions	A_{405} Reading 1	2	$\bar{x}$	Notes
ApMV A 74-10 in apple	.30	1.69	1.0	underline = positive
healthy apple (Marvell)	.01	.02	.02	positive > .04 appl
PNRSV 15 B cucumber	.01	.01	.01	
ApMV ATCC cucumber	.90	2.70	1.80	
healthy cucumber	.04	.01	.03	
Wye Target Meristem A hop	.02	.01	.02	+ > .04 hop
Wye Target Meristem B hop	.00	.01	.01	
buffer only	.03	.01	.02	
Fuggle w. split leaf blotch	.01	.11	.06	
Horner-field				
Cascade 56103	.46	.43	.45	
Fuggle gh 21	.01	.01	.01	
Comet gh 21	.01	.01	.01	
hop cross 7714-a	.02	.02	.02	batch of 5 plants
7714-b	.01	.08	.05	5
7714-c	.01	.01	.01	5
7714-d	.02	.01	.02	5
7728	.03	.01	.02	10
7704	.01	.01	.01	10
7709	.01	.00	.01	10
7722	.00	.00	.00	10
7701	.22	.09	.16	10
7701	.01	.01	.01	10
7721	.01	.03	.02	10
7721	.12	.01	.07	10
7715	.01	.00	.01	10
7715	.01	.00	.01	10
7729	.01	.00	.01	10
7729	.02	.01	.02	10
7718	.02	.01	.02	20

June 5, 1978.

Additional notes by Converse:

Fuggle from the field and Cascade (56013) from greenhouse 21 were infected. Three seedling populations tested as composites may contain positives.

None of the hops scored as positives by ELISA for hop mosaic or for Prunus NRSV have shown any positive symptoms one week after bioassay on Chenopodium quinoa and Nicotiana clevelandii.

Notes on ELISA 86 test for apple mosaic virus in hops 5/2/78 Converse

1. The system worked well with known apple mosaic virus (ApMV) and gave uniformly low healthy readings (A_{405} = .02) for healthy hop or apple, so that readings above 0.04 could be rated positive.

2. The following individual hop plants were positive:

	Av A_{405}
Fuggle with split leaf blotch from Horner's field	.06
Cascade 56103 gh 21	.45

3. The following composite samples were positive and will be retested as individual hop plants:

	Av A_{405}	Composite of how many plants
7714-b	.05	5
7701 (code 15)	.16	10
7721 (code 18)	.07	10

4. Fuggle, Comet, and Cascade hops in greenhouse 21 were all negative for ApMV.

maximum permissible tolerances:

40 CFR 180	PESTICIDE CHEMICAL	Cacao Beans	Coffee	Hops	Peppermint	Spearmint	SPICE CROPS: Cumin Seed	Ginger Root	Mustard Seed	Rape Seed	Sesame Seed	Other Spices See List (2)
		TOLERANCE PARTS PER MILLION										
.105	DEMETON = Systox	-	-	1.25	-	-	-	-	-	-	-	-
.111	MALATHION	-	-	1	8	8	-	-	-	-	-	-
.115	ZINEB	-	-	60	-	-	-	-	-	-	-	-
.121	PARATHION	-	-	1	-	-	-	-	0.2	0.2	-	-
.123	INORGANIC BROMIDES (METHYL BROMIDE)	50*	75*	-	-	-	100*	100*	-	-	-	-
.127	PIPERONYL BUTOXIDE	8*	-	-	-	-	-	-	-	-	-	-
.128	PYRETHRINS	1*	-	-	-	-	-	-	-	-	-	-
.130	HYDROGEN CYANIDE	25*	-	-	-	-	250*	250*	-	-	25*	150*
.140	BHC	-	-	-	-	-	-	-	-	-	-	Paprika
.142	2,4 D	-	-	0.1[N]	-	-	-	-	-	-	-	-
.144	PLICTRAN	-	-	30	-	-	-	-	-	-	-	-
.147	DDT	-	-	20 R (Fresh)	-	-	-	-	-	-	-	-
.150	DALAPON	-	2	0.2	-	-	-	-	-	-	-	-
.151	ETHYLENE OXIDE	-	-	-	-	-	50*	Whole Spices				
.153	DIAZINON	-	0.2	0.75	-	-	-	-	-	-	-	-
.163	DICOFOL = Kelthane	-	-	30	-	-	-	-	-	-	-	-
.174	TETRADIFON = Tedion	-	-	30 Fresh	100	100	-	-	-	-	-	-
.183	DISULFOTON = Disyston	0.3	0.3	0.5	-	-	-	-	-	-	-	-
.205	PARAQUAT	-	0.05[N]	0.1 / 0.5 Vines	-	-	-	-	-	-	-	-
.206	PHORATE = Thimet	-	-	0.5	-	-	-	-	-	-	-	-
.207	TRIFURALIN = Treflan	-	-	0.05[N]	-	-	-	-	-	(0.01)	-	-
.215	NALED 2/ = Dibrom	-	-	0.5	-	-	-	-	-	-	-	-
.224	GIBBERELLIC ACID	-	-	0.15[N]	-	-	-	-	-	-	-	-
.225	ALUMINUM PHOSPHIDE	0.1	0.1	-	-	-	-	-	-	-	-	-
.235	DICHLORVOS	0.5* Nonperishable packaged or bagged raw agricultural commodities containing 6% or less fat or in nonperishable bulk stored raw agricultural commodities.										
.251	MIREX	0.01[N] All raw agricultural commodities except eggs, milk, fat of cattle, goats, hogs, horses, poultry, sheep.										
.254	CARBOFURAN	-	0.1	-	-	-	-	-	-	-	-	-
.259	PROPARGITE = Omite	-	-	15	50 Mint	50 Mint	-	-	-	-	-	-
.264	THIONAZIN	-	-	-	0.1[N] Mint	0.1[N] Mint	-	-	-	-	-	-
.268	BARBAN	-	-	-	-	-	-	-	0.1[N]	-	-	-
.269	ALDICARB	-	0.1	-	(1.5)	(1.5)	-	-	-	-	-	-
.276	FORMETANATE HYDROCHLORIDE=Carzol	-	-	(150)	-	-	-	-	-	-	-	-
.281	DINOSEB= Dinotro (Dow General)	-	-	0.1[N]	-	-	-	-	-	-	-	-
.300	ETHEPHON	-	0.1[N]	-	-	-	-	-	-	-	-	-
.347	TEPP	-	-	(0.1)	-	-	-	-	-	-	-	-
.355	BENTAZON	-	-	-	-	1Mint Mint	1Min Mint					
.364	GLYPHOSATE	-	1	-	-	-	-	-	-	-	-	-
.369	DIFENZOQUAT	-	-	-	-	-	-	-	-	(0.2)	-	-
.375	MAGNESIUM PHOSPHIDE	0.1	0.1	-	-	-	-	-	-	-	-	-

(2)List of Spices

Allspice
Anise
Basil
Bay
Black Pepper
Caraway
Cassia
Celery Seed
Chili
Cinnamon
Cloves
Coriander
Dill
Mace
Marjoram
Nutmeg
Oregano
Paprika
Poppy
Red Pepper
Rosemary
Sage
Savory
Thyme
Tumeric
White Pepper

Note: some cpds, such as DDT etc. are no longer registered for use on hops.

2/ Naled has 0.5 ppm tolerance for all Raw Agricultural Commodities except as listed

Underlining indicates there are food additive tolerances, which appear in the Tolerance Chemicals section
N = Negligible Residue Tolerance
* = Post Harvest Application
() = Administrative Guidelines/Sec. 18 Crisis Exemptions
R = Restrictions for livestock feed

ACD 7/78

NORFLURAZON 80 WP / HOPS

Introduction:

The primary objective of the 1976/77 trial program was to determine whether or not past results, which were mainly obtained from small scale tests, could be confirmed with the use of grower equipment in large scale trials. This program extended throughout the major hop producing areas in the United States. Number of trials - 17.

Summary of the Results:

Phytotoxicity: no damage was observed in any trial with the normal* or double rate of norflurazon.

Weed Control: Considering the severe drought, there was generally adequate control of annual grasses and broadleaf weeds with norflurazon at the normal rate*. Good suppression of quackgrass was also obtained.

Conclusion

With the completion of this program, and with the confirming results obtained, it appears that a full label request for norflurazon in hops is in order.

*normal rate
2 lb/ac ai on coarse textured soils
3 lb/ac ai on medium textured soils
4 lb/ac ai on fine textured soils

TH,EU/dsb

3/17/78

Location and No. of Trials:

Idaho	4 trials
Oregon	6 trials
Washington	6 trials
California	1 trial

Treatments:

Norflurazon at normal, double, and in most trials three times the normal rate.

Timing of Application:

Fourteen of the seventeen trials had two application dates (fall and spring). In general, the fall applications were made after the hop yards had been worked for the last time in the fall and in time to receive the winter (October - January) rains. The spring treatments were made soon (within a week) after stringing.

Application:

Grower equipment, usually a regular "dinitro-rig", had to be changed slightly for satisfactory application. A Tee-Jet 8004 or 8006 nozzle was placed in the lowest nozzle body, and the other two nozzle bodies were plugged. The inserted nozzle tip was turned forward at an angle which would deliver a spray pattern over a 3 ft. swath. Because of numerous poles in hop yards, it may be best to mix half dose rates in the mixing tanks and operate both sides of the rig, overlapping one row on each turn.

RESULTS

Phytotoxicity:

Phytotoxic effects were observed in three trials, however symptoms were only found in plots treated in the spring with the 3n rates. Chlorosis was found only on sucker growth and in minimal amounts (< 5%).

Norflurazon apparently did not affect hop quality as measured by alpha and beta acid content (trials H 3047-104, H 3047-106, and 3047-108).

Weed Control: Tables 2 and 3

Even though the Northwest was in its most severe drought in recorded history, weed control was generally adequate. An-

nual weeds, such as, annual bluegrass (Poa annua), green and yellow foxtail (Setaria viridis and lutescens), barnyardgrass (Echinochloa crusgalli), downy brome (Bromus tectorum), chickweed (Stellaria media), common groundsel (Senecio vulgaris), shepherdspurse (Capsella bursa-pastoris), lambsquarters (Chenopodium album), pigweed (Amaranthus sp.), were readily controlled by normal rates of norflurazon (80 WP). Quackgrass (Agropyron repens), an important perennial grass weed, was suppressed in most trials.

Note:

Several researchers participated in the 1976-77 trial program.

They were: Dr. Arnold Appleby, Weed Science Dept., Oregon State University

Dr. Al Haunold, USDA, Hop Specialist, Corvallis, Oregon

Dr. Alex Ogg, Jr., Plant Physiologist, IAREC, Prosser, Washington

Dr. Marvin Montgomery, OSU, Herbicide Chemist

Mr. Ben Studer, Cooperative Extension Agent, Bonner's Ferry, Idaho.

TH,EU/dsb

3/3/78

Table 1 US FEP 27/77

MAIN PARAMETERS OF THE TRIALS

Trial No.	Location	Tested By	Variety	Age Yrs	Soil Type	Plot size /ft²	Date Applied	Soil Moisture Status	Temp °F	Weeds present at Application	Weed Stage	Paraquat lb/ai	Volume Water Gal/ac	Irrigation	Comments
3005-514	Elk Grove,CA	LRusso	n/a	Est.	M-F	300	5/20/77	Dry	50	Pigweed (RR)	Cot-1 leaf	no	50	Furrow	No phyto,no weeds to rate, disced
3012-4	Parma, ID	THolt	Cascade	-	M	300	12/9/76 4/15/77	Dry Dry	38 35	Quackgrass	Dormant Disced	no	45	Sprinkler	No phyto-5-10% chlorosis on sucker growth at 3X rate
3012-5	Parma, ID	THolt	L 8	Mature	M	300	12/9/76 4/15/77	Dry Dry	38 35	Foxtail (gr. & yl.)	Dormant Disced	no	45	Furrow	No phyto.
3012-6	Parma, ID	THolt	Cascade	-	M	300	12/9/76 4/15/77	Dry Dry	38 35		Dormant Disced	no	45	Furrow	No phyto - slight chlorosis at 3X rate.
3012-7	Bonners Ferry ID	Studer	Hallertau Tettnang	Mature	Rubson soil series	Large scale	10/27/76 4/6/77	60% FC 70% FC	60 63	Quackgrass Poa annua Shepherdspurse	Dormant Dormant	-	70	Furrow	No phyto.
3037-115	Hubbard, OR	THolt	Fuggle	12+	F	300	10/29/76 4/4/77	Moist Moist	50 45	Quackgrass	Growing Growing	1.0	46	Sprinkler	No phyto.
3037-116	Gervais, OR	THolt	Bullion	-	F	300	11/7/76 4/7/77	Moist Moist	45-50 55	Poa annua Chickweed Groundsel Quackgrass	Dormant Disced	no	50	Sprinkler	No phyto.
3037-117	Gervais, OR	THolt	Fuggle	Mature	F	300	11/7/76 4/7/77	Moist Moist	45-50 55	Quackgrass	Dormant Disced	1.0	50	Sprinkler	No phyto.

Table 1 (cont'd) US FEP 27/77

MAIN PARAMETERS OF THE TRIALS

Trial No.	Location	Tested By	Variety	Age Yrs	Soil Type	Plot size /ft^2	Date Applied	Soil Moisture Status	Temp °F	Weeds present at Application	Weed Stage	Paraquat lb/al	Volume Water Gal/ac	Irrigation	Comments
3037-118	Woodburn, OR	THolt	Fuggle	Mature	F	300	11/16/76 4/22/77	Moist Moist	55 60	Quackgrass	Growing Growing	1.0	72	Sprinkler	No phyto.
3037-119	Grants Pass, OR	Appleby	Late Cluster	Mature	Sandy loam	75	11/22/76	Moist	45	Poa annua Quackgrass Chickweed	Emerging Qug = 6" flowering	no	25	Sprinkler	No phyto, no weed ratings due to excessive cultivation
3037-120	Corvallis, OR	Appleby	6 Varieties	1-2	Silt loam	90	11/8/76 5/5/77	Dry Moist	57 63	Poa annua Sowthistle Shepherdspurse Chickweed	E.post L.post	0.5 no	12.5	Sprinkler	No phyto to these young plants
3047-104	Grandview,WA	A.Ogg	Cascade	Mature	Loam	180	11/18/76 4/12/77	Dry Dry	45 45-50	Annual weeds	Dormant	-	42	Furrow	No phyto.
3047-105	Toppenish,WA	A.Ogg	Yakima Cluster	Mature	Silt loam	300	11/18/76 4/27/77	Dry Dry	50 48	Annual weeds	Dormant Disced	no	50	Furrow	No phyto.
3047-106	Toppenish,WA	A.Ogg	Brewers Gold	Mature	Loam	300	11/18/76 4/27/77	Dry Dry	50 48	Annual weeds	Dormant	no	60	Sprinkler	No phyto, no weed ratings due to excessive cultivation.
3047-107	Moxee, WA	A.Ogg	Comet	Mature	M	300	11/18/76 4/27/77	Dry Dry	50 55	Annual weeds	Dormant Disced	no	50	Furrow	No phyto.
3047-108	Moxee, WA	A.Ogg	Cascade	Mature	M	300	11/18/76 4/27/77	Dry Dry	50 55	Barnyardgrass Pigweed	Dormant Disced	no	60	Sprinkler	No phyto.
3047-131	Grandview,WA	A.Ogg	Cascade	Mature	Loam	90	4/12/77	Dry	55	Annual weeds	Grasses up	0 0.5 1.0	100	Sprinkler	No phyto.

Table 2 US FEP 27/77

% WEED CONTROL

Trial No.	Weeds	Soil Type	Fall Application Applic. Date	Rating Date	NORFLURAZON lb/ac ai 2	3	4	6	8	9	12	16	Spring Application Applic. Date	Rating Date	NORFLURAZON lb/ac ai 2	3	4	6	8	9	12	16	Remarks
3012-4	General	M	12/9	7/15		85		85					4/15	7/15		95		100		95			
	"		"	9/2		95		95					"	9/2		100		100		100			
	Nutsedge		"	7/15		85		85					"	7/15		95		100		95			
	"		"	9/2		95		95					"	9/2		100		100		100			
	Barnyardgrass		"	9/2		95		95					"	9/2		100		100		100			
3012-5	Foxtail (gr. & yl.)	M	12/9	7/15		75		80					4/15	7/15		95		95		95			
			"	9/2		75		75					"	9/2		75*		90*		95*			*still showing
	Barnyardgrass		"	9/2		75		75					"	9/2		75		90		95+			good activity
3012-6	General	M	12/9	9/2		70		95		90			4/15	9/2		85		95		95			
	Barnyardgrass		"	7/15		85		90		95			"	7/15		95		95		95			
	Pigweed		"	7/15		85		90		95			"	7/15		95		95		95			
	"		"	9/2		60		90		90			"	9/2		75		95		100			
	Purslane		"	7/15		85		90		95			"	7/15		95		95		95			
	"		"	9/2		0		95		95			"	9/2		60		95		95			
	Foxtail		"	9/2		80		100		100			"	9/2		100		100		100			
3012-7	Quackgrass	F	10/27	5/10			20		50		60		4/6	5/10			0		10		15		
	"		"	6/14			20		50		60		"	6/14			0		10		15		
	"		"	9/13			10		30		40		"	9/13			0		0		10		
	Bluegrass		"	5/10			40		80		90		"	5/10			10		20		25		
	"		"	6/14			40		90		90		"	6/14			10		30		30		
	"		"	9/13			40		90		90		"	9/13			10		30		30		
	Shepherdspurse		"	5/10			60		90		90		"	5/10			50		60		80		
	"		"	6/14			80		90		90		"	6/14			50		60		90		
3037-115	Quackgrass	F	10/29	6/7			75		85			90	4/4	6/7			75+		75+		85	90	Fall tmts. in-
	"		"	8/9			80		85			100	"	8/9			75		80		95+	100	cluded 24 lb/ac treatment

Table 2 (cont'd) US FEP 27/77

% WEED CONTROL

Trial No.	Weeds	Soil Type	Fall Application Applic. Date	Fall Application Rating Date	Fall Application NORFLURAZON lb/ac ai 2	3	4	6	8	9	12	16	Spring Application Applic Date	Spring Application Rating Date	Spring Application NORFLURAZON lb/ac ai 2	3	4	6	8	9	12	16	Remarks
3037-116	General	F	11/7	3/15			95		100		100		4/7	5/13			60		60		90		
	"		"	5/13			95		100		100												
	Annual bluegrass		"	3/15			100		100		100		"	5/13			70		100		100		
	"		"	5/13			95		100		100												
	Chickweed		"	3/15			100		100		100		"	5/13			100		100		100		
	"		"	5/13			95		100		100												
	Groundsel		"	3/15			100		100		100		"	5/13			100		100		100		
	"		"	5/13			95		100		100												
	Quackgrass		"	3/15			70		85		100		"	5/13			50		70		75		
	"												"	6/12			50		50		95+		
	"												"	8/9			85		95		95+		
3037-117	Quackgrass	F	11/7	5/13			50		50		50		4/7	5/13			70		80		85		
	"		"	6/7			75		80		90		"	6/7			95		95		95		
	"		"	8/9			75		80		90		"	8/9			85		95+		95+		
3037-118	Quackgrass	F	11/16	6/7			75		75		75		4/22	6/7	75		85		85		100		
	"		"	8/9			0		0		50		"	8/9	0		100		100		80		
3037-120	Henbit	C	11/8	3/8	78		93		99				5/5	7/1	34		51		69				
	"		"	7/1	37		54		94														
	Chickweed		"	3/8	100		100		100														
	Annual bluegrass		"	3/8	100		100		100														
	Shepherdspurse		"	3/8	100		100		100														
	Lambsquarters		"	7/1	40		85		100				5/5	7/1	50		68		85				
	Pigweed		"	7/1	56		84		99+				"	7/1	55		75		89				
	Groundsel		"	7/1	47		73		99				"	7/1	34		51		69				
3047-104	Lambsquarters	M	11/18	5/23		85		95		99+			4/12	5/23		50		67		90			
	Pigweed		"	5/23		85		95		99+			"	5/23		25		75		80			
	"		"	9/1		70		85		95			"	9/1		80		95		98			

Table 2 (cont'd) US FEP 27/77

% WEED CONTROL

Trial No.	Weeds	Soil Type	Fall Application Applic. Date	Fall Application Rating Date	Fall Application NORFLURAZON lb/ac ai 2	3	4	6	8	9	12	16	Spring Application Applic Date	Spring Application Rating Date	Spring Application NORFLURAZON lb/ac ai 2	3	4	6	8	9	12	16	Remarks
3047-104 (cont'd)	Foxtail (gr. & yl.)	M	11/18	5/23		85		95		99+			4/12	5/23		80		-		-			
	Barnyardgrass		"	9/1		95		99		99			"	9/1		90		99		99			
	Mallow		"	9/1		85		95		99			"	9/1		90		97		99			
	Downy brome		"	5/23		0		20		50			"	5/23		10		35		50			
			"	5/23		0		25		90			"	5/23		0		15		35			
3047-105	Barnyardgrass	M	11/18	9/7		0		95		99			4/27	9/7		70		99		99			
	Pigweed		"	9/7		0		95		98			"	9/7		70		99		99			
	Field bindweed		"	9/7		0		-		-			"	9/7		0		-		-			
	Lovegrass		"	9/7		0		95		99			"	9/7		90		99		99			
	Mallow		"	9/7		0		-		-			"	9/7		0		-		-			
3047-107	Barnyardgrass	M	11/18	6/24		95		100		99			4/27	6/24		70		99		99			
	Pigweed		"	6/24		94		98		98			"	6/24		-		-		98			
3047-108	Barnyardgrass	M	11/18	9/9		90		98		98			4/27	9/9		80		95		98			
	Pigweed		"	9/9		90		95		95			"	9/9		67		90		90			
3047-131	Lambsquarters	M											4/12	9/1		95		100					
	Foxtail(gr.&yl.)												"	9/1		90		100					
	Barnyardgrass												"	9/1		100		90					
	Downy brome												"	5/23		60		80					
	Tumble mustard												"	5/23		100		100					

Table 3 US FEP 27/77

% WEED CONTROL BY SPECIES

Trial No.	Weeds	Soil Type	Fall Application Applic. Date	Fall Application Rating Date	Fall Application NORFLURAZON lb/ac ai 2	3	4	6	8	9	12	16	Spring Application Applic Date	Spring Application Rating Date	Spring Application NORFLURAZON lb/ac ai 2	3	4	6	8	9	12	16	Remarks
3012-4	General	M	12/9	7/15		85		85					4/15	7/15		95		100		95			
"	"	"	"	9/2		95		95					"	9/2		100		100		100			
3012-6	"	M	12/9	9/2		70		95		90			4/15	9/2		85		95		95			
3037-116	"	F	11/7	3/15			95		100		100		4/7	5/13			60		60		90		
"	"	"	"	5/13			95		100		100												
3012-4	Barnyardgrass	M	12/9	9/2		95		95					4/15	9/2		100		100		100			
3012-5	"	M	12/9	9/2		75		75					4/15	9/2		75		90		95			
3012-6	"	M	12/9	7/15		85		90		95			4/15	7/15		95		95		95			
3047-104	"	M	11/18	9/1		85		95		99+			4/12	9/1		90		97		99			
3047-105	"	M	11/18	9/7		0		95		99			4/27	9/7		70		99		99			
3047-107	"	M	11/18	6/24		95		100		99			4/27	6/24		70		99		99			
3047-108	"	M	11/18	9/9		90		98		98			4/27	9/9		80		95		98			
3047-131	"	M											4/12	9/1		100		90					
3012-7	Annual bluegrass	F	10/18	5/10			40		80		90		4/6	5/10			10		20		25		
"	"	"	"	6/14			40		90		90		"	6/14			10		30		30		
"	"	"	"	9/13			40		90		90		"	9/13			10		30		30		
3037-116	"	F	11/7	3/15			100		100		100		4/7	5/13			60		60		90		
"	"	"	"	5/13			95		100		100												
3037-120	"	C	11/8	3/8	100		100		100														
3047-104	Downy brome	M	11/18	5/23		0		25		90			4/12	5/23		0		15		35			
3047-131	"	M											4/12	5/23		60		80					
3047-104	Mallow	M	11/18	5/23		0		20		50			4/12	5/23		10		35		50			
3047-105	"	M	11/18	9/7		0		-		-			4/27	9/7		0		-		-			
3047-105	Field bindweed	M	11/18	9/7		0		-		-			4/27	9/7		0		-		-			

Table 3 (cont'd) US FEP 27/77

% WEED CONTROL BY SPECIES

Trial No.	Weeds	Soil Type	Fall Application Applic. Date	Rating Date	NORFLURAZON lb/ac ai 2	3	4	6	8	9	12	16	Spring Application Applic. Date	Rating Date	NORFLURAZON lb/ac ai 2	3	4	6	8	9	12	16	Remarks
3047-105	Lovegrass	M	11/18	9/7		0		95		99			4/27	9/7		90		99		99			
3047-131	Tumble mustard	M											4/12	5/23		100		100					
3037-120	Lambsquarters	C	11/8	7/1	40		85		100				5/5	7/1	50		68		85				
3047-104	"	M	11/18	5/23		85		95		99			4/12	5/23		50		67		90			
3047-131	"	M											4/12	9/1		95		100					
3012-5	Foxtail	M	12/9	7/15		75		80					4/15	7/15		95		95		95			
"	" (gr. & yl.)	"	"	9/2		75		75					"	9/2		75		90		95			
3012-6	"	M	12/9	9/2		80		100		100			4/15	9/2		100		100		100			
3047-104	" (gr. & yl.)	M	11/18	5/23		85		95		99			4/12	5/23		80		-		-			
"	" (gr. & yl.)	"	"	9/1		95		99		99			"	9/1		90		99		99			
3047-131	" (gr. & yl.)	M											4/12	9/1		90		100					
3012-4	Nutsedge	M	12/9	7/15		85		85					4/15	7/15		95		100		95			
"	"	"	"	9/2		95		95					"	9/2		100		100		100			
3012-6	Pigweed	M	12/9	7/15		85		90		95			4/15	7/15		95		95		95			
"	"	"	"	9/2		60		90		90			"	9/2		75		95		100			
3037-120	"	C	11/8	7/1	56		84		99+				5/5	7/1	55		75		89				
3047-104	"	M	11/18	5/23		85		95		99+			4/12	5/23		25		75		80			
"	"	"	"	9/1		70		85		95			"	9/1		80		95		98			
3047-105	"	M	11/18	9/7		0		95		98			4/27	9/7		70		99		99			
3047-107	"	M	11/18	6/24		94		98		98			4/27	6/24		-		-		98			
3047-108	"	M	11/18	9/9		90		95		95			4/27	9/9		67		90		90			
3012-6	Purslane	M	12/9	7/15		85		90		95			4/15	7/15		95		95		95			
"	"	"	"	9/2		0		95		95			"	9/2		60		95		95			

Table 3 (cont'd) US FEP 27/77

% WEED CONTROL BY SPECIES

Trial No.	Weeds	Soil Type	Fall Application: Applic. Date	Fall Application: Rating Date	Fall Application: NORFLURAZON lb/ac ai 2	3	4	6	8	9	12	16	Spring Application: Applic Date	Spring Application: Rating Date	Spring Application: NORFLURAZON lb/ac ai 2	3	4	6	8	9	12	16	Remarks
3037-116	Chickweed	F	11/7	3/15			100		100		100												
"	"	"	"	5/13			95		100		100		4/7	5/13			100		100		100		
3037-120	"	C	11/8	3/8	100		100		100														
3012-7	Quackgrass	F	10/27	5/10			20		50		60		4/6	5/10			0		10		15		
"	"	"	"	6/14			20		50		60		"	6/14			0		10		15		
"	"	"	"	9/13			10		30		40		"	9/13			0		0		10		
3037-115	"	F	10/29	6/7			75		85			90	4/4	6/7			75+		75+		85	90	
"	"	"	"	8/9			80		85			100	"	8/9			75		80		95+	100	
3037-116	"	F	11/7	3/15			70		85		100		4/7	5/13			50		70		75		
"	"	"											"	6/12			50		50		95+		
"	"												"	8/9			85		95		95+		
3037-117	"	F	11/7	5/13			50		50		50		4/7	5/13			70		80		85		
"	"	"	"	6/7			75		80		90		"	6/7			95		95		95		
"	"	"	"	8/9			75		80		90		"	8/9			85		95+		95+		
3037-118	"	F	11/16	6/7			75		75		75		4/22	6/7	75		85		85		100		
"	"	"	"	8/9			0		0		50		"	8/9	0		100		100		80		
3012-7	Shepherdspurse	F	10/27	5/10			60		90		90		4/6	5/10			50		60		80		
"	"	"	"	6/14			80		90		90		"	6/14			50		60		90		
3037-120	"	C	11/8	3/8	100		100		100														
3037-116	Groundsel	F	11/7	3/15			100		100		100		4/7	5/13			100		100		100		
"	"	"	"	5/13			95		100		100												
3037-120	"	C	11/8	7/1	47		73		99				5/5	7/1	34		51		69				
3037-120	Henbit	C	11/8	3/8	78		93		99														
"	"	"	"	7/1	37		54		94				5/5	7/1	34		51		69				

Department of
Agronomic Crop Science

Oregon State University

Corvallis, Oregon 97331 (503) 754-2821

June 26, 1978

MEMO TO: Al Haunold

FROM: A. P. Appleby APA

RE: Ronstar in hops

I have recently discussed with Ron Burr of Rhodia Co. the possibility of registration of Ronstar for bindweed control in hops. He has asked further questions concerning the use of Ronstar for sucker control in young hops. This might increase the potential market for the product and therefore increase the likelihood that Rhodia would approve addition of hops on the Ronstar label.

Specifically, Ron has asked for a memo indicating your observations, limited though they may be, on the use of Ronstar as a sucker control agent and any estimates of potential acreage for which this might be used. They would also be interested in any of your observations concerning toxicity of Ronstar to hops in applications made to date.

Thanks for your help.

APA:g

July 5, 1978

M E M O R A N D U M

TO: A.P. Appleby, OSU Crop Science Department
Ron Burr, Rhodia Corporation

FROM: Al Haunold, USDA hop research, Corvallis, OR

RE: Ronstar in hops

Ronstar has given excellent control of field bindweed in experimental trials at Corvallis in 1977. Admittedly, the commercial hop acreage infested with bindweed and similar weeds that might be controlled by Ronstar is rather limited, but certain growers are quite interested in a selective herbicide against such weeds.

An additional facet appeared in the initial Ronstar trials in 1977 that might be worth pursuing further. Young hop plants, perhaps 4-6 feet tall, that were treated with Ronstar showed good control of untrained suckers, whereas shoots that were trained on a string and whose shoot tip was not sprayed continued to grow unaffected. If this turns out to be the pattern for Ronstar, I foresee appreciable use of such a compound for sucker control in commercial hop yards.

Hop growers at the present time rely basically on two methods for controlling unwanted sucker growth in hop yards in the spring: 1) mechanical removal which necessitates an enormous labor force that frequently exceeds 100 persons per farm at the height of the season, or 2) chemical control. Chemicals used at the present time are Dinitro and Paraquat. Both should not be used until the hops are at least 10-12 feet tall and frequently it has been my experience, particularly with Dinitro, that hops should be near the top of the trellis before Dinitro is sprayed in the customary manner. Otherwise, injury to the vegetative shoots, particularly the epidermal layer, occurs and the shoot may be lost for the season. Paraquat appears to be somewhat less drastic in its action, but it also can cause damage to young hop shoots that are less than 8-10 feet tall.

If Ronstar could be used for suckering, I foresee an acreage in excess of 10,000 acres that could be treated at least once and perhaps two or three times during the early growing season. Hop growers are very interested in chemical suckering compounds that can be used on very young hops since they primarily rely on hand stripping at the early stages of growth.

1978 Ronstar Experiments: Yield Data
Seeded Hop Yard, East Farm
Harvested: September 20, 1978

Variety	Plot No.	Treatment	Number of plants/vines	Green weight per plot	Yield per acre[1/]	
				g		
Bullion	102	1	4/19	9200	981	
	201	1	4/20	7900	843	
	402	2	4/13	10600	1130	
	303	1	4/16	7700	821	
	101	2	4/18	8500	906	
	401	control	4/19	7000	746	
	403	1	4/19	7550	800	
	202	2	4/16	9200	981	
	301	2	4/18	9000	960	$\bar{x}$ = 908 lbs/A
	203	Control	4/20	7900	843	
	404	Control	4/21	10300	1098	
	302	Control	4/20	11200	1194	
	103	Control	4/14	8000	853	$\bar{x}$ = 997 lbs/A
Cascade	206		3/17	4800	683	
	205		3/20	5600	796	
	303		3/11	3300	469	
	107		3/14	4000	569	
	304		3/5	4400	626	
	109		3/11	3800	540	$\bar{x}$ = 614 lbs/A
	202	Control	3/13	4600	654	
	104	Control	3/20	4600	654	
	301	Control	3/14	4500	640	$\bar{x}$ = 649 lbs/A

[1/] Not corrected for number of vines/plot.

Calculation factors: 4 hill plot: 0.1066468
3 hill plot: 0.1421958

4 Replications: 1 = 2.2 + 2.2 kg/ha
2 = 8.8 kg/ ha
3 = control 0 kg/ha

Treatments 1, 2, applied June 30
3,4 applied July 21

Another experiment on July 7, 1978: Early postemergence sucker control on Cascade:
8 different treatments plus a control:
1.1 kg/ha, 1.1 + 1.1 kg/ha, 2.2 ; 2.2 + 2.2 ; 4.4; 4.4 + 4.4 ;
8.8 ; 8.8 + 8.8 kg/ha and non=treated control

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
WESTERN REGION

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

Bill Brewster
Crop Science Department
OSU.

Nov. 29, 1978.

Re: Ronstar testing in commercial Oregon Hop Yards:

The following growers are willing to cooperate in commercial evaluation of Ronstar in Oregon Hop Yards:

Roger Kerr	9015 Windsor Island Rd. Salem, OR. 97303 Tel: 116-393-3589
Ed Crosby	16826 Butteville Rd., Woodburn, OR. 97071 Tel: 981-1222

I explained to both growers that we need a total of 60 hills for a Winter, Spring, Summer application.

We would harvest the hops shortly before they begin commercial harvest in that field, bring the hops by truck to Corvallis and run them through our picker, dry them and bale samples for residue analyses.

I will talk to the Oregon Hop Commission to see how they want to handle the reimbursement to the grower for the loss of yield from the 60 hills. There should not be any problem in working something out.

Both growers stated that they have morning-glory problems in their fields and that the control of this weed alone would be worth the effort. An extra bonus-- almost beyond their expectations-- would be the early application of Ronstar for sucker control. As you know, this is a hand-operation until the hops are at least 12 - 15 ft tall, when dinitro or paraquat may be used.

Sincerely,

Alfred Haunold
Research Geneticist

cc. Dr. C. E. Horner
Dr. A.P. Appleby
Roger Kerr
Ed Crosby

1978: HOP CHEMISTRY

Handling Suggestions

for Cascade, Bullion, Brewers Gold and Comet varieties

Issued by the Hop Research Advisory Committee, which functions in cooperation with Hop Growers of America.

Researchers advise that discussions with growers, dealers and brewers, together with years of experience and recent discoveries, indicate these recommendations are valid. If followed they are beneficial in preserving the desired brewing characteristics of Cascades and in retaining the desired alpha levels in Brewers Golds, Bullions and Comets, also preventing formation of undesirable components in the four varieties.

Dry Temperature: Should not exceed 150 degrees.*

Moisture Content: Cascades require more care than most varieties to assure that they are neither overdried nor underdried. Overdrying (6% moisture or less) should be avoided to prevent shattering.* Underdrying (9% moisture or more) can lead to heavy bales and require great care in mixing before baling.

Cooling: Cascades should be cooled 12 to 24 hours before baling, with care taken in mixing prior to baling.

Bale Weight: Should be as low as feasible to retain the shape of the bale. Generally, this will be between 180 and 195 lbs. Bales should not exceed 200 lbs.

Farm Storage: Baled Cascades should be placed in cold storage as soon as possible. If held on the farm 24 to 48 hours, they should be single stacked on end with an inch or so space between bales for good ventilation.

Warehousing: At the receiving center Cascades should be provided with good ventilation (an air space on one side of each bale). Stickers or spacers should be used between layers when stacking is necessary. Stacking on ends is preferred to flat stacking.

Storage: Cascades should be put into cold storage immediately after delivery to the receiving center.

Cascade begins its mellowing process immediately after picking. For this process to take place without affecting the delicate flavor, good conditions must be provided for removal of the warmth that is naturally generated during the mellowing process.

Experience has shown that the same rules for handling Cascades may be used beneficially for handling Bullions, Brewers Golds and Comets.

*High drying temperatures result in loss of alpha and increased moisture level between the bottom and top of the hops in the kiln, making it difficult to mix adequately before baling. While hops are hot, or when they are overdried, shattering may result from dropping them from the kiln bed to the floor. Another result will be increased rupturing of glands during baling, causing formation of undesirable components.

8/17/78

Oregon State University

Department of Agricultural Chemistry

Corvallis, Oregon

Preliminary report of Certified Hop Analyses October 3, 1978.

Variety		Year	Bales	As is basis (at 8% moisture) %α	%β	HSI
Fuggle		1970-74	6,500	4.4	2.3	---
		1975	2,949	5.0	2.5	---
		1976	1,635	5.0	2.6	---
		1977	0	---	---	---
	to date	1978	2,835	4.3	2.2	.34
English		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	---
	to date	1978	11,368	8.8	4.5	.28
Cascade		1971-74	145	6.0	4.9	---
		1975	2,495	6.4	5.1	---
		1976	2,050	5.5	4.6	---
		1977	3,251	6.7	5.2	---
	to date	1978	2,930	6.3	5.1	.26
Willamette	to date	1978	70	6.0	3.9	.29
Cluster (Grants Pass)		1977	1,000	7.3	4.4	---
	to date	1978	0	0.0	0.0	0.00
Talisman (Grants Pass)		1977	1,055	8.2	4.2	---
	to date	1978	0	0.0	0.0	0.00
Columbia		1978	55	6.5	3.7	.28
Willamette		1978	70	6.0	3.9	.29

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.

Department of Agricultural Chemistry
Oregon State University
Corvallis, Oregon 97331 (503) 754-3791

March 13, 1979

Dr. Jim Benson
Branch Experiment Station
Rt. 3, Box 298
Sandpoint, ID

1978 Analysis of hops from No. Idaho

Dear Jim:

Sorry I forgot to send results of your samples.

Identification	At 8% mc %α	%β	HSI	lbs/A
Cascade	4.4	6.0	0.22	2584
Hallertau	3.6	5.0	0.22	1021
Styrian	5.4	3.1	0.24	1560

Although you waited a while before analysis, the HSI values show no loss has occurred.

Sincerely,

Gail

Gail

cc: Al Haunold

Analysis of 1978 Tettnanger: Stauffer ranch, Hubbard, OR.

harvested: Aug. 15, 1978. Sample received: Aug. 22, 1978.

Moisture: 7.40 % As is basis: alpha 5.35 dry weight basis: 5.78
beta 2.45 2.64

Hop Storage Index: 0.35

UNITED STATES DEPARTMENT OF AGRICULTURE
SCIENCE AND EDUCATION ADMINISTRATION

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

October 25, 1978

Subject: Washington plots of 21094 and 21095

To: A. Haunold copies to Horner, Skotland, Nickerson

Samples of USDA-21094 and USDA-21095 were included in a package received from Cal Skotland last week (cover letter attached). Gail has analyzed these for their most significant quality characteristics...alphas:

Table I. Analysis of USDA-21094 and USDA-21095 from Skotland. 1978.

Selection	Harv. date	Spectro. Anal. @ 8% M.C. α	β	α-ratio	HSI
21094	9/11	5.9	6.9	46	0.21
	9/18	6.6	7.2	48	0.21
	avg.	6.2	7.0	47	0.21
21095	9/11	5.1	6.7	43	0.21
	9/18	4.4	6.8	40	0.23
	avg.	4.8	6.8	41	0.22
L-1	9/ 2	4.8	3.0	62	0.37
	*	(5.9)	(3.7)	(62)	(0.25)

* Corrected for oxidation already incurred:
α_o(or β_o) = α_t(or β_t) x 1.1 log(HSI_t/0.25).

These will go into storage this week along with our regular storage trials.

1978 DM date: 21 Can test SH.

			Rating
21094:	Severe inf. 21 of 21	Disease Index 3.00	S
21095	" 20 of 20	" 3.00	S
Yak CC.	" 20 of 23	" 2.69	S

S = susceptible

I have summarized pertinent analytical records for these two selections in Table II.

Table II. Comparison of USDA-21094 and USDA-21095 at Different Locations and Years. Spectro. Anal @ 8% Moisture.

Selection	Year	α	β	α-ratio	HSI	%R	Location
21094	1975	9.5	6.4	59	0.24	83	Smith
	1976	7.7	7.2	52	0.24	68	Smith
	1977	8.3	6.8	54	0.23	n.a.	Smith
		5.8	5.7	50	0.26	n.a.	Will.
	1978	6.2	7.0	47	0.21	n.a.	Yakima
21095	1975	6.9	6.1	53	0.25	88	Smith
	1976	7.2	6.5	53	0.24	81	Smith
	1977	7.0	6.1	54	0.24	n.a.	Smith
		6.6	4.7	58	0.25	n.a.	Will.
	1978	4.8	6.8	41	0.22	n.a.	Yakima

Our first three seedless years were in the Smith Yard which has traditionally yielded high analysis plots. The 1977 results from baby plots in the Willamette Yard showed somewhat lower values for both alpha- and beta-acids. The Yakima Valley samples are also lower alpha and show the expected reduction in alpha-ratio.

On the basis of available data, I do not think Cal's samples should be distributed to brewers for evaluation. No matter how similar the quality profile of these selections are to that of Clusters, they have no future in the Yakima Valley unless their alphas are at least equivalent to Cluster.

Comparison with Cluster in Table I suggests that USDA-21094 may have alpha similar to Cluster, but judgement suggests the control may be unreliable. We have arranged for another Cluster control (commercial) but will not have results until next week.

I think Cal's plots should be continued another year but am skeptical about being able to demonstrate a substantial advantage over Cluster.

It has always seemed to me that the Mildew resistance of these selections offers a distinct advantage to the Willamette Valley, but that in Yakima Mildew resistance is less important and easily offset by lower alphas.

We will report further as additional analyses are completed.

Sam Likens

AGRICULTURAL RESEARCH SERVICE
WESTERN REGION

OF UNITED STATES
DEPARTMENT OF
AGRICULTURE

Field Crops Breeding and Production
Research Unit
Room 2080, Cordley Hall
Department of Botany and Plant
Pathology
Oregon State University
Corvallis, Oregon 97331

February 16, 1978

Dr. Shinkichi Kubo
Manager, Raw Materials Dept.
Kirin Brewery Co., Ltd.
26-1 Jingumae 6 Chome
Shibuya-Ku, Tokyo

Dear Dr. Kubo:

We have completed the analyses on the experimental hop samples referred to in my letter of November 29, 1977, to you. We plan to ship you samples from 12 experimental lines and two "control" varieties within a few days.

The two control varieties listed in the enclosed table are:

56013 = Cascade
56001 = Hallertauer m.f.

The controls were grown by us and harvested and processed in the same way as the experimental samples.

The first two samples (7003-143, 7003-243) listed in the enclosed table were grown in our "seedless" garden and should be nearly seedless. The other samples will be seeded because they were grown in our large nursery where we were making selections for the first time among both male and female genotypes.

Samples 3 through 12 in the table (7504-016 through 7507-053) are from progenies of crosses made on Cascade in 1975 and were mature plants for the first time in 1977. The males used in these crosses were chosen with the expectation that they would: 1) improve storage stability, 2) reduce cohumulone, and 3) keep the alpha:beta ratio near 1.

In addition to the samples listed in the table, we are sending a sample of high alpha selection No. 21055. We have decided that 21055 has too low yield potential to develop as a commercial variety. We are going to publish a registration paper, registering it with the Crop Science Society of America as a new genetic source of high alpha.

Dr. Haunold has already used 21055 as the female parent in a series of crosses made in 1973. The progenies from 21055 show excellent potential for high

2.

alpha and improved agronomic traits. Selections from 21055 x 5 different male plants were planted as baby hops in 1977 and will be available for evaluation as mature plants in 1978.

We hope the samples we are sending you from our 1977 experiments will be the beginning of a cooperative program between Kirin and our research program. The objective of the cooperative program will be to identify hop selections that have the potential of meeting the requirement for Kirin Beer. When promising selections are jointly identified by Kirin and ourselves, we would plan to increase these to provide larger quantities of hops for Kirin to evaluate as potential new varieties for production in the United States.

Besides the material we are sending 1977 crop samples of, we will have in the future a large number of potential candidates from various crosses that have already been made and are in various stages of agronomic evaluation in our nurseries.

We hope this program will be of mutual interest, and eventually, mutual benefit to Kirin and to the U.S. hop industry.

Sincerely,

C. E. Horner
Research Leader

Enclosure

cc:
Sam T. Likens
Alfred Haunold

Lab Report
Likens and Nickerson
February 13, 1978

EVALUATION OF CASCADE-TYPES BY KIRIN

Dr. Kubo from Kirin Breweries visited here last August and surveyed the hop yard. He expressed special interest in the crosses on Cascade (7504-7507) and asked that samples be sent him for evaluation by their group.

Bale samples were prepared from machine-harvested samples of 33 genotypes from these crosses. According to Al's notes, 10 of these indicated satisfactory yields in combination with alphas over 6%. In addition, 2 genotypes from the 7003 cross (65009 x 19046 M) were thought to be of possible interest to Kirin.

Accordingly, complete analysis were run on these 12 genotypes plus Cascade. A 5-cone sample of Halltertau m.f. was also included as a reference. Methods and notes are given in the footnote of the attached Table.

DISCUSSION

Three genotypes stand out as having combination of presumably desirable quality traits. 7003-143 has a good alpha level (7-9%), with an α-ratio near 50, good storage so far this year and near Fuggle last year. The cofraction is near Cascade; the oil content is not high and myrcene is the lowest found in the group. Although it does not contain farnesine, it has the highest β-caryophyllene and humulene contents.

Genotypes 7504-130 and 7504-151 had high α-acids (8-9%) in combination with acceptable storage stabilities. They had cofractions (13-14%) much lower than Cascade (26-28%) and near Ha m.f. (11%). Their myrcene contents were mid-range of those tested.

All samples except 7003-143 and 7003-243 are seeded, an undesirable property in Kirin's view. Al suggests they be informed of this and asked to try to evaluate "around" the seeded condition. Al and I also feel that all 12 genotypes plus Cascade should be sent to them and that we try to correlate their evaluations with combinations of chemical characteristics.

Distribution

Likens	Haunold	Romanko
Nickerson	Horner (2)	Zimmermann

SAMPLES SELECTED FOR POSSIBLE KIRIN EVALUATION
(1977 Crop. Analyses Completed February, 1978)

Ident.	Type	% α	% β	α-R	HSI_o	HSI_3	% R	CoF	% Oil	Oil Composition % Myr	% β-C	% Far	% Hum	Lab ser. no.	Remarks
7003-143	B	7.1	7.2	49	0.25	0.38✓	80	28	1.2	54	11	0	29	1071	Will.
(Smith)	B	9.1	7.4	54	0.25	--	--	--	--					931	Sm.
7003-243	B	6.5	6.7	49	0.27	0.36✓	82	41	1.3	60	9	0	24	974	Will.
(Smith)	B	9.4	7.5	54	0.25	--	--	--	--					932	Sm.
7504-016	B	7.3	3.3	69	0.28	0.54	65	--	1.5	86	2	5	3	1061	
	C	8.3	3.9	68	0.24	--	--	27	--	--				12	
7504-130	B	9.4	4.2	68	0.27	0.39✓	79	--	1.4	74	3	7	4	1043	
	C	9.3	4.0	69	0.24	--	--	14	--	--				386	
7504-151	B	8.3	4.3	66	0.31	0.41✓	77	--	2.1	74	5	2	14	1060	
	C	7.6	4.8	61	0.26	--	--	13	--	--				388	
7506-006	B	7.9	3.2	70	0.31	0.43	75	--	1.8	85	2	2	8	1073	1/2 lb avail.
	C	7.7	2.9	72	0.28	--	--	19	--	--				102	
7506-008	B	8.6	5.8	59	0.28	0.46	72	--	1.6	78	2	4	11	1067	1/2 lb avail.
	C	8.5	6.3	58	0.26	--	--	14	--	--				104	
7506-111	B	8.9	4.4	66	0.28	0.39✓	79✓	--	1.1	77	3	3	13	1064	
	C	10.3	5.4	65	0.25	--	--	31(32)	--	--				154	
7506-179	B	9.4	4.0	70	0.28	0.58	62	--	1.8	70	3	5	14	1076	
	C	9.7	4.4	69	0.26	--	--	34	--	--				279	
7506-234	B	9.3	4.2	63	0.27	0.63	58	--	1.4	62	4	9	18	1047	1/4 lb. avail.
	C	8.4	3.8	69	0.27	--	--	18	--	--				298	
7506-253	B	8.4	4.6	64	0.28	0.58	62	--	1.9	77	3	1	13	1062	
	C	7.8	4.4	64	0.32	--	--	15	--	--				308	
7507-053	B	8.5	5.5	60	0.28	0.68	47	--	1.3	83	2	3	9	1057	
	C	8.1	5.3	60	0.22	--	--	23	--	--				242	
56013 Case.	B	5.3	4.5	53	0.30	0.59	61	--	1.1	85	1	2	6	1077	
	C	4.7	4.3	52	0.31	--	--	26	--					410	
56001 Hallert.	C	5.6	4.3	57	0.26	--	--	11	1.4					408	oil from 1976

Notes: 1. All samples except 7003-143 and 7003-144 are seeded samples from the main yard. 2. B = 450 g bale samples; C = 5-cone samples. Both from same plants. 3. Analyses for α- and β-acids by ASBC spectrophotometric analysis. Bale results calculated to 8% moisture; cone sample results on as-is basis. 4. α-R = Alpha-ratio = $100\alpha/(\alpha+\beta)$. 5. HSI_o = Hop Storage Index at time of initial analysis; HSI_3 = index after 3 months at 22°C. These will be measured again after 6 months storage. 6. % R = the $\%(\alpha+\beta)$ remaining after 3 months storage. Calculated by: $\% R = 1 - \log(HSI_3/0.24)$. 7. CoF = estimate of cohumulone ratio by direct pyrolysis of lupulin. % oil = ml oil/100 g. By hydrodistillation. 9. Myr = myrcene; β-caryophyllene; Far = farnesine; Hum = humulene. Each in % of total oil. Determined by gas chromatography on a 1/8 in x 25 ft column packed with 8% FFAP and programmed from 80° to 190° at 1°/min.

Experimental Hop Yard: J. I. Haas Yakima, WA

HIGH ALPHA VARIETY TEST PLOTS

October, 1977 Results

April, 1978 Results

Variety	% Moisture	October % Alpha	April %Alpha	October % Beta	April % Beta	Oct HSI	April HSI
7--3-243	7.2	5.4	4.2	5.9	3.7	0.258	.450
7004-03	<7.0	6.7	5.4	4.4	2.8	0.258	.466
7005-70	7.0	8.2	6.4	5.9	4.0	0.280	.509
7005-72	7.7	8.5	7.1	6.2	5.2	0.233	.335
7005-87	<7.0	6.4	4.6	3.6	1.6	0.255	.512
7005-182	7.1	7.5	4.5	5.0	3.5	0.252	.375
7005-201	<7.0	8.1	5.1	6.2	3.6	0.227	.538
7005-205	7.2	11.6	8.3	6.1	3.6	0.230	.437
7005-232	7.0	8.2	7.2	5.2	4.2	0.257	.366
7006-61	7.7	5.0	4.2	2.2	2.2	0.293	.428
7006-74	7.0	8.8	8.2	4.7	4.0	0.252	.397
7006-96	7.9	7.5	4.0	6.0	3.7	0.232	.551
7006-194 = 2193	<7.0	10.8	9.3	4.6	3.4	0.288	.414
7006-206	<7.0	10.6	8.2	4.9	3.3	0.281	.512
7006-230	7.0	3.7		2.9		0.325	
7006-302	<7.0	8.3	6.0	5.0	3.0	0.263	.566
7006-311 = 2194	<7.0	10.2	7.4	5.0	2.8	0.246	.549
7006-339	<7.0	8.7		8.4		0.23	
7006-356	<7.0	10.2	7.8	8.9	6.5	0.236	.339
7006-382	<7.0	5.1	4.6	3.8	3.5	0.309	.404
7006-392	8.0	9.4	6.8	5.7	4.1	0.244	.446
7006-408 = 2195	<7.0	8.5	7.0	5.2	4.0	0.263	.382
7006-445	<7.0	7.9	6.4	5.8	4.3	0.278	.472
7006-450	<7.0	9.6	6.1	5.4	3.0	0.247	.587
7007-162	<7.0	8.0	6.8	5.8	4.8	0.239	.412
7007-206	12.6	7.1		5.4		0.253	
7007-339	<7.0	11.2	9.1	6.1	4.9	0.274	.396
Brewers Gold	7.2	5.0	3.5	4.1	2.7	0.247	.541
Bullion	<7.0	7.0	5.8	4.9	4.0	0.257	.416
Bullion VF	<7.0	8.0	4.9	4.8	3.8	0.258	.396
Bullion VI	7.3	6.4	5.4	4.7	4.0	0.241	.397
Cascade	9.8	2.7	1.8	6.0	3.8	0.212	.557
Cascade VF	<7.0	2.2	1.6	5.1	3.0	0.252	.614
Cascade VI	<7.0	2.1	1.3	4.9	2.7	0.235	.682
Early Cluster	<7.0	5.1		5.1		0.23	
E-2 Cluster	<7.0	4.7	4.0	4.5	4.2	0.25	.311
E-2 VF	<7.0	4.7	3.7	4.4	4.0	0.25	.364
E-2 VI	<7.0	4.0		4.1		0.24	
Late Cluster	7.1	2.4		3.7		0.212	
L-1 Cluster	<7.0	5.4	3.9	4.5	4.3	0.267	.350
L-8 Cluster	7.0	3.5	3.4	4.3	4.2	0.251	.338
Comet	7.1	4.9	2.9	4.4	2.2	0.261	.718
Fuggle	7.0	4.8	4.3	3.4	2.9	0.28	.365
Talisman	<7.0	5.3	4.7	4.2	3.6	0.222	.387

JOHN I. HAAS, INC. January 5, 1979

Variety	% Moisture	% Alpha 1978	% Alpha 1977	% Beta	HSI	
7003-243 = 21181	7.4	7.2	(5.4)	7.0	.228	
7004-03	7.6	10.4	(6.7)	5.4	.245	
7005-70	7.0	6.1	(8.2)	8.4	.263	
72	7.8	10.6	(8.5)	7.7	.221	
87	7.1	5.1	(6.4)	3.2	.265	
182	<7.0	7.9	(7.5)	5.1	.261	
194 = 21193	7.0	14.9	(10.8)	5.6	.240	good storage
201	7.1	7.5	(8.1)	5.9	.241	
232	13.5	7.4	(8.2)	4.0	.258	
7006-61	7.1	6.6	(5.0)	2.4	.303	
96	7.9	5.9	(7.5)	6.2	.262	
296	7.1	10.9		6.0	.250	
302	7.0	9.0	(8.3)	5.6	.263	
311 = 21194	7.0	12.1	(10.2)	3.5	.252	g. storage
339	<7.0	12.5	(8.7)	6.7	.260	
356	7.2	9.4	(10.2)	8.1	.266	
382	7.0	8.5	(5.1)	4.5	.294	
392	7.1	8.9	(9.4)	8.3	.259	
408 = 21195	7.2	12.3	(8.5)	4.9	.277	g. storage
445	8.9	7.0	(7.9)	3.2	.276	
450	<7.0	7.2	(9.6)	5.1	.268	
7007-206	7.1	6.8	(7.1)	5.8	.282	
339	7.2	9.9	(11.2)	6.9	.267	
Fuggle	7.1	2.2	(4.8)	2.6	.351	

JOHN I. HAAS, INC. January 5, 1979

Variety	% Moisture	% Alpha 1978	% Alpha 1977	% Beta	HSI
Cascade	7.6	3.5	(2.7)	6.0	.239
Cascade VI	<7.0	4.4	(2.1)	4.3	.318
Cascade VF	7.2	5.2	(2.2)	6.9	.257
Bullion	7.1	5.6	(7.0)	5.3	.278
Bullion VI	11.0	5.4	(6.4)	4.8	.251
Bullion VF	7.1	6.5	(8.0)	6.0	.243
L1 Cluster	7.5	4.9	(5.4)	4.5	.263
Early Cluster	7.0	5.3	(5.1)	5.3	.244
E2 Cluster	7.0	4.4	(4.7)	4.2	.307
E2 VI	<7.0	3.9	(4.0)	4.1	.275
E2 VF	<7.0	4.1	(4.7)	4.0	.282
Late Cluster	7.1	4.0	(2.4)	4.0	.272
L-8	7.1	4.7	(3.5)	4.5	.262
Brewers Gold	7.0	4.2	(5.0)	4.1	.283
Talisman	<7.0	4.6	(5.3)	3.5	.261
Comet	7.0	8.6	(4.9)	5.1	.252

Department of Agricultural Chemistry
Oregon State University
Corvallis, Oregon 97331 (503) 754-3791

Sample Identification: Washington Enriched Cascade Pellets
Dec. 1, 1978, I 518, Contract #78-6F2-4368
TTWMB (TAIWAN)

Moisture Content: 5.95%

	On Dry Weight Basis
CV (Conductometric Value)	10.2%
% α-acids (Spectro.)	10.0%
% β-acids (Spectro.)	12.3%
Hop Storage Index	0.286
Soft Resins	29.4%
Hard Resins	3.7%
Total Resins	33.1%
Oil Content (ml oil/100g hops)	1.57%

Cogeners of α-acid (NMR)

Cohumulone	29
Adhumulone	9
Humulone	62

Hop Oil Composition (Major peaks)

Myrcene	78.1
Methylbutylisobutyrate	1.5
Caryophyllene	3.2
✓ Farnesene	3.1
Humulene	10.9

Analyzed by [illegible], December 12, 1978
Gail Nickerson, Chemist

xc: Dr. V. H. Freed
Department Head

Distribution: Horner
Haunold
Nickerson
Zimmermann

LAB REPORT
Nov. 30, 1978
Likens and Nickerson

HOP OIL AS SOURCE FOR BOLL WEEVIL PHEROMONES

On Nov. 21 I received a call from

Dr. Paul Hedin, USDA
P. O. Box 5367
Mississippi State, Mississippi 39762

who said that his group had tentatively identified caryophyllene and humulene alcohols as pheromones associated with the female boll weevil and that these occurred in the approximate proportion of 1:2.

He had remembered that Ron Buttery had identified caryophyllene and humulene as constituents of hop oil and subsequently got a sample of oil from Ron, presumably as a source from which the alcohols could be prepared. Apparently the oil served his purpose and he now wanted more oil...first a relatively small amount, but later he may want a larger supply for use in field trials. I offered to composite some samples of Brewers Gold oil from 1973 for his use provided the oil still appeared to be in satisfactory condition.

Regarding the possibility of obtaining a larger quantity at some future date, I checked with Bert Grant at S. S. Steiner Inc. in Yakima. Bert said he had some hop oil on hand from the 1978 crop, possibly 1 to 3 gallons. He also made a tentative price quote of about $1.00/ml. Moreover, he sent three 1-ml samples for our appraisal.

We composited eleven of the 1973 Brewers Gold samples and obtained about 50 ml. The samples had been sealed in glass ampoules since distillation and stored at room temperature out of direct sunlight. The viscosity of the oil had increased significantly (to about that of thin syrup) and we anticipated that it was a result of polymerization of myrcene and possibly the sesquiterpenes.

Consequently, we ran G.C. profiles on a single sample and the composited sample of the Brewers Gold oil and on each of the three samples from Bert Grant. Results are summarized in Table I and G.C. profiles are appended.

Surprisingly, the myrcene and sesquiterpene contents of the stored samples (LL 49-73 and LL Comp-73) are typical for fresh Brewers Gold.

One microliter of oil was chromatographed in each case which allows direct comparison of total integrator counts as indications of volatility of the oils. (A low number of integrator counts would indicate that a part of the oil had polymerized and deposited in the injection chamber of the G.C., thus producing no counts at the detector.) Total counts for the three fresh oils, however, ranged from 964 x 10^4 to 1349 x 10^4 and the 1973 oils fell into this range. Visual examination of the profiles shows the composited sample to be normal. We conclude that the composited sample is analytically normal and that re-distillation would be of little value. We have no idea of the cause of the increased viscosity.

The composited sample was chromatographed to three hours to include the area at which sesquiterpene oxides elute. One peak, at 164.29 minutes, is possibly humulene epoxide and amounts only to 1.2% of the total oil, further indicating the lack of substantial deterioration.

Commercial oils showed normal profiles but two, SSS78-G and SSS78-F, had lower myrcene content and higher sesquiterpene content. These would likely be more satisfactory for Dr. Hedin's purpose.

Table I GC Analysis of Selected Hop Oils

Identification	%myr.	%MeBIB	%cary.	% hum	all others	Total Counts
LL 49-73	83	2	4	8	3	1331
LL Comp-73	81	3	4	8	4	1087
SSS78-G	62	9	6	17	6	993
SSS78-F ✓	77	2	5	15	1	964
SSS78-RX	87	3	2	6	2	1349

Identifications: LL49-73 = Ser. no. 49, Commercial Brewers Gold, 1973

LL Comp-73 = Composite of 11 samples of commercial BG, 1973

SSS78 G = Sample from Bert Grant (SS Steiner). Recd. 11/21/78

SSS78-F = do

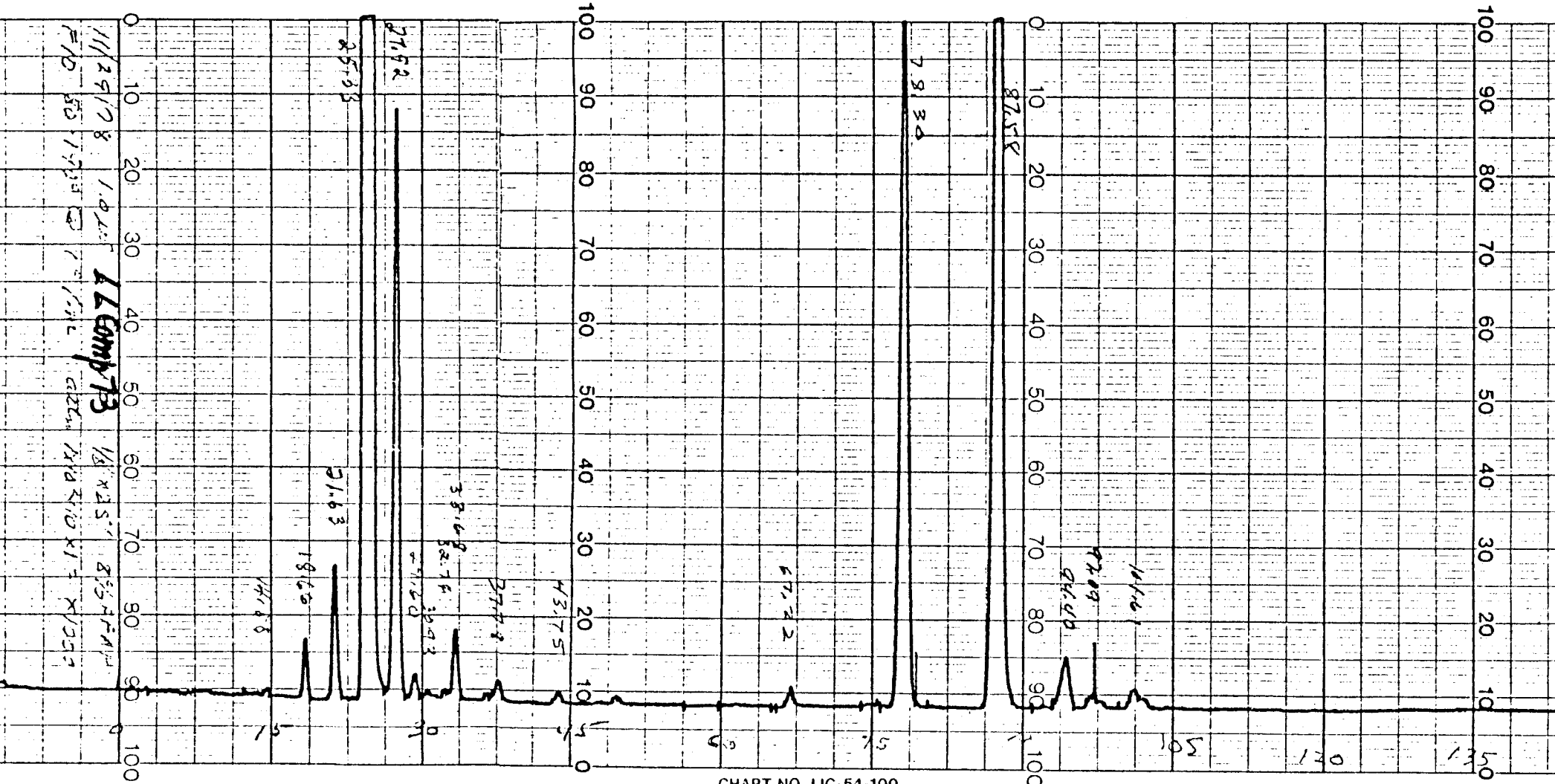
SSS78-RX = do

LL samples: 250 g Brewers Gold steam distilled from 5 liter water according to Wright and Connery, Proc. Am. Soc. Brewing Chemists, 1951. SSS samples: preparation unknown.

GC Conditions: 1.0 µl sample. 1/8" x 25' aluminum columns packed with 8% FFAP. FID programmed 80°-180°C at 1°/min. Atten: X1000. Chart speed, 4in/hr.

myr = myrcene
MeBIB = methyl/butyl/isobutyrate
cary = caryophyllene
hum = humulene

Sample LL Comp. 73



Sample 78-F

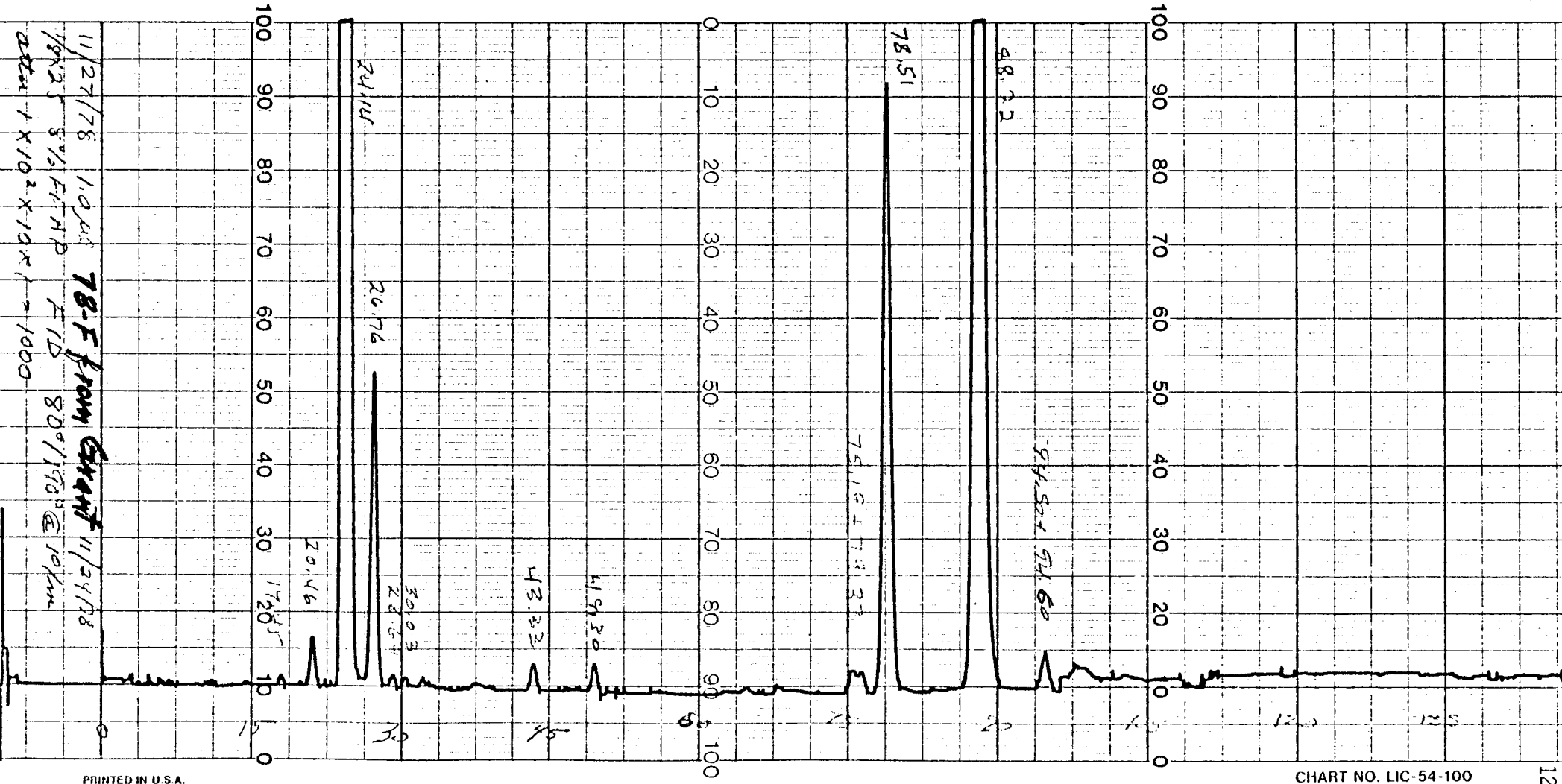


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CHART NO. LIC-54-100

126

Sample 78-G

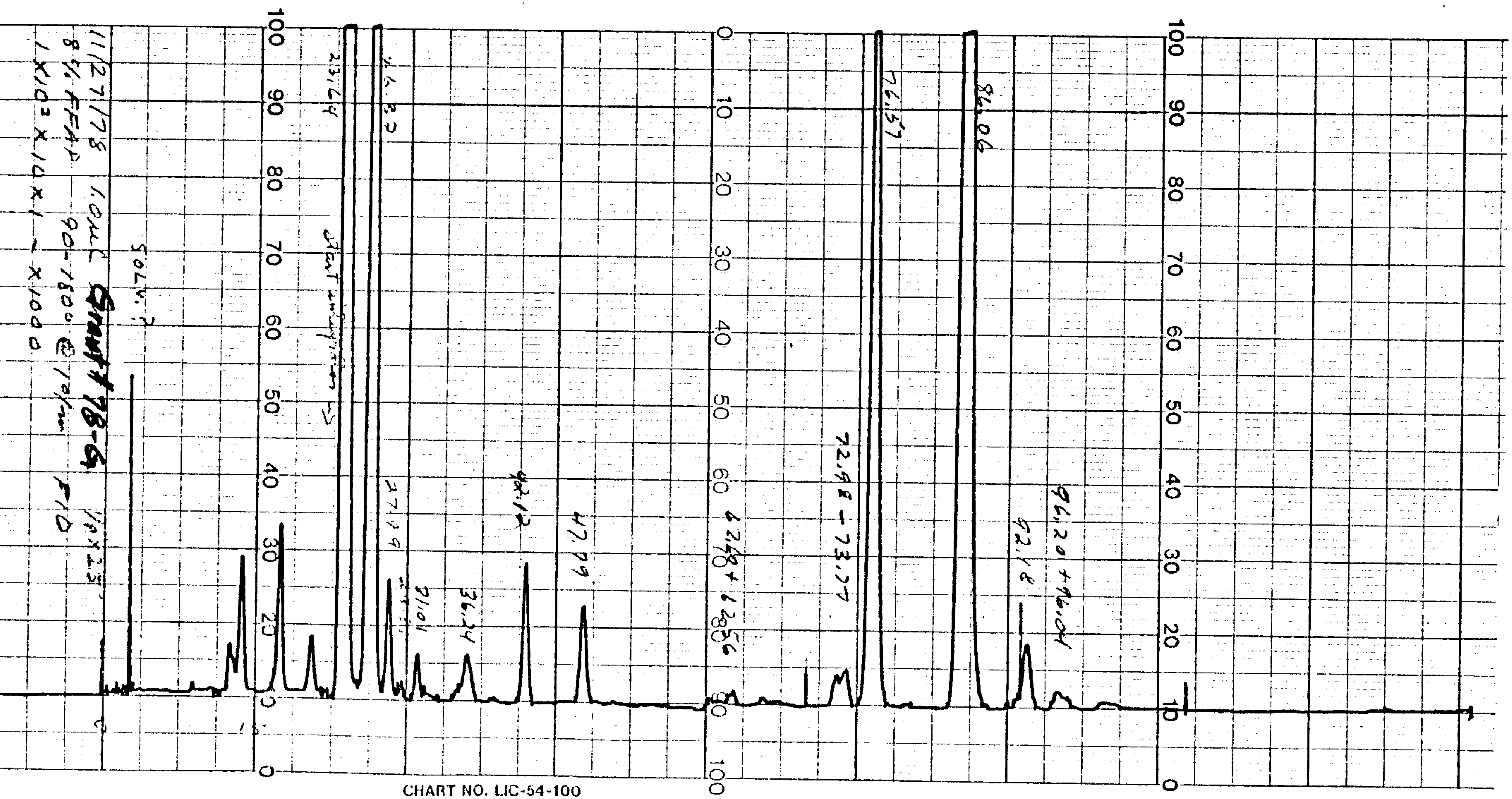

CHART NO. LIC-54-100
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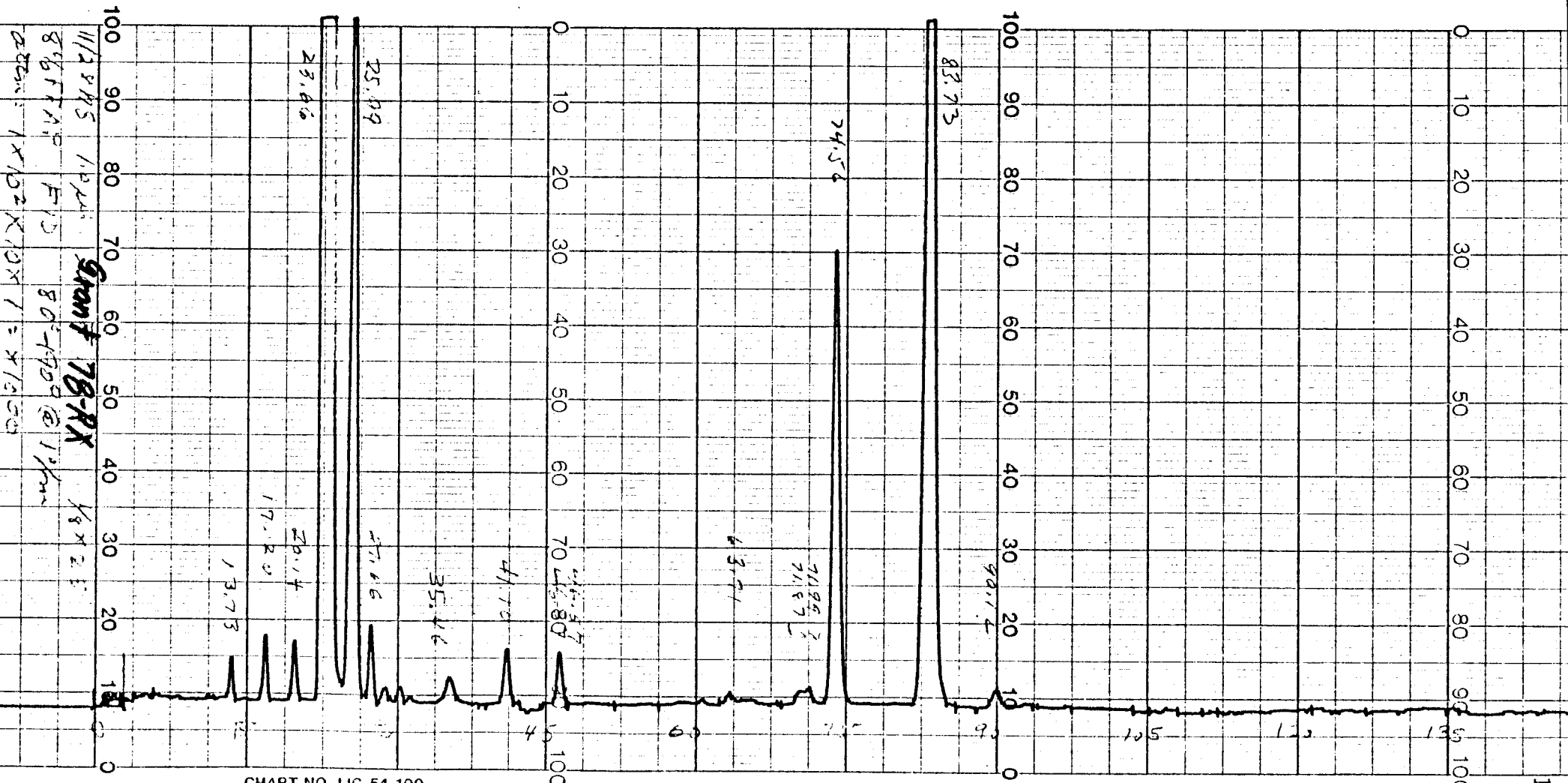
23.64
26.37
76.57
86.06
72.98 - 73.77
47.79
36.24
92.18

Sample 78-Rx



FEBRUARY 15, 1979

(1)

Summary: 5-CONE ANALYSES

CROSS 7601, 1978 CHEMICAL ANALYSES

TRAIT	NON-ZERO ITEMS	MEAN	RANGE MINIMUM	RANGE MAXIMUM	STANDARD DEVIATION	% COEFF OF VARIATION	SUM OF ITEMS	SUM OF ITEMS SQUARED
LBAAC	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00
ALPHA	30	6.78	2.92	13.05	2.7605	40.7	203.28	1598.41
BETA	30	2.67	1.38	4.31	.8424	31.6	79.98	233.80
RATIO	30	69.97	50.00	84.00	8.1642	11.7	2099.00	148793.00
SUM	30	9.44	4.97	16.62	3.2200	34.1	283.26	2975.22
HSI	30	.29	.23	.39	.0397	13.6	8.78	2.62
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
OIL	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
YIELD	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00

CROSS 7602, 1978 CHEMICAL ANALYSES

TRAIT	NON-ZERO ITEMS	MEAN	RANGE MINIMUM	RANGE MAXIMUM	STANDARD DEVIATION	% COEFF OF VARIATION	SUM OF ITEMS	SUM OF ITEMS SQUARED
LBAAC	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00
ALPHA	30	6.68	3.32	10.73	2.0696	31.0	200.28	1461.29
BETA	30	2.66	.87	4.97	1.0117	38.0	79.84	242.16
RATIO	30	71.23	49.00	86.00	6.1906	8.7	2137.00	153337.00
SUM	30	9.34	4.67	14.92	2.8709	30.7	280.12	2854.60
HSI	30	.30	.25	.42	.0363	12.3	8.87	2.66
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
OIL	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
YIELD	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00

CROSS 7603, 1978 CHEMICAL ANALYSES

TRAIT	NON-ZERO ITEMS	MEAN	RANGE MINIMUM	RANGE MAXIMUM	STANDARD DEVIATION	% COEFF OF VARIATION	SUM OF ITEMS	SUM OF ITEMS SQUARED
LBAAC	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00
ALPHA	28	6.57	3.14	10.86	1.8794	28.6	183.99	1304.38
BETA	28	2.38	1.09	4.37	.7993	33.6	66.60	175.66
RATIO	28	72.79	61.00	88.00	5.5133	7.6	2038.00	149158.00
SUM	28	8.95	4.56	13.91	2.3908	26.7	250.59	2397.03
HSI	28	.33	.28	.38	.0269	8.3	9.10	2.98
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
OIL	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
YIELD	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00

CROSS 7604, 1978 CHEMICAL ANALYSES

TRAIT	NON-ZERO ITEMS	MEAN	RANGE MINIMUM	RANGE MAXIMUM	STANDARD DEVIATION	% COEFF OF VARIATION	SUM OF ITEMS	SUM OF ITEMS SQUARED
LBAAC	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00
ALPHA	29	7.37	2.45	11.46	2.3171	31.4	213.72	1725.38
BETA	29	2.74	1.18	4.60	.9781	35.7	79.52	244.83
RATIO	29	72.07	60.00	83.00	6.4804	9.0	2090.00	151800.00
SUM	29	10.11	3.92	14.60	2.9475	29.1	293.24	3208.42
HSI	29	.29	.25	.38	.0341	11.7	8.46	2.50
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
OIL	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
YIELD	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00

CROSS 7605, 1978 CHEMICAL ANALYSES

TRAIT	NON-ZERO ITEMS	MEAN	RANGE MINIMUM	RANGE MAXIMUM	STANDARD DEVIATION	% COEFF OF VARIATION	SUM OF ITEMS	SUM OF ITEMS SQUARED
LBAAC	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00
ALPHA	55	6.90	2.11	12.44	2.4163	35.0	379.45	2933.13
BETA	55	2.92	.71	6.65	1.3422	46.0	160.35	564.77
RATIO	55	70.31	53.00	82.00	6.4775	9.2	3867.00	274151.00
SUM	55	9.81	2.82	17.35	3.5072	35.7	539.80	5962.13
HSI	55	.31	.24	.44	.0402	13.2	16.78	5.21
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
OIL	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
YIELD	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00

CROSS 7606, 1978 CHEMICAL ANALYSES

TRAIT	NON-ZERO ITEMS	MEAN	RANGE MINIMUM	RANGE MAXIMUM	STANDARD DEVIATION	% COEFF OF VARIATION	SUM OF ITEMS	SUM OF ITEMS SQUARED
LBAAC	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00
ALPHA	36	7.76	3.98	12.82	2.1702	27.9	279.54	2335.47
BETA	36	2.63	1.25	5.52	1.0022	38.1	94.64	283.95
RATIO	36	74.53	63.00	83.00	4.8254	6.5	2683.00	200773.00
SUM	36	10.39	5.23	18.24	2.9814	28.7	374.18	4200.28
HSI	36	.31	.16	.47	.0509	16.3	11.20	3.57
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
OIL	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
YIELD	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00

FEB 15 [illegible]

(3)

CROSS 7607, 1978 CHEMICAL ANALYSES

TRAIT	NON-ZERO ITEMS	MEAN	RANGE MINIMUM	RANGE MAXIMUM	STANDARD DEVIATION	% COEFF OF VARIATION	SUM OF ITEMS	SUM OF ITEMS SQUARED
LBAAC	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00
ALPHA	4	6.00	4.68	7.45	1.2642	21.1	23.98	148.55
BETA	4	2.05	1.70	2.59	.4157	20.3	8.21	17.37
RATIO	4	74.00	72.00	75.00	1.4142	1.9	296.00	21910.00
SUM	4	8.05	6.43	10.04	1.6683	20.7	32.19	267.40
HSI	4	.34	.31	.36	.0208	6.2	1.34	.45
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
OIL	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
YIELD	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00

CROSS 7608, 1978 CHEMICAL ANALYSES

TRAIT	NON-ZERO ITEMS	MEAN	RANGE MINIMUM	RANGE MAXIMUM	STANDARD DEVIATION	% COEFF OF VARIATION	SUM OF ITEMS	SUM OF ITEMS SQUARED
LBAAC	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00
ALPHA	2	4.16	2.19	6.13	2.7860	67.0	8.32	42.37
BETA	2	2.48	1.87	3.09	.8627	34.8	4.96	13.05
RATIO	2	58.50	41.00	76.00	24.7487	42.3	117.00	7457.00
SUM	2	6.64	5.28	8.00	1.9233	29.0	13.28	91.88
HSI	2	.35	.33	.37	.0283	8.1	.70	.25
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
OIL	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
YIELD	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00

CROSS 7609 - ONLY ONE SAMPLE

CROSS 7610, 1978 CHEMICAL ANALYSES

TRAIT	NON-ZERO ITEMS	MEAN	RANGE MINIMUM	RANGE MAXIMUM	STANDARD DEVIATION	% COEFF OF VARIATION	SUM OF ITEMS	SUM OF ITEMS SQUARED
LBAAC	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00
ALPHA	42	7.97	3.31	12.05	1.9400	24.3	334.76	2822.51
BETA	42	2.64	1.00	3.99	.8345	31.6	110.90	321.38
RATIO	42	74.88	62.00	84.00	4.2150	5.6	3145.00	236229.00
SUM	42	10.61	4.32	15.77	2.6286	24.8	445.66	5012.17
HSI	42	.31	.26	.40	.0307	10.0	12.90	4.00
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
OIL	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
YIELD	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00

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CROSS 7611, 1978 CHEMICAL ANALYSES

TRAIT	NON-ZERO ITEMS	MEAN	RANGE MINIMUM	RANGE MAXIMUM	STANDARD DEVIATION	% COEFF OF VARIATION	SUM OF ITEMS	SUM OF ITEMS SQUARED
LBAAC	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00
ALPHA	41	8.37	3.78	14.27	2.9701	35.5	343.26	3226.70
BETA	41	2.67	1.07	5.51	.9979	37.3	109.56	332.60
RATIO	41	75.20	63.00	87.00	4.3429	5.8	3083.00	232581.00
SUM	41	11.04	4.98	18.23	3.7882	34.3	452.82	5575.15
HSI	41	.30	.18	.39	.0399	13.5	12.14	3.66
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
OIL	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
YIELD	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00

CROSS 7612, 1978 CHEMICAL ANALYSES

TRAIT	NON-ZERO ITEMS	MEAN	RANGE MINIMUM	RANGE MAXIMUM	STANDARD DEVIATION	% COEFF OF VARIATION	SUM OF ITEMS	SUM OF ITEMS SQUARED
LBAAC	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00
ALPHA	17	8.12	4.51	11.67	2.1619	26.6	138.06	1195.99
BETA	17	2.89	1.27	4.18	1.0104	34.9	49.19	158.67
RATIO	17	73.65	60.00	79.00	4.7426	6.4	1252.00	92566.00
SUM	17	11.01	5.78	15.66	3.0031	27.3	187.25	2206.80
HSI	17	.30	.26	.41	.0417	14.1	5.03	1.52
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
OIL	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
YIELD	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00

CROSS 7613, 1978 CHEMICAL ANALYSES

TRAIT	NON-ZERO ITEMS	MEAN	RANGE MINIMUM	RANGE MAXIMUM	STANDARD DEVIATION	% COEFF OF VARIATION	SUM OF ITEMS	SUM OF ITEMS SQUARED
LBAAC	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00
ALPHA	31	6.96	1.65	11.06	2.2795	32.7	215.90	1659.53
BETA	31	2.44	.63	4.13	.9313	38.2	75.60	210.38
RATIO	31	73.61	62.00	82.00	4.8005	6.5	2282.00	168676.00
SUM	31	9.40	2.28	14.00	3.0233	32.2	291.50	3015.25
HSI	31	.28	.19	.43	.0510	18.2	8.67	2.50
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
OIL	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
YIELD	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00

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CROSS 7614, 1978 CHEMICAL ANALYSES

TRAIT	NON-ZERO ITEMS	MEAN	RANGE MINIMUM	RANGE MAXIMUM	STANDARD DEVIATION	% COEFF OF VARIATION	SUM OF ITEMS	SUM OF ITEMS SQUARED
LBAAC	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00
ALPHA	29	7.60	3.48	15.82	2.9089	38.3	220.40	1911.97
BETA	29	2.53	1.00	5.62	.9457	37.4	73.30	210.31
RATIO	29	74.17	59.00	81.00	4.8482	6.5	2151.00	160203.00
SUM	29	10.13	4.76	21.44	3.7336	36.9	293.70	3364.78
HSI	29	.30	.26	.41	.0384	12.7	8.75	2.68
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
OIL	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
YIELD	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00

CROSS 7616, 1978 CHEMICAL ANALYSIS

TRAIT	NON-ZERO ITEMS	MEAN	RANGE MINIMUM	RANGE MAXIMUM	STANDARD DEVIATION	% COEFF OF VARIATION	SUM OF ITEMS	SUM OF ITEMS SQUARED
LBAAC	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00
ALPHA	24	9.37	5.02	13.70	2.3488	25.1	224.80	2232.52
BETA	24	3.32	1.95	5.81	.9578	28.9	79.67	285.57
RATIO	24	73.29	63.00	80.00	4.6763	6.4	1759.00	129423.00
SUM	24	12.69	7.36	18.25	3.0276	23.9	304.47	4073.40
HSI	24	.29	.26	.34	.0232	7.9	7.05	2.08
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
OIL	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
YIELD	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00

CROSS 7615, 1978 CHEMICAL ANALYSES

TRAIT	NON-ZERO ITEMS	MEAN	RANGE MINIMUM	RANGE MAXIMUM	STANDARD DEVIATION	% COEFF OF VARIATION	SUM OF ITEMS	SUM OF ITEMS SQUARED
LBAAC	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00
ALPHA	29	7.59	3.34	11.75	2.4156	31.8	220.16	1834.78
BETA	29	2.52	1.35	4.23	.7710	30.7	72.95	200.15
RATIO	29	74.38	60.00	79.00	3.9226	5.3	2157.00	160867.00
SUM	29	10.11	5.28	15.98	3.1024	30.7	293.11	3232.02
HSI	29	.30	.25	.36	.0288	9.7	8.64	2.60
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
OIL	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
YIELD	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00

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CROSS 7617, 1978 CHEMICAL ANALYSES

TRAIT	NON-ZERO ITEMS	MEAN	RANGE MINIMUM	RANGE MAXIMUM	STANDARD DEVIATION	% COEFF OF VARIATION	SUM OF ITEMS	SUM OF ITEMS SQUARED
LBAAC	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00
ALPHA	27	9.57	5.28	13.25	2.1425	22.4	258.50	2594.25
BETA	27	3.83	2.20	6.59	1.2336	32.2	103.31	434.86
RATIO	27	71.11	60.00	76.00	3.7245	5.2	1920.00	136894.00
SUM	27	13.40	7.48	19.09	3.1790	23.7	361.81	5111.15
HSI	27	.27	.25	.31	.0140	5.1	7.42	2.04
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
OIL	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
YIELD	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00

CROSS 7618, 1978 CHEMICAL ANALYSES

TRAIT	NON-ZERO ITEMS	MEAN	RANGE MINIMUM	RANGE MAXIMUM	STANDARD DEVIATION	% COEFF OF VARIATION	SUM OF ITEMS	SUM OF ITEMS SQUARED
LBAAC	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00
ALPHA	27	8.87	4.05	13.55	2.6684	30.1	239.49	2309.40
BETA	27	3.55	1.66	6.08	1.1462	32.2	95.97	375.28
RATIO	27	70.63	60.00	85.00	5.9040	8.4	1907.00	135597.00
SUM	27	12.42	5.74	18.36	3.4779	28.0	335.46	4482.39
HSI	27	.29	.25	.35	.0231	7.8	7.95	2.35
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
OIL	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
YIELD	0	0.00	0.00	0.00	0.0000	0.0	0.00	0.00

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LUPULIN ANALYSES

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MALE LUPULIN ANALYSES 1978 data [redacted] 1973 crosses

TRAIT	NON-ZERO ITEMS	MEAN	RANGE MINIMUM	RANGE MAXIMUM	STANDARD DEVIATION	% COEFF OF VARIATION	SUM OF ITEMS	SUM OF ITEMS SQUARED
CRUSH 3HR (HSI)	90	.75	.26	2.55	.5953	79.1	67.71	82.48
ALPHA	92	41.30	19.11	58.75	9.7961	23.7	3799.58	165654.58
BETA	92	17.06	5.97	32.58	4.2451	24.9	1569.19	28404.65
RATIO	92	70.11	44.00	81.00	5.1022	7.3	6450.00	454570.00
SUM	92	58.36	25.29	79.48	12.4034	21.3	5368.77	327300.81
HSI	92	.31	.25	.42	.0356	11.6	28.15	8.73
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	48	5.39	2.20	9.90	2.5820	47.9	258.80	1708.70

MALE LUPULIN ANALYSES (1978): [redacted] 1975 crosses

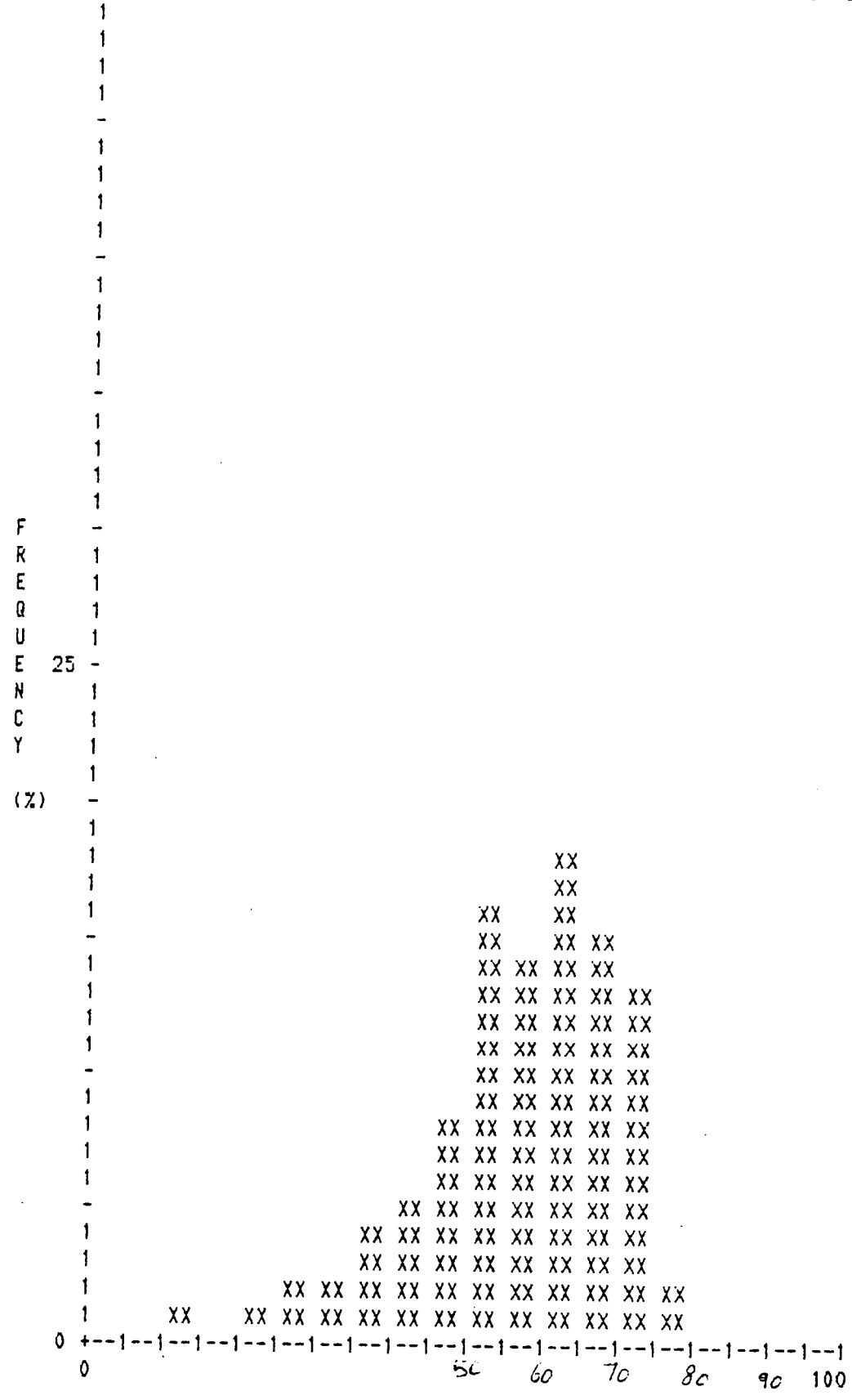
TRAIT	NON-ZERO ITEMS	MEAN	RANGE MINIMUM	RANGE MAXIMUM	STANDARD DEVIATION	% COEFF OF VARIATION	SUM OF ITEMS	SUM OF ITEMS SQUARED
CRUSH 3HR(HSI)	30	.75	.30	2.48	.6400	85.6	22.43	28.65
ALPHA	30	32.35	8.35	60.01	12.6060	39.0	970.51	36004.77
BETA	30	33.65	14.16	57.39	12.4837	37.1	1009.50	38489.12
RATIO	30	48.23	16.00	78.00	15.3301	31.8	1447.00	76609.00
SUM	30	66.00	25.37	97.46	14.3092	21.7	1980.01	136619.16
HSI	30	.26	.21	.38	.0357	13.6	7.87	2.10
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 (HOURS)	11	2.65	1.10	4.60	1.1475	43.2	29.20	90.68

MALE LUPULIN ANALYSES (1978): [redacted] 1976 crosses

TRAIT	NON-ZERO ITEMS	MEAN	RANGE MINIMUM	RANGE MAXIMUM	STANDARD DEVIATION	% COEFF OF VARIATION	SUM OF ITEMS	SUM OF ITEMS SQUARED
CRUSH 3 HR(HSI)	44	1.00	.38	1.98	.5982	60.0	43.90	59.19
ALPHA	190	23.84	.54	54.09	12.1897	51.1	4529.32	136055.37
BETA	190	16.07	1.55	53.12	7.1953	44.8	3053.03	58842.77
RATIO	190	57.36	11.00	79.00	11.9704	20.9	10899.00	652283.00
SUM	190	39.91	2.96	85.08	16.5909	41.6	7582.35	354613.40
HSI	190	.35	.24	.88	.0773	22.2	66.06	24.10
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 (HOURS)	2	4.10	3.80	4.40	.4243	10.3	8.20	33.80

ALPHA RATIO FOR 1976 CROSSES, MALE LUPULIN (1978)

1 50 - 0 0 1 0 1 3 3 8 10 15 31 26 34 29 25 4 0 0 0 0



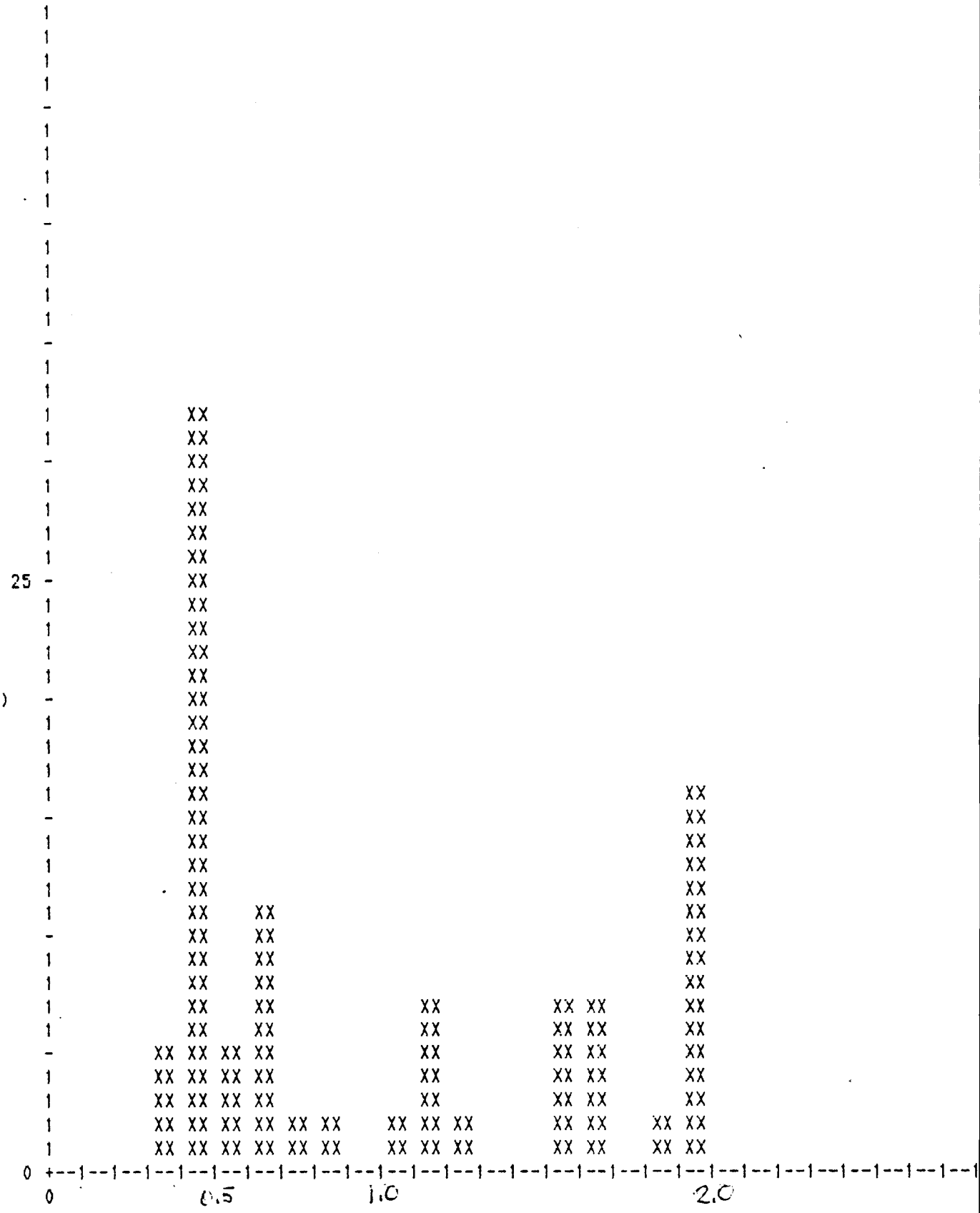
ALPHA RATIO

INTERVAL = 5.00

NO. OF ITEMS = 190

MALE LUPULIN ANALYSES (1978), 1976 CROSSES: ~~HIS~~ HSI AFTER 3 HRS AT 85(C)(CRUSHED)

1 50 - 0 0 0 2 14 2 5 1 1 0 1 3 1 0 0 3 3 0 1 7 0 0 0 0 0 0 0 0



HSI AFTER CRUSHED STORAGE AT 85°C

INTERVAL = .10

NO. OF ITEMS = 44

Glossary of Terms Used in Computer Printouts

5-Cone (as is basis) and Bale (8% moisture content) Analyses

Trait	Definition
LBAAC	Pounds of alpha-acid/ acre
ALPHA	% Alpha-acid in hops
BETA	% Beta-acid in hops
RATIO	Alpha ratio, Alpha/(Alpha + Beta)
SUM	% Alpha + % Beta
HSI	Hop storage index of initial analysis
HSI6MO	Hop storage index after 6 months RT storage
PERCENT	% (Alpha + Beta) remaining after 6 months at RT
OIL	Oil content, mls oil/ 100 g hops
COF	Cofraction
YIELD	Pounds hops/acre

Lupulin Analyses

Trait	Definition
CRUSH	Hop storage index of crushed lupulin after 3 hrs at 85°C
ALPHA	% Alpha-acid in lupulin
BETA	% Beta-acid in lupulin
RATIO	Alpha ratio, Alpha/(Alpha + Beta)
SUM	% Alpha + % Beta in lupulin
HSI	Hop storage index of initial analysis
HSI6MO	Calculated HSI6MO, using SP_o and Permeability
PERCENT	Calculated % (alpha+beta) remaining using HSI6MO
PERM	Measure of lupulin permeability, $(SP_t-SP_o)/t$
COF	Cofraction
SPO	Safe period, hours before deterioration of crushed lupulin at 85°C

1978: Balesamplest Star: SUMMARY OF 1978 BALE AND 5-CONE ANALYSES AS OF 79/07/12.

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
BATES		BALE	WASH	8/21/78	0	0	7.0	5.2	57	12.2	.24	.31	92	.51	0	984
BATES		BALE	WASH	8/24/78	0	0	7.0	5.6	55	12.6	.22	.29	86	.38	0	978
FOLLY		BALE	WASH	8/28/78	0	0	7.6	5.5	57	13.1	.22	.30	90	.50	0	985
I30-15		BALE	IDAHO	9/19/78	0	0	7.8	4.0	66	11.9	.31	0.00	0	0.00	0	142
I31-11A		BALE	323:21-25	9/19/78	2240	238	10.6	7.6	58	18.2	.24	.61	53	1.93	0	1071
I32-13		BALE	044:19-20	9/20/78	0	0	8.8	3.7	70	12.5	.29	.56	63	2.01	0	1168
I33-6		BALE	324:21-25	9/01/78	3071	204	6.7	4.2	61	10.8	.26	.72	40	.96	0	340
I34-52		BALE	045:19-20	9/20/78	0	0	7.3	3.6	66	11.0	.24	.58	54	1.14	0	1171
I36-40		BALE	IDAHO	9/19/78	0	0	9.4	5.7	62	15.2	.29	0.00	0	0.00	0	143
I43-11		BALE	IDAHO	9/19/78	0	0	9.9	5.1	66	15.0	.27	0.00	0	0.00	0	144
I43-16		BALE	301:21-25	9/01/78	821	100	12.3	8.4	59	20.7	.23	.30	88	1.13	0	896
19001	BREWERS GOLD	BALE	001:01-04	9/07/78	0	0	8.7	4.0	68	12.7	.28	.82	42	1.70	0	1124
19001	BREWERS GOLD	BALE	001:01-04	9/08/78	0	0	9.6	4.6	67	14.2	.25	.92	32	2.23	0	924
19001	BREWERS GOLD	BALE	031:01-02	9/20/78	0	0	8.9	4.2	67	13.1	.25	.83	38	2.59	0	1176
19001	BREWERS GOLD	BALE	209:01-10	9/15/78	1706	166	9.8	5.1	65	14.9	.26	.62	50	2.73	0	962
19001	BREWERS GOLD	BALE	302:01-05	9/19/78	1493	130	8.7	5.0	63	13.7	.27	.88	37	2.62	0	1080
19209	FUGGLE	BALE	003:01-04	8/22/78	0	0	4.4	2.2	67	6.6	.28	.40	79	.67	0	24
21011	L 16	BALE	005:01-04	9/07/78	0	0	4.8	4.3	52	9.1	.24	.29	84	.30	0	1132
21014	HALLERTAU MF	BALE	007:01-04	8/22/78	0	0	4.9	4.2	53	9.1	.23	.43	70	.92	0	914
21014	HALLERTAU MF	BALE	247:01-02	8/29/78	512	26	5.1	5.3	48	10.4	.26	.67	49	1.31	0	40
21014	HALLERTAU MF	BALE	326:01-05	8/25/78	725	37	5.2	5.1	50	10.3	.25	.61	55	1.10	0	98
21015	TETTNANGER	BALE	STAUFFER	8/15/78	0	0	5.3	2.6	(67)	7.9	.33	0.00	0	0.00	0	4
21015	TETTNANGER	BALE	008:01-04	8/22/78	0	0	4.7	3.9	54	8.6	.23	.45	67	.62	0	92
21015	TETTNANGER	BALE	248:01-02	8/29/78	256	13	5.3	4.3	55	9.6	.24	.59	52	.60	0	341
21015	TETTNANGER	BALE	327:01-05	8/28/78	355	17	4.9	4.8	50	9.7	.24	.48	58	.80	0	931
21016	FUGGLE N VF	BALE	009:01-04	8/22/78	0	0	5.3	2.6	67	7.8	.26	.34	76	.91	0	93
21016	FUGGLE N VF	BALE	204:01-10	8/23/78	1224	66	5.4	2.9	64	8.4	.25	.47	75	1.24	0	440
21016	FUGGLE N VF	BALE	304:01-05	8/28/78	930	52	5.6	2.8	66	8.5	.28	.49	68	1.50	0	94
21039	GOLDEN STAR	BALE	015:01-04	9/07/78	0	0	4.5	4.2	51	8.8	.26	.47	62	.50	0	1094
21040	COLUMBIA	BALE	226:01-10	9/18/78	2229	187	8.4	4.1	67	12.5	.24	.40	70	1.67	0	883
21040	COLUMBIA	BALE	309:01-05	9/07/78	1280	86	6.8	4.0	62	10.8	.24	.33	85	.69	0	1131
21041	WILLAMETTE	BALE	227:01-10	9/18/78	1834	108	5.9	3.8	60	9.7	.26	.46	67	1.40	0	960
21041	WILLAMETTE	BALE	310:01-05	9/07/78	1152	59	5.2	3.4	60	8.6	.26	.39	75	.78	0	1123
21043	WYE CHALLENGER	BALE	018:05-08	8/28/78	0	0	7.6	4.2	64	11.8	.23	.33	82	1.00	0	907
21043	WYE CHALLENGER	BALE	215:01-10	9/15/78	789	48	6.2	4.4	58	10.6	.28	.44	78	.91	0	1135

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
21043	WYE CHALLENGER	BALE	247:09-10	9/18/78	917	72	7.9	5.4	59	13.3	.26	.43	70	1.74	0	965
21043	WYE CHALLENGER	BALE	328:01-05	8/30/78	1100	73	6.7	4.3	60	11.0	.26	.40	77	1.17	0	335
21044	WYE NORTHDOWN	BALE	019:05-08	8/24/78	0	0	7.5	4.2	64	11.7	.25	.38	75	1.42	0	925
21044	WYE NORTHDOWN	BALE	216:01-10	8/23/78	825	78	9.5	6.3	60	15.8	.26	.46	68	1.79	0	23
21044	WYE NORTHDOWN	BALE	248:09-10	9/18/78	469	41	9.0	6.7	57	15.7	.23	.42	71	2.29	0	970
21045	SEREBRIANKA	BALE	011:09-12	8/24/78	0	0	3.9	3.0	56	6.9	.27	.49	52	0.00	0	99
21047	SVALOF 85	BALE	010:09-12	8/24/78	0	0	3.8	1.9	66	5.7	.29	.53	63	.67	0	873
21049	STYRIAN	BALE	020:05-08	8/24/78	0	0	5.2	2.5	67	7.7	.27	.37	72	.82	0	87
21049	STYRIAN	BALE	214:01-10	8/23/78	1246	52	4.2	2.5	62	6.7	.29	.46	72	.87	0	866
21049	STYRIAN	BALE	247:11-13	8/28/78	1194	55	4.7	2.5	65	7.1	.25	.49	72	.96	0	860
21049	STYRIAN	BALE	329:01-05	8/28/78	964	44	4.6	2.5	64	7.1	.29	.42	74	.80	0	91
21050	AHIL	BALE	001:09-12	8/29/78	0	0	9.6	3.8	71	13.5	.26	.63	54	1.74	0	912
21050	AHIL	BALE	218:01-10	8/23/78	1979	220	11.2	4.6	70	15.7	.25	.62	53	1.42	0	899
21050	AHIL	BALE	249:09-10	8/29/78	2218	222	10.0	4.3	70	14.3	.25	.75	43	1.74	0	338
21051	APOLON	BALE	004:09-12	8/29/78	0	0	10.9	4.0	73	14.8	.25	.69	45	1.67	0	60
21053	AURORA	BALE	003:09-12	8/29/78	0	0	9.6	3.8	71	13.4	.27	.39	76	1.04	0	892
21053	AURORA	BALE	219:01-10	9/15/78	836	95	11.4	4.3	72	15.8	.26	.49	63	1.46	0	1134
21053	AURORA	BALE	246:11-13	9/18/78	569	64	11.4	4.5	71	15.9	.26	.44	66	2.06	0	884
21053	AURORA	BALE	330:01-05	8/25/78	900	97	10.8	4.2	71	15.0	.24	.36	81	1.36	0	88
21054	6806-067	BALE	210:01-10	8/23/78	1930	172	9.0	4.0	69	12.9	.29	.53	63	1.25	0	62
21055	6806-080	BALE	212:01-10	8/23/78	1024	134	13.1	4.6	74	17.6	.29	.37	89	1.67	0	865
21055	6806-080	BALE	316:06-10	8/28/78	1248	179	14.4	4.1	77	18.5	.28	.34	84	1.42	0	19
21056	BULLION 10A VF	BALE	013:09-12	8/28/78	0	0	9.7	5.0	65	14.7	.24	.63	53	2.15	0	948
21056	BULLION 10A VF	BALE	206:01-10	8/28/78	2653	319	12.1	5.7	67	17.7	.25	.83	37	2.00	0	938
21056	BULLION 10A VF	BALE	308:01-05	8/30/78	2116	249	11.8	2.8	80	14.6	.25	.62	54	1.40	0	906
21077	SAAZER	BALE	021:05-08	8/23/78	0	0	4.1	3.3	55	7.4	.27	.59	50	0.00	0	102
21077	SAAZER	BALE	228:01-10	8/28/78	448	29	6.6	4.5	59	11.1	.24	.56	52	1.07	0	104
21078	RECORD	BALE	224:01-10	8/28/78	1984	167	8.4	6.3	57	14.7	.25	.38	72	1.31	0	895
21078	RECORD	BALE	317:01-05	8/30/78	1054	79	7.6	4.8	61	12.3	.25	.43	72	1.38	0	905
21080	BACKA	BALE	008:09-12	9/20/78	0	0	3.5	4.8	41	8.3	.22	.46	63	.53	0	1169
21080	BACKA	BALE	220:01-10	9/18/78	821	32	3.9	7.4	34	11.3	.23	.47	58	.94	0	971
21081	DUNAV	BALE	005:09-12	8/29/78	0	0	6.6	3.3	66	9.9	.28	.41	77	1.03	0	39
21081	DUNAV	BALE	221:01-10	9/15/78	1664	102	6.2	3.5	63	9.6	.30	.49	66	1.39	0	329
21081	DUNAV	BALE	305:06-10	8/30/78	691	48	7.1	3.4	67	10.5	.25	.40	78	1.03	0	437
21082	NEOPLANTA	BALE	006:09-12	8/29/78	0	0	10.1	4.4	69	14.5	.23	.28	83	.98	0	922

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
21082	NEOPLANTA	BALE	222:01-10	9/15/78	1638	125	7.7	3.9	66	11.6	.25	.48	54	1.27	0	887
21082	NEOPLANTA	BALE	306:06-10	9/19/78	2000	168	8.4	4.5	65	12.9	.26	.55	57	1.53	0	1100
21083	VOJODENIA	BALE	007:09-12	9/20/78	0	0	7.6	3.6	67	11.2	.24	.39	77	.80	0	1099
21083	VOJODENIA	BALE	223:01-10	9/18/78	1510	127	8.4	4.4	65	12.8	.26	.39	73	1.38	0	958
21083	VOJODENIA	BALE	327:06-10	8/30/78	1280	94	7.4	3.3	69	10.7	.26	.32	80	.71	0	939
21091	6771-019	BALE	237:23-32	8/23/78	2432	120	5.0	4.0	55	8.9	.24	.46	61	.92	0	910
21091	6771-019	BALE	305:11-15	8/25/78	1314	47	3.6	3.3	52	6.9	.28	.63	55	.92	0	38
21092	CASCADE VF	BALE	014:09-12	9/14/78	0	0	5.1	4.6	52	9.7	.28	.74	41	1.00	0	1147
21092	CASCADE VF	BALE	202:01-10	9/15/78	2159	130	6.0	4.5	57	10.5	.28	.68	46	1.28	0	898
21092	CASCADE VF	BALE	306:01-05	9/07/78	1954	112	5.7	5.3	51	11.1	.28	.77	40	1.28	0	1113
21093	N. BREWER VF	BALE	012:09-12	8/24/78	0	0	8.8	3.4	72	12.2	.28	.39	79	1.36	0	14
21093	N. BREWER VF	BALE	313:01-05	8/24/78	1400	136	9.7	3.9	71	13.7	.27	.37	80	1.65	0	26
21094	6903-112	BALE	WASH	9/11/78	0	0	5.9	6.9	46	12.8	.21	.39	73	.43	0	980
21094	6903-112	BALE	WASH	9/18/78	0	0	6.6	7.2	47	13.8	.21	.36	72	.49	0	981
21094	6903-112	BALE	225:12-21	9/18/78	1418	102	7.2	6.7	51	14.0	.19	.37	73	.78	0	929
21094	6903-112	BALE	306:11-15	9/19/78	1481	109	7.4	7.0	51	14.3	.22	.37	75	.73	0	1079
21095	6903-259	BALE	WASH	9/11/78	0	0	5.0	6.7	42	11.7	.21	.35	80	.58	0	983
21095	6903-259	BALE	WASH	9/18/78	0	0	4.4	6.6	39	11.0	.23	.38	72	.62	0	982
21095	6903-259	BALE	240:12-21	9/18/78	1237	71	5.8	6.0	49	11.8	.22	.34	74	.80	0	880
21095	6903-259	BALE	307:11-15	9/19/78	1017	63	6.2	5.1	54	11.3	.23	.36	79	.82	0	1051
21098	6913-068	BALE	232:23-27	9/18/78	2719	208	7.7	5.0	60	12.7	.25	1.14	22	2.54	0	961
21098	6913-068	BALE	309:11-15	9/19/78	2140	127	6.0	4.5	57	10.5	.36	1.24	20	1.64	0	1070
21099	6921-006	BALE	310:11-15	8/25/78	1655	150	9.1	7.5	54	16.6	.25	.51	68	2.12	0	13
21112	WYE TARGET VF	BALE	016:09-12	8/29/78	0	0	10.4	4.2	71	14.6	.26	.49	65	1.45	0	84
21112	WYE TARGET VF	BALE	217:01-10	8/28/78	2133	237	11.1	4.4	71	15.5	.26	.65	50	1.25	0	935
21112	WYE TARGET VF	BALE	303:06-10	8/25/78	2560	295	11.6	4.4	72	16.0	.24	.49	67	1.36	0	861
21113	LUBELSKA	BALE	018:09-12	8/24/78	0	0	5.9	4.9	54	10.8	.24	.50	62	.96	0	930
21113	LUBELSKA	BALE	328:06-10	8/24/78	313	15	5.0	4.1	54	9.1	.25	.50	59	.69	0	932
21114	NADWISLANSKA	BALE	019:09-12	8/28/78	0	0	3.5	3.2	52	6.7	.26	.45	62	.50	0	103
21114	NADWISLANSKA	BALE	329:06-10	8/28/78	213	10	5.1	4.5	53	9.5	.27	.45	66	.58	0	100
21116	BREWERS GOLD VF	BALE	015:09-12	9/20/78	0	0	9.9	4.5	68	14.4	.27	.97	30	2.51	0	1173
21116	BREWERS GOLD VF	BALE	213:01-10	9/15/78	1152	117	10.2	5.3	65	15.5	.24	.75	40	2.95	0	963
21116	BREWERS GOLD VF	BALE	302:06-10	9/19/78	2451	231	9.4	5.1	65	14.5	.26	.85	39	2.56	0	1101
21167	HYBRID 2 INDIA	BALE	229:01-10	9/18/78	2997	237	7.9	6.9	53	14.8	.23	0.00	0	1.03	0	876
21180	7003-143	BALE	242:12-16	9/18/78	2193	208	9.5	8.7	52	18.2	.22	.50	61	2.81	0	879

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
21180	7003-143	BALE	329:11-15	8/31/78	2269	183	8.1	8.7	48	16.8	.22	.46	65	1.10	0	337
21181	7003-243	BALE	204:17-21	9/18/78	2159	140	6.5	6.6	49	13.1	.24	.38	73	1.14	0	954
21181	7003-243	BALE	302:16-20	9/19/78	1954	110	5.6	6.2	47	11.8	.22	.48	59	.62	0	1050
48209	FUGGLE H	BALE	010:01-04	8/22/78	0	0	4.9	2.3	67	7.1	.30	.40	73	.96	0	943
48209	FUGGLE H	BALE	203:01-10	8/23/78	1331	79	6.0	3.0	66	9.0	.27	.44	73	1.03	0	89
48209	FUGGLE H	BALE	303:01-05	8/24/78	529	26	5.0	2.6	65	7.7	.28	.42	73	1.03	0	944
56001	HALLERTAU	BALE	011:01-04	8/22/78	0	0	4.2	4.3	49	8.5	.25	.63	57	.94	0	20
56013	CASCADE	BALE	013:01-04	9/07/78	0	0	5.9	4.2	58	10.0	.29	.86	37	1.06	0	1125
56013	CASCADE	BALE	015:77	9/12/78	0	0	7.0	4.3	62	11.3	.25	.71	43	1.68	0	869
56013	CASCADE	BALE	016:90	9/12/78	0	0	6.2	4.7	56	10.9	.26	.84	36	1.54	0	1155
56013	CASCADE	BALE	024:83	9/14/78	0	0	7.1	4.7	60	11.8	.25	.73	46	1.57	0	1108
56013	CASCADE	BALE	208:01-10	9/15/78	2124	128	6.1	5.4	53	11.4	.25	.77	38	1.68	0	897
56013	CASCADE	BALE	305:01-05	9/07/78	2141	116	5.4	4.6	54	10.0	.28	.73	45	1.03	0	1130
60042	SHINSHUWASE	BALE	016:01-04	9/07/78	0	0	4.7	4.2	52	9.0	.24	.42	59	.67	0	1063
60052		BALE	047:03-04	9/20/78	0	0	9.2	6.5	58	15.7	.23	.46	62	.82	0	1159
61019	YUGO GOLDING	BALE	017:01-04	8/22/78	0	0	4.4	2.1	68	6.5	.27	.39	83	.67	0	27
61019	YUGO GOLDING	BALE	246:03-04	8/29/78	1728	98	5.7	3.3	63	9.0	.26	.55	64	1.56	0	35
61020	SAV GOLDING	BALE	018:01-04	8/22/78	0	0	4.9	2.3	67	7.2	.28	.38	83	.69	0	18
61020	SAV GOLDING	BALE	247:03-04	9/28/78	1386	81	5.9	2.9	67	8.8	.26	.49	68	1.42	0	97
61021	TETTNANG-SWISS	BALE	019:01-04	8/24/78	0	0	5.3	4.1	56	9.4	.24	.51	52	.67	0	951
61021	TETTNANG-SWISS	BALE	248:03-04	8/29/78	661	38	5.8	5.7	50	11.5	.24	.75	38	1.04	0	342
62013	COMET	BALE	020:01-04	9/20/78	0	0	10.4	3.8	73	14.2	.26	.66	49	1.68	0	1172
62013	COMET	BALE	054:01-02	9/20/78	0	0	9.2	4.2	68	13.4	.26	.68	47	1.53	0	1140
62013	COMET	BALE	249:03-04	9/18/78	0	0	11.4	5.1	69	16.5	.24	.81	40	3.31	0	928
62013	COMET	BALE	318:01-05	9/07/78	1450	161	11.1	5.5	66	16.6	.25	.84	34	2.37	0	1091
62051	JANUS	BALE	021:01-04	8/23/78	0	0	4.8	2.1	69	6.9	.28	.31	73	0.00	0	101
62052	DENSITY	BALE	001:05-08	9/20/78	0	0	5.2	3.0	63	8.2	.25	.43	69	.55	0	1170
62052	DENSITY	BALE	245:05-06	8/29/78	2197	114	5.2	3.7	58	8.9	.25	.35	80	.38	0	82
62053	DEFENDER	BALE	002:05-08	8/28/78	0	0	3.6	1.2	75	4.7	.27	.43	67	.64	0	908
64100	BULLION	BALE	003:05-08	8/28/78	0	0	8.7	5.2	62	13.9	.23	.62	51	2.17	0	29
64100	BULLION	BALE	035:03-04	9/20/78	0	0	9.2	4.8	65	13.9	.24	.74	42	2.34	0	1175
64100	BULLION	BALE	205:01-10	8/28/78	2201	233	10.6	5.4	66	16.0	.24	.66	51	2.12	0	37
64100	BULLION	BALE	307:01-05	8/30/78	1408	133	9.5	4.9	65	14.4	.25	.64	50	1.89	0	878
64107	N. BREWER	BALE	004-05-08	8/24/78	0	0	8.3	3.2	72	11.5	.27	.36	70	1.39	0	96
64107	N. BREWER	BALE	225:01-10	8/23/78	597	53	9.0	3.7	70	12.7	.29	.39	76	1.52	0	877

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML8/ 100G	COF	SERIAL NUMBER
64107	N. BREWER	BALE	247:05-06	8/29/78	1024	98	9.6	4.2	69	13.8	.27	.44	77	2.18	0	439
64107	N. BREWER	BALE	312:01-05	8/25/78	491	41	8.5	3.5	71	12.0	.26	.37	79	1.52	0	872
65009	BG X 19058M	BALE	228:23-27	9/18/78	2119	221	10.5	9.0	53	19.4	.23	.96	28	3.85	0	959
65009	BG X 19058M	BALE	303:11-15	9/19/78	1800	166	9.3	7.8	54	17.1	.25	1.17	22	3.18	0	1072
65101	TALISMAN	BALE	005:05-08	9/20/78	0	0	6.1	3.4	63	9.5	.23	.53	54	.80	0	1174
65102	YAKIMA CL (L1)	BALE	WASH	9/02/77	0	0	4.8	3.0	61	7.8	.37	.47	70	.15	0	979
65102	YAKIMA CL (L1)	BALE	006:05-08	9/20/78	0	0	5.2	3.8	58	9.0	.24	.34	78	.55	0	1098
65103	E2	BALE	323:01-05	8/28/78	906	63	7.0	4.7	59	11.7	.23	.29	85	.66	0	86
66050	ALLIANCE	BALE	012:05-08	8/28/78	0	0	6.4	2.1	75	8.5	.26	.37	78	.91	0	937
66050	ALLIANCE	BALE	244:07-08	8/29/78	1471	84	5.7	2.0	73	7.8	.27	.40	72	1.35	0	61
66051	PROGRESS	BALE	009:05-08	8/28/78	0	0	6.7	2.5	73	9.1	.27	.38	82	1.03	0	30
66051	PROGRESS	BALE	245:07-08	8/29/78	1536	107	7.0	2.7	72	9.8	.28	.46	71	1.34	0	947
66054	CALICROSS	BALE	014:05-08	9/20/78	0	0	5.8	4.7	55	10.4	.27	.42	59	.78	0	1160
66054	CALICROSS	BALE	325:01-05	9/07/78	1269	91	7.2	6.1	54	13.3	.24	.34	80	1.02	0	1119
68052	PETHAM GOLDING	BALE	017:05-08	8/28/78	0	0	6.3	1.9	76	8.2	.26	.50	67	.83	0	15
7003-015		BALE	213:12-16	9/17/78	1400	98	7.0	3.3	67	10.3	.40	0.00	0	1.10	0	927
7003-015		BALE	319:11-15	9/19/78	1717	168	9.8	4.7	67	14.5	.26	0.00	0	1.34	0	1081
7003-038		BALE	322:11-15	8/30/78	1795	150	8.4	8.1	50	16.5	.23	0.00	0	.69	0	893
7003-066		BALE	323:11-15	8/31/78	1804	125	7.0	7.1	49	14.1	.24	0.00	0	1.35	0	936
7003-079		BALE	325:11-15	8/31/78	1617	96	5.9	7.9	42	13.9	.22	0.00	0	.94	0	432
7003-250		BALE	303:16-20	8/31/78	1766	156	8.9	7.1	55	16.0	.24	0.00	0	1.11	0	12
7003-284		BALE	304:16-20	9/31/78	2112	114	5.4	11.3	32	16.8	.26	0.00	0	1.46	0	923
7004-075		BALE	307:16-20	8/31/78	2215	226	10.2	4.0	71	14.3	.26	0.00	0	1.97	0	336
7005-022		BALE	309:16-21	9/01/78	2175	217	10.0	3.7	72	13.7	.30	0.00	0	2.18	0	16
7005-070		BALE	312:16-20	8/31/78	2668	235	8.8	7.5	54	16.3	.28	0.00	0	1.71	0	333
7005-194		BALE	051:07-08	9/20/78	0	0	11.0	4.6	70	15.6	.25	.36	79	1.88	0	1141
7005-194		BALE	315:16-20	9/19/78	981	116	11.9	4.6	72	16.4	.24	.59	55	2.31	0	1069
7005-201		BALE	319:16-20	8/31/78	2058	163	8.0	6.3	55	14.3	.22	0.00	0	.73	0	90
7005-205		BALE	320:16-20	8/31/78	1884	218	11.6	5.3	68	16.9	.25	0.00	0	1.34	0	345
7005-232		BALE	321:16-20	8/31/78	2550	197	7.7	4.0	66	11.7	.26	0.00	0	.85	0	95
7006-016		BALE	322:21-25	9/01/78	1674	198	11.9	4.8	71	16.6	.25	0.00	0	3.04	0	894
7006-061		BALE	323:16-20	8/31/78	1180	68	5.8	2.1	73	8.0	.27	0.00	0	.69	0	21
7006-095		BALE	322:16-21	8/31/78	1728	120	7.0	9.9	41	16.9	.25	0.00	0	3.23	0	31
7006-278		BALE	328:16-20	8/31/78	1770	132	7.5	4.2	64	11.7	.25	0.00	0	1.21	0	343
7006-296		BALE	330:16-20	8/31/78	1600	195	12.2	6.6	65	18.8	.24	0.00	0	2.87	0	334

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/ 100G	COF	SERIAL NUMBER
7006-311	BALE	043:09-10	9/20/78	0	0	13.4	5.3	71	18.6	.25	.84	36	2.85	0	1167
7006-382	BALE	326:16-20	8/31/78	1404	118	8.5	3.8	69	12.2	.25	0.00	0	.48	0	344
7006-398	BALE	206:28-32	9/18/78	845	109	13.0	8.7	59	21.7	.23	0.00	0	2.31	0	955
7006-398	BALE	306:21-25	9/01/78	1107	150	13.6	7.5	64	21.1	.24	0.00	0	1.75	0	332
7006-408	BALE	309:21-25	9/01/78	2730	283	10.4	5.5	65	15.9	.24	0.00	0	1.27	0	34
7006-445	BALE	311:21-25	9/01/78	2069	168	8.2	5.5	59	13.6	.23	0.00	0	2.18	0	862
7006-450	BALE	312:21-25	9/01/78	0	0	13.0	5.0	72	18.1	.24	0.00	0	2.76	0	22
7006-456	BALE	313:21-25	9/01/78	1735	115	6.6	3.5	65	10.2	.27	0.00	0	.82	0	911
7007-175	BALE	317:21-25	9/01/78	1135	80	7.1	4.0	63	11.1	.29	0.00	0	1.52	0	17
7007-339	BALE	321:21-25	9/01/78	1877	245	13.1	6.5	66	19.6	.25	0.00	0	3.17	0	874
7013-130	BALE	321:06-10	8/28/78	2790	222	8.0	5.1	61	13.1	.23	0.00	0	1.46	0	339
7101-096	BALE	309:26-30	9/01/78	1747	74	4.3	2.8	60	7.1	.28	0.00	0	.71	0	85
7101-099	BALE	311:26-30	9/19/78	1348	69	5.1	2.4	67	7.6	.29	0.00	0	1.39	0	1065
7101-118	BALE	313:26-30	9/01/78	1408	51	3.7	3.0	54	6.7	.26	0.00	0	1.14	0	913
7101-175	BALE	315:26-30	9/07/78	1580	55	3.5	2.6	57	6.1	.29	0.00	0	.96	0	1061
7101-181	BALE	316:26-30	9/07/78	0	0	3.0	2.6	53	5.5	.32	0.00	0	.85	0	1117
7101-184	BALE	317:26-30	9/07/78	1928	82	4.3	2.3	64	6.6	.30	0.00	0	1.25	0	1105
7101-210	BALE	320:26-30	9/07/78	0	0	4.1	2.1	66	6.1	.29	0.00	0	1.03	0	1104
7102-006	BALE	308:06-10	8/28/78	0	0	3.6	4.2	46	7.8	.27	0.00	0	1.17	0	904
7102-025	BALE	313:06-10	8/25/78	1041	62	6.0	5.2	53	11.2	.24	0.00	0	1.45	0	941
7102-026	BALE	314:06-10	8/30/78	0	0	4.1	3.4	54	7.6	.25	0.00	0	.51	0	105
7301-003	BALE	323:26-30	9/07/78	1920	218	11.4	6.4	63	17.8	.26	0.00	0	2.53	0	1112
7301-034	BALE	324:26-30	9/07/78	1902	240	12.7	4.1	75	16.7	.24	0.00	0	1.14	0	1102
7301-183	BALE	325:26-30	9/07/78	1263	128	10.2	2.7	78	12.9	.25	0.00	0	1.45	0	1103
7302-029	BALE	326:26-30	9/07/78	1443	158	11.0	2.8	79	13.7	.29	0.00	0	1.65	0	1116
7303-007	BALE	328:26-30	9/07/78	873	93	10.7	3.7	74	14.4	.29	0.00	0	1.64	0	1097
7303-019	BALE	329:26-30	9/07/78	2097	279	13.3	3.6	78	16.9	.27	0.00	0	0.00	0	1118
7306-139	BALE	306:31-35	9/06/78	1322	101	7.7	3.7	67	11.5	.27	0.00	0	.83	0	885
7306-148	BALE	307:31-35	9/06/78	1262	88	7.0	5.6	55	12.6	.26	0.00	0	1.21	0	919
7307-023	BALE	309:31-35	9/06/78	969	80	8.4	3.3	71	11.6	.30	0.00	0	.89	0	946
7308-034	BALE	311:31-35	9/06/78	1315	105	8.0	3.7	68	11.7	.32	0.00	0	.73	0	875
7310-039	BALE	313:31-35	9/06/78	572	57	10.1	4.4	69	14.5	.26	0.00	0	1.60	0	436
7311-031	BALE	314:31-35	9/06/78	921	123	13.5	4.1	76	17.6	.26	0.00	0	3.28	0	926
7311-032	BALE	315:31-35	9/06/78	674	85	12.7	3.4	78	16.2	.26	0.00	0	1.22	0	867
7311-152	BALE	321:31-35	9/06/78	2048	297	14.5	3.8	79	18.4	.28	0.00	0	2.37	0	942

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7311-177	BALE	322:31-35	9/06/78	883	106	12.1	3.7	76	15.8	.28	0.00	0	2.35	0	909
7312-009	BALE	324:31-35	9/06/78	1002	177	17.7	5.2	77	22.9	.26	0.00	0	2.84	0	921
7312-015	BALE	325:31-35	9/07/78	1109	112	10.2	4.4	69	14.6	.26	0.00	0	1.14	0	964
7312-027	BALE	327:31-35	9/06/78	1013	104	10.3	5.6	65	15.9	.24	0.00	0	1.42	0	433
7312-036	BALE	323:06-10	9/19/78	938	110	11.8	3.8	75	15.6	.28	0.00	0	1.93	0	1092
7312-041	BALE	328:31-35	9/06/78	835	137	16.5	5.9	73	22.3	.27	0.00	0	2.45	0	920
7312-083	BALE	325:06-10	9/19/78	572	77	13.5	4.4	75	17.8	.28	.40	80	2.07	0	1082
7312-129	BALE	344:01-05	8/30/78	834	112	13.5	6.0	69	19.4	.29	0.00	0	2.84	0	25
7312-134	BALE	326:06-10	9/19/78	1422	156	11.0	4.5	70	15.5	.26	0.00	0	1.00	0	1064
7313-009	BALE	331:01-05	8/30/78	697	90	13.0	5.3	70	18.3	.27	0.00	0	1.75	0	33
7313-032	BALE	333:01-05	8/30/78	2232	272	12.2	4.6	72	16.8	.26	0.00	0	1.02	0	940
7313-043	BALE	334:01-05	8/30/78	1642	168	10.2	3.5	74	13.7	.28	0.00	0	1.14	0	28
7313-053	BALE	335:01-05	8/30/78	1536	167	10.9	4.5	70	15.4	.30	0.00	0	2.10	0	83
7313-083	BALE	336:01-05	8/30/78	1152	180	15.7	6.3	71	22.0	.26	0.00	0	2.14	0	36
7313-110	BALE	338:01-05	8/30/78	1392	157	11.3	4.3	72	15.7	.28	0.00	0	1.93	0	32
7315-063	BALE	343:01-05	8/30/78	2033	277	13.7	4.3	76	18.0	.25	0.00	0	1.49	0	945
7504-002	BALE	007:84	9/07/78	0	0	7.3	5.3	57	12.6	.27	.45	59	.69	0	1128
7504-004	BALE	007:86	9/11/78	0	0	8.0	5.2	60	13.2	.28	.56	61	.38	0	1121
7504-014	BALE	008:62	9/07/78	0	0	7.7	4.5	63	12.1	.29	.72	44	.78	0	1087
7504-016	BALE	008:64	9/07/78	0	0	5.9	5.4	52	11.3	.27	.42	71	.24	0	1089
7504-026	BALE	008:74	9/07/78	0	0	6.7	5.3	56	12.0	.29	.48	67	.50	0	1111
7504-031	BALE	008:79	9/07/78	0	0	9.0	6.5	58	15.5	.24	.55	56	.89	0	1129
7504-034	BALE	008:82	9/07/78	0	0	6.0	7.3	45	13.3	.27	.59	51	.66	0	1110
7504-044	BALE	008:92	9/07/78	0	0	6.0	5.1	54	11.1	.27	.63	51	.87	0	1088
7504-053	BALE	009:67	9/08/78	0	0	7.0	4.4	61	11.4	.24	0.00	0	.60	0	1085
7504-056	BALE	009:70	9/07/78	0	0	7.3	3.9	65	11.1	.31	.90	34	0.00	0	1106
7504-057	BALE	009:71	9/08/78	0	0	7.8	4.9	61	12.6	.26	0.00	0	.66	0	1093
7504-058	BALE	009:72	9/07/78	0	0	6.0	4.2	58	10.2	.25	.36	70	.24	0	1062
7504-071	BALE	009:85	9/07/78	0	0	7.3	3.9	65	11.1	.26	0.00	0	.76	0	1133
7504-073	BALE	009:87	9/08/78	0	0	6.1	5.5	52	11.5	.28	.65	50	0.00	0	1120
7504-081	BALE	010:61	9/11/78	0	0	7.5	3.4	68	10.8	.26	.80	38	1.32	0	1115
7504-082	BALE	010:62	9/11/78	0	0	2.9	2.4	55	5.3	.27	0.00	0	0.00	0	1095
7504-083	BALE	010:63	9/11/78	0	0	7.0	2.4	74	9.4	.30	.51	65	.98	0	1031
7504-092	BALE	010:72	9/11/78	0	0	6.0	5.5	52	11.6	.25	0.00	0	.47	0	1032
7504-093	BALE	010:73	9/11/78	0	0	5.9	4.6	56	10.6	.25	0.00	0	1.45	0	1114

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7504-095	BALE 010:75	9/11/78	0	0	8.9	5.0	63	13.9	.24	.34	76	.73	0	1060
7504-099	BALE 010:79	9/07/78	0	0	8.1	7.4	52	15.5	.24	.40	71	.82	0	1090
7504-102	BALE 010:82	9/08/78	0	0	10.2	6.7	60	16.9	.23	.59	49	0.00	0	1086
7504-108	BALE 010:88	9/07/78	0	0	5.9	5.1	53	11.0	.31	.68	48	.82	0	1107
7504-113	BALE 010:93	9/11/78	0	0	6.3	8.0	44	14.3	.25	.49	60	.48	0	1074
7504-119	BALE 011:65	9/11/78	0	0	5.8	3.3	64	9.1	.25	0.00	0	.58	0	1068
7504-122	BALE 011:68	9/11/78	0	0	6.3	4.4	59	10.7	.26	.56	59	.69	0	1041
7504-127	BALE 011:73	9/11/78	0	0	6.2	5.4	53	11.6	.27	.53	61	.60	0	1035
7504-130	BALE 011:76	9/11/78	0	0	8.4	5.5	60	13.9	.25	.48	64	.64	0	1073
7504-137	BALE 011:83	9/11/78	0	0	7.0	5.8	54	12.8	.25	.46	59	.42	0	1042
7504-138	BALE 011:84	9/11/78	0	0	7.0	5.4	56	12.3	.23	0.00	0	.78	0	1067
7504-149	BALE 012:61	9/11/78	0	0	4.7	4.6	50	9.3	.25	0.00	0	.94	0	1029
7504-151	BALE 012:63	9/11/78	0	0	9.9	4.2	70	14.1	.25	.48	55	0.00	0	1030
7504-164	BALE 012:76	9/11/78	0	0	7.2	5.1	58	12.2	.23	0.00	0	.33	0	1096
7504-167	BALE 012:79	9/19/78	0	0	5.4	3.6	59	9.0	.25	0.00	0	1.03	0	1066
7504-196	BALE 013:74	9/11/78	0	0	6.1	4.4	58	10.5	.23	0.00	0	.94	0	1033
7504-205	BALE 013:83	9/11/78	0	0	7.0	6.2	52	13.2	.28	.49	69	1.00	0	1083
7504-214	BALE 013:92	9/11/78	0	0	5.8	4.3	57	10.0	.24	0.00	0	.67	0	1059
7504-222	BALE 014:66	9/11/78	0	0	6.6	4.5	59	11.1	.26	0.00	0	.98	0	1034
7504-231	BALE 014:75	9/11/78	0	0	7.8	4.8	62	12.6	.23	.45	63	.82	0	1043
7504-236	BALE 014:80	9/11/78	0	0	8.2	3.3	71	11.5	.27	0.00	0	.87	0	1084
7504-237	BALE 014:81	9/13/78	0	0	5.5	4.4	55	10.0	.25	0.00	0	.51	0	1040
7504-238	BALE 014:82	9/12/78	0	0	5.9	3.3	63	9.2	.27	0.00	0	.49	0	1136
7504-250	BALE 014:94	9/12/78	0	0	8.8	4.1	68	12.9	.26	.72	49	1.47	0	868
7504-253	BALE 015:63	9/12/78	0	0	5.6	5.6	50	11.2	.24	0.00	0	.41	0	870
7504-258	BALE 015:68	9/12/78	0	0	6.9	4.7	59	11.6	.23	.54	61	1.07	0	871
7504-259	BALE 015:69	9/12/78	0	0	4.9	4.4	52	9.2	.29	0.00	0	.44	0	1151
7505-013	BALE 015:91	9/12/78	0	0	5.4	5.0	52	10.4	.18	0.00	0	.64	0	863
7505-024	BALE 016:68	9/12/78	0	0	7.1	3.1	69	10.2	.27	.49	67	1.07	0	888
7505-025	BALE 016:69	9/12/78	0	0	6.0	6.5	47	12.5	.23	.52	58	.78	0	1154
7505-026	BALE 016:70	9/12/78	0	0	7.6	4.1	64	11.8	.27	.47	71	1.03	0	1152
7505-028	BALE 016:72	9/12/78	0	0	5.2	6.1	46	11.4	.25	.52	58	.69	0	1153
7505-029	BALE 016:73	9/12/78	400	30	7.5	6.0	55	13.5	.25	.62	54	1.18	0	1163
7505-031	BALE 016:75	9/12/78	0	0	5.4	4.8	52	10.1	.22	.67	47	.82	0	900
7505-032	BALE 016:76	9/12/78	0	0	6.3	2.9	68	9.2	.25	0.00	0	.89	0	976

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/ 100G	COF	SERIAL NUMBER
7505-038	BALE	016:82	9/12/78	0	0	5.5	2.9	65	8.3	.31	0.00	0	.85	0	1157
7505-039	BALE	016:83	9/12/78	0	0	5.2	4.5	53	9.7	.27	0.00	0	.60	0	1156
7506-001	BALE	016:92	9/12/78	0	0	7.2	2.7	72	9.9	.25	0.00	0	1.21	0	901
7506-006	BALE	017:63	9/12/78	0	0	7.6	3.9	66	11.5	.28	.71	49	1.89	0	1164
7506-007	BALE	017:64	9/12/78	0	0	8.0	4.8	62	12.7	.23	.50	73	1.25	0	864
7506-008	BALE	017:65	9/12/78	0	0	10.2	5.8	63	16.0	.24	.54	53	1.56	0	889
7506-009	BALE	017:66	9/12/78	0	0	7.9	8.9	47	16.8	.33	0.00	0	1.71	0	1150
7506-010	BALE	017:67	9/12/78	0	0	8.0	3.2	71	11.2	.26	0.00	0	1.63	0	977
7506-015	BALE	017:72	9/12/78	0	0	8.1	3.4	70	11.5	.26	.73	45	1.24	0	1137
7506-016	BALE	017:73	9/13/78	0	0	10.1	5.0	66	15.1	.25	.49	62	1.15	0	1053
7506-020	BALE	017:77	9/13/78	0	0	11.0	6.4	63	17.4	.25	.73	41	2.18	0	933
7506-021	BALE	017:78	9/13/78	0	0	7.7	2.9	72	10.6	.27	0.00	0	1.31	0	1078
7506-026	BALE	017:83	9/13/78	0	0	9.8	4.4	68	14.2	.25	.52	57	1.46	0	1054
7506-030	BALE	017:87	9/13/78	0	0	6.7	3.0	69	9.7	.29	0.00	0	1.24	0	1037
7506-038	BALE	018:61	9/13/78	0	0	8.7	4.8	64	13.6	.29	.79	37	1.60	0	1056
7506-041	BALE	018:64	9/13/78	0	0	9.2	3.5	72	12.7	.26	.55	54	1.10	0	902
7506-043	BALE	018:66	9/13/78	0	0	7.9	2.4	76	10.3	.30	0.00	0	1.39	0	1039
7506-044	BALE	018:67	9/13/78	0	0	7.4	4.0	64	11.4	.27	0.00	0	1.49	0	1049
7506-047	BALE	018:70	9/13/78	0	0	10.9	4.2	71	15.1	.25	.56	57	1.36	0	1052
7506-058	BALE	018:81	9/13/78	0	0	8.7	4.5	66	13.2	.26	.53	60	0.00	0	1057
7506-067	BALE	018:90	9/13/78	0	0	6.3	3.7	63	10.0	.28	0.00	0	.67	0	1075
7506-068	BALE	018:91	9/13/78	0	0	6.9	7.0	49	14.0	.29	.79	36	1.25	0	1076
7506-078	BALE	019:67	9/13/78	0	0	8.3	3.3	71	11.6	.25	0.00	0	1.64	0	1055
7506-083	BALE	019:72	9/13/78	0	0	8.3	2.8	74	11.1	.29	.62	57	1.59	0	1045
7506-107	BALE	020:62	9/13/78	0	0	6.3	2.9	68	9.2	.32	.56	64	1.42	0	1044
7506-109	BALE	020:64	9/13/78	0	0	7.9	5.3	59	13.2	.22	.66	52	1.59	0	1047
7506-111	BALE	020:66	9/13/78	0	0	8.1	5.3	60	13.4	.26	.49	62	.98	0	1077
7506-115	BALE	020:70	9/13/78	0	0	8.3	5.3	61	13.6	.24	0.00	0	1.50	0	903
7506-123	BALE	020:78	9/13/78	0	0	7.1	4.7	60	11.8	.30	.90	31	1.82	0	1046
7506-124	BALE	020:79	9/13/78	0	0	7.6	4.1	64	11.7	.26	.61	54	1.59	0	1048
7506-135	BALE	020:90	9/13/78	0	0	10.3	4.9	67	15.3	.26	.83	36	1.45	0	934
7506-141	BALE	021:62	9/13/78	0	0	10.1	4.2	70	14.2	.30	.69	48	1.36	0	1036
7506-142	BALE	021:63	9/13/78	0	0	7.2	2.4	74	9.6	.27	0.00	0	.78	0	1038
7506-147	BALE	021:68	9/14/78	0	0	7.2	7.0	50	14.2	.27	0.00	0	1.50	0	1142
7506-149	BALE	021:70	9/14/78	0	0	6.6	2.2	74	8.8	.26	.57	58	1.02	0	434

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
7506-155	BALE	021:76	9/14/78	0	0	9.3	3.1	75	12.4	.29	0.00	0	1.84	0	1166
7506-156	BALE	021:77	9/14/78	0	0	8.7	4.0	68	12.6	.26	.72	45	1.14	0	953
7506-159	BALE	021:80	9/14/78	0	0	7.4	2.9	72	10.3	.26	.78	39	1.04	0	1127
7506-168	BALE	021:89	9/14/78	0	0	9.7	5.1	65	14.8	.26	0.00	0	1.77	0	1149
7506-175	BALE	022:62	9/14/78	0	0	6.7	2.9	70	9.5	.31	.73	44	1.39	0	1146
7506-179	BALE	022:66	9/14/78	0	0	8.3	4.3	65	12.6	.29	.72	35	1.36	0	1161
7506-196	BALE	022:83	9/14/78	0	0	7.2	3.9	65	11.1	.26	0.00	0	1.53	0	890
7506-200	BALE	022:87	9/14/78	0	0	9.3	3.8	71	13.1	.26	.53	62	1.79	0	1144
7506-211	BALE	023:64	9/14/78	0	0	7.0	3.8	64	10.7	.26	.51	67	.98	0	1138
7506-220	BALE	023:73	9/14/78	0	0	11.3	4.4	72	15.6	.24	.60	50	1.81	0	891
7506-231	BALE	023:84	9/14/78	0	0	10.2	6.5	61	16.7	.25	.64	53	1.46	0	1139
7506-232	BALE	023:85	9/14/78	0	0	8.2	3.1	72	11.2	.33	.85	39	1.39	0	1143
7506-243	BALE	024:62	9/14/78	0	0	6.0	4.9	54	10.9	.40	0.00	0	.71	0	1158
7506-245	BALE	024:64	9/14/78	0	0	9.5	4.9	65	14.4	.29	.86	27	.73	0	1126
7506-247	BALE	024:66	9/14/78	0	0	9.4	4.9	65	14.3	.26	0.00	0	1.53	0	1148
7506-253	BALE	024:72	9/14/78	0	0	8.4	4.3	65	12.7	.25	.54	55	1.03	0	1165
7506-257	BALE	024:76	9/14/78	0	0	7.3	2.6	73	10.0	.25	.60	57	1.54	0	952
7507-008	BALE	024:92	9/14/78	0	0	5.6	3.7	60	9.3	.26	0.00	0	0.00	0	435
7507-010	BALE	024:94	9/14/78	0	0	5.6	3.9	58	9.5	.35	.58	60	1.32	0	1162
7507-013	BALE	025:63	9/14/78	0	0	6.0	3.0	66	9.0	.29	0.00	0	1.00	0	1109
7507-015	BALE	025:65	9/15/78	0	0	10.7	6.2	63	16.8	.23	.43	66	2.01	0	881
7507-017	BALE	025:67	9/15/78	0	0	7.1	3.2	68	10.4	.23	.54	47	.91	0	969
7507-019	BALE	025:69	9/15/78	0	0	4.8	4.8	49	9.6	.21	0.00	0	1.17	0	975
7507-023	BALE	025:73	9/15/78	0	0	10.2	5.4	65	15.6	.24	.55	55	1.85	0	957
7507-032	BALE	025:82	9/15/78	0	0	5.3	4.3	55	9.6	.24	0.00	0	1.34	0	949
7507-048	BALE	026:64	9/15/78	0	0	5.1	4.7	52	9.8	.23	0.00	0	1.17	0	974
7507-053	BALE	026:69	9/15/78	0	0	8.9	5.5	61	14.4	.25	.87	32	1.57	0	950
7507-062	BALE	026:78	9/15/78	0	0	10.0	6.7	59	16.7	.23	.51	55	1.35	0	966
7507-072	BALE	026:88	9/15/78	0	0	7.7	4.2	64	11.8	.25	0.00	0	1.97	0	968
7507-096	BALE	027:78	9/15/78	0	0	7.8	5.9	56	13.7	.23	.30	77	.98	0	956
7507-097	BALE	027:79	9/15/78	0	0	5.3	5.0	51	10.2	.25	0.00	0	1.77	0	973
7507-109	BALE	027:91	9/15/78	0	0	7.9	5.4	59	13.3	.23	.57	51	1.29	0	967
7507-118	BALE	028:66	9/15/78	0	0	6.6	3.5	65	10.0	.26	0.00	0	1.40	0	972
7507-120	BALE	028:68	9/15/78	0	0	9.1	3.9	69	13.0	.28	.46	66	1.90	0	882
7606-199	BALE	022:86	9/14/78	0	0	10.2	4.1	71	14.3	.26	0.00	0	1.14	0	1145

1978: Cone samples + Star: SUMMARY OF 1978 BALE AND 5-CONE ANALYSES AS OF 79/07/12.

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
BG = 19001		CONE	IDAHO	9/01/78	0	0	9.5	4.2	69	13.7	.26	0.00	0	0.00	0	1023
GALENA		CONE	IDAHO	9/01/78	0	0	16.0	8.8	64	24.8	.23	0.00	0	0.00	0	1010
GALENA, baby at Ball's		CONE	IDAHO,WFB	9/18/78	0	0	5.9	4.2	58	10.0	.25	0.00	0	0.00	0	1026
I14-24A		CONE	041:19-20	9/20/78	0	0	4.1	2.8	59	6.9	.25	0.00	0	0.00	0	313
I21-17A		CONE	042:19-20	9/20/78	0	0	9.2	3.8	70	13.0	.23	0.00	0	0.00	0	271
I21-26A		CONE	043:19-20	9/20/78	0	0	3.9	4.6	46	8.5	.23	0.00	0	0.00	0	294
I31-11A		CONE	323:21-25	9/19/78	0	0	11.2	5.3	67	16.4	.23	.56	61	0.00	0	169
I34-5		CONE	325:21-25	9/19/78	1400	129	9.3	4.2	68	13.5	.24	.66	53	0.00	0	162
I43-11		CONE	049:21-22	9/20/78	0	0	6.9	4.6	60	11.4	.22	0.00	0	0.00	0	288
I43-24A		CONE	048:19-20	9/20/78	0	0	5.7	5.6	50	11.3	.20	0.00	0	0.00	0	282
I51-8A		CONE	052:19-20	9/20/78	0	0	6.6	3.5	65	10.1	.26	0.00	0	0.00	0	290
I55-12A		CONE	054:19-20	9/20/78	0	0	4.7	2.9	61	7.5	.27	0.00	0	0.00	0	232
L-8		CONE	IDAHO	9/01/78	0	0	6.2	4.7	56	10.9	.24	0.00	0	0.00	0	1011
W004-026		CONE	043:17-18	9/20/78	0	0	6.6	3.4	65	10.0	.24	0.00	0	0.00	0	304
W101-062		CONE	044:17-18	9/20/78	0	0	5.5	5.5	50	11.1	.25	0.00	0	0.00	0	298
W101-238		CONE	045:17-18	9/20/78	0	0	9.9	3.8	72	13.7	.25	.64	54	0.00	0	315
W203-583		CONE	029:69-70	9/15/78	0	0	4.7	1.9	71	6.6	.23	0.00	0	0.00	0	68
W204-235		CONE	317:11-15	9/19/78	0	0	3.6	2.6	58	6.2	.27	0.00	0	0.00	0	159
W404-015		CONE	029:77-78	9/15/78	0	0	7.1	3.7	65	10.8	.27	0.00	0	0.00	0	63
W404-022		CONE	029:81-82	9/15/78	0	0	6.9	4.2	61	11.1	.23	0.00	0	0.00	0	69
W404-025		CONE	029:83-84	9/15/78	0	0	8.3	5.7	59	14.0	.22	.46	70	0.00	0	64
W404-036		CONE	029:89-90	9/15/78	0	0	5.5	3.0	64	8.5	.25	0.00	0	0.00	0	65
W404-049		CONE	029:91-92	9/15/78	0	0	8.0	4.1	65	12.1	.24	0.00	0	0.00	0	76
W405-033		CONE	029:93-94	9/15/78	0	0	5.1	5.0	50	10.2	.25	0.00	0	0.00	0	81
19001	BREWERS GOLD	CONE	139:01	9/20/78	0	0	8.6	4.9	63	13.5	.25	.54	63	0.00	0	262
19001	BREWERS GOLD	CONE	150:45	9/22/78	0	0	8.1	3.7	68	11.7	.26	.62	56	0.00	0	453
19001	BREWERS GOLD	CONE	158:36	9/25/78	0	0	9.1	4.0	69	13.1	.28	.86	40	0.00	0	597
19001	BREWERS GOLD	CONE	173:43	9/26/78	0	0	6.4	3.6	64	9.9	.27	.66	53	0.00	0	723
21015	TETTNANGER	CONE	IDAHO	9/01/78	0	0	4.4	3.7	54	8.2	.30	0.00	0	0.00	0	1019
21040	COLUMBIA	CONE	IDAHO	9/01/78	0	0	8.3	4.6	64	12.9	.26	0.00	0	0.00	0	1024
21040	COLUMBIA	CONE	208:23-27	9/18/78	0	0	6.7	3.6	64	10.3	.25	.39	78	0.00	0	118
21041	WILLAMETTE	CONE	IDAHO	9/01/78	0	0	5.3	3.5	60	8.8	.31	0.00	0	0.00	0	1016
21041	WILLAMETTE	CONE	212:23-27	9/18/78	0	0	5.8	3.5	62	9.3	.28	.45	71	0.00	0	114
21042	6769-002	CONE	226:23-37	9/18/78	0	0	4.3	3.3	56	7.6	.25	.43	73	0.00	0	113
21042	6769-002	CONE	304:11-15	9/19/78	0	0	3.5	2.8	56	6.3	.27	.59	58	0.00	0	192

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
21091	6771-019	CONE	IDAHO	9/01/78	0	0	9.0	6.6	57	15.5	.26	0.00	0	0.00	0	1021
21099	6921-006	CONE	240:23-27	9/18/78	1400	112	8.0	5.8	58	13.8	.27	.43	74	0.00	0	119
21159	6818-043	CONE	053:15-16	9/20/78	0	0	4.2	7.8	35	12.0	.20	.43	73	0.00	0	286
21160	6901-140	CONE	032:17-18	9/20/78	0	0	3.8	5.4	41	9.2	.22	.46	70	0.00	0	316
21161	6903-226	CONE	036:17-18	9/20/78	0	0	3.1	6.6	32	9.7	.21	.34	85	0.00	0	243
21162	6903-263	CONE	037:17-18	9/20/78	0	0	3.4	4.2	44	7.5	.22	.36	82	0.00	0	289
21163	6907-058	CONE	039:17-18	9/20/78	0	0	5.2	7.4	41	12.6	.23	.34	84	0.00	0	216
21164	6907-077	CONE	040:17-18	9/20/78	0	0	3.2	6.5	32	9.7	.22	0.00	0	0.00	0	264
21165	6913-096	CONE	041:17-18	9/20/78	0	0	5.6	7.3	43	12.9	.23	.56	60	0.00	0	214
21166	6916-024	CONE	042:17-18	9/20/78	0	0	7.3	6.4	53	13.7	.24	.67	52	0.00	0	283
21167	HYBRID 2 INDIA	CONE	321:01-05	9/19/78	1000	78	7.8	5.9	56	13.7	.22	.36	81	0.00	0	176
30-15		CONE	IDAHO	9/01/78	0	0	7.6	3.7	67	11.3	.25	0.00	0	0.00	0	1017
31-11A		CONE	IDAHO	9/01/78	0	0	5.0	4.6	52	9.6	.26	0.00	0	0.00	0	1018
33-06		CONE	IDAHO	9/01/78	0	0	5.7	4.0	58	9.6	.25	0.00	0	0.00	0	1009
36-40		CONE	IDAHO	9/01/78	0	0	9.9	6.9	59	16.8	.25	0.00	0	0.00	0	1022
43-11		CONE	IDAHO	9/01/78	0	0	10.8	5.5	66	16.4	.25	0.00	0	0.00	0	1008
47-17		CONE	IDAHO	9/01/78	0	0	8.9	7.3	54	16.2	.25	0.00	0	0.00	0	1013
48209	FUGGLE H	CONE	139:02	9/20/78	0	0	3.2	2.0	61	5.2	.29	.44	72	0.00	0	211
48209	FUGGLE H	CONE	150:46	9/22/78	0	0	3.5	1.7	67	5.2	.33	.53	63	0.00	0	446
48209	FUGGLE H	CONE	158:37	9/25/78	0	0	3.6	1.8	66	5.5	.34	.60	57	0.00	0	586
48209	FUGGLE H	CONE	173:44	9/26/78	0	0	3.8	2.0	65	5.7	.32	.55	62	0.00	0	735
51-19A		CONE	IDAHO	9/01/78	0	0	3.1	3.6	46	6.8	.26	0.00	0	0.00	0	1020
56001	HALLERTAU	CONE	IDAHO	9/01/78	0	0	4.1	4.5	48	8.6	.28	0.00	0	0.00	0	1014
56013	CASCADE	CONE	IDAHO	9/01/78	0	0	7.8	5.9	56	13.7	.25	0.00	0	0.00	0	1012
56013	CASCADE	CONE	007:81	9/14/78	0	0	6.8	4.0	62	10.8	.25	.51	65	0.00	0	43
56013	CASCADE	CONE	028:89	9/15/78	0	0	6.8	4.1	62	10.9	.26	.53	63	0.00	0	67
62013	CONET	CONE	IDAHO	9/01/78	0	0	8.8	5.0	63	13.8	.26	0.00	0	0.00	0	1025
64100	BULLION	CONE	IDAHO	9/01/78	0	0	10.6	5.7	65	16.2	.24	0.00	0	0.00	0	1015
65101	TALISMAN	CONE	322:01-05	9/19/78	0	0	6.4	4.1	61	10.5	.25	.50	66	0.00	0	151
66052	PRIDE RINGWOOD	CONE	246:07-08	9/18/78	2000	0	7.3	6.4	53	13.7	.23	.33	85	0.00	0	111
66052	PRIDE RINGWOOD	CONE	324:01-10	9/19/78	900	45	5.1	4.2	54	9.3	.24	.42	74	0.00	0	167
66054	CALICROSS	CONE	248:07-08	9/18/78	2400	100	4.2	3.7	53	7.9	.23	.31	89	0.00	0	106
66056	SMOOTHCONE	CONE	244:09-10	9/18/78	1600	0	7.0	5.1	58	12.0	.25	.41	75	0.00	0	121
6761-016		CONE	205:23-27	9/18/78	1800	79	4.4	2.5	63	6.9	.28	.37	81	0.00	0	138
6771-021		CONE	236:12-16	9/18/78	2000	83	4.2	2.8	60	6.9	.26	.56	60	0.00	0	133

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
6771-021	CONE	313:11-15	9/19/78	2600	115	4.4	3.4	56	7.8	.32	.51	65	0.00	0	179
6903-107	CONE	314:11-15	9/19/78	2400	62	2.6	3.2	44	5.8	.27	.33	86	0.00	0	166
7002-024	CONE	031:07-08	9/20/78	0	0	7.4	4.0	64	11.4	.28	0.00	0	0.00	0	237
7003-003	CONE	212:12-16	9/18/78	1800	87	4.8	5.3	47	10.2	.24	0.00	0	0.00	0	136
7003-003	CONE	318:11-15	9/19/78	1800	64	3.6	4.0	47	7.6	.27	0.00	0	0.00	0	175
7003-004	CONE	032:07-08	9/20/78	0	0	5.9	5.4	52	11.2	.23	0.00	0	0.00	0	302
7003-015	CONE	213:12-16	9/18/78	1400	93	6.7	3.0	69	9.6	.26	0.00	0	0.00	0	140
7003-029	CONE	032:19-20	9/20/78	0	0	2.2	10.1	17	12.3	.20	0.00	0	0.00	0	227
7003-032	CONE	222:12-16	9/18/78	2000	118	5.9	2.6	69	8.5	.25	0.00	0	0.00	0	128
7003-032	CONE	321:11-15	9/19/78	0	0	6.5	3.0	68	9.5	.25	0.00	0	0.00	0	186
7003-038	CONE	227:12-16	9/18/78	1400	66	4.8	5.5	46	10.3	.22	0.00	0	0.00	0	130
7003-046	CONE	033:07-08	9/20/78	0	0	7.1	4.3	62	11.4	.24	.57	60	0.00	0	269
7003-052	CONE	033:19-20	9/20/78	0	0	1.9	9.7	16	11.6	.22	0.00	0	0.00	0	259
7003-066	CONE	229:12-16	9/18/78	2000	88	4.4	4.7	48	9.1	.27	0.00	0	0.00	0	126
7003-075	CONE	230:12-16	9/18/78	1800	113	6.3	5.3	54	11.6	.24	0.00	0	0.00	0	135
7003-075	CONE	324:11-15	9/19/78	1800	115	6.4	4.7	58	11.1	.24	0.00	0	0.00	0	180
7003-079	CONE	231:12-16	9/18/78	1600	70	4.4	6.1	41	10.5	.23	0.00	0	0.00	0	139
7003-081	CONE	233:12-16	9/18/78	1800	70	3.9	4.8	44	8.8	.23	0.00	0	0.00	0	131
7003-081	CONE	326:11-15	9/19/78	2400	95	4.0	4.7	45	8.7	.25	0.00	0	0.00	0	174
7003-114	CONE	034:07-08	9/20/78	0	0	2.3	3.2	42	5.5	.23	0.00	0	0.00	0	241
7003-118	CONE	035:07-08	9/20/78	0	0	2.2	6.9	24	9.0	.23	0.00	0	0.00	0	325
7003-121	CONE	036:07-08	9/20/78	0	0	4.9	2.9	63	7.8	.25	0.00	0	0.00	0	309
7003-154	CONE	038:07-08	9/20/78	0	0	7.3	6.6	52	13.9	.23	0.00	0	0.00	0	321
7003-176	CONE	202:17-21	9/18/78	1600	106	6.7	7.0	48	13.7	.23	0.00	0	0.00	0	124
7003-176	CONE	330:11-15	9/19/78	1800	100	5.6	6.6	45	12.2	.22	0.00	0	0.00	0	193
7003-243	CONE	IDAHO	9/01/78	0	0	4.5	6.6	40	11.1	.21	0.00	0	0.00	0	998
7003-250	CONE	205:17-21	9/18/78	2000	144	7.2	5.2	58	12.4	.23	0.00	0	0.00	0	127
7003-284	CONE	210:17-21	9/18/78	0	0	3.3	7.3	30	10.6	.22	0.00	0	0.00	0	132
7003-287	CONE	041:07-08	9/20/78	0	0	6.5	5.4	54	11.9	.27	0.00	0	0.00	0	220
7003-306	CONE	043:07-08	9/20/78	0	0	4.5	4.3	51	8.8	.29	0.00	0	0.00	0	328
7004-003	CONE	IDAHO	9/01/78	0	0	3.9	2.7	59	6.6	.29	0.00	0	0.00	0	1004
7004-003	CONE	212:17-21	9/18/78	2200	205	9.3	4.6	67	13.9	.31	0.00	0	0.00	0	141
7004-075	CONE	221:17-21	9/18/78	1600	151	9.5	3.5	72	13.0	.27	0.00	0	0.00	0	123
7004-138	CONE	034:19-20	9/20/78	0	0	4.6	9.3	33	13.9	.22	0.00	0	0.00	0	270
7005-002	CONE	035:19-20	9/20/78	0	0	6.8	4.5	60	11.3	.23	0.00	0	0.00	0	296

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL MLS/ 100G	COF	SERIAL NUMBER
7005-006	CONE	308:16-20	9/19/78	0	0	5.7	4.8	54	10.5	.24	0.00	0	0.00	0	191
7005-008	CONE	036:19-20	9/20/78	0	0	7.4	5.1	59	12.4	.21	0.00	0	0.00	0	246
7005-040	CONE	310:16-20	9/19/78	2400	107	4.5	2.6	62	7.1	.30	0.00	0	0.00	0	177
7005-070	CONE	IDAHO	9/01/78	0	0	4.0	3.1	55	7.1	.27	0.00	0	0.00	0	1003
7005-070	CONE	238:17-21	9/18/78	2000	127	6.4	4.6	57	11.0	.28	0.00	0	0.00	0	137
7005-072	CONE	IDAHO	9/01/78	0	0	11.9	7.1	62	19.1	.22	0.00	0	0.00	0	988
7005-087	CONE	IDAHO	9/01/78	0	0	9.1	3.1	74	12.1	.25	0.00	0	0.00	0	1000
7005-087	CONE	314:16-20	9/19/78	0	0	2.6	1.3	67	3.9	.31	0.00	0	0.00	0	171
7005-113	CONE	046:07-08	9/20/78	0	0	9.3	7.6	54	16.9	.26	0.00	0	0.00	0	242
7005-123	CONE	047:07-08	9/20/78	0	0	10.7	6.1	63	16.8	.25	0.00	0	0.00	0	238
7005-149	CONE	311:16-20	9/19/78	0	0	3.8	1.4	72	5.3	.27	0.00	0	0.00	0	182
7005-149	CONE	048:07-08	9/20/78	0	0	8.6	3.3	72	11.9	.22	0.00	0	0.00	0	247
7005-182	CONE	207:23-27	9/18/78	1400	103	7.4	4.7	61	12.0	.26	0.00	0	0.00	0	134
7005-183	CONE	050:07-08	9/20/78	0	0	5.2	2.7	66	7.9	.28	0.00	0	0.00	0	231
7005-194	CONE	IDAHO	9/01/78	0	0	11.5	4.2	73	15.7	.25	0.00	0	0.00	0	992
7005-201	CONE	IDAHO	9/01/78	0	0	8.0	5.3	60	13.3	.23	0.00	0	0.00	0	994
7005-201	CONE	209:23-27	9/18/78	1800	108	6.0	5.1	54	11.1	.25	0.00	0	0.00	0	125
7005-205	CONE	IDAHO	9/01/78	0	0	12.2	5.6	68	17.8	.23	0.00	0	0.00	0	1002
7005-205	CONE	210:23-27	9/18/78	1600	85	5.4	3.5	60	8.9	.25	0.00	0	0.00	0	129
7005-232	CONE	IDAHO	9/01/78	0	0	6.1	4.2	58	10.3	.26	0.00	0	0.00	0	991
7005-232	CONE	211:23-27	9/18/78	1800	114	6.4	2.8	69	9.2	.28	0.00	0	0.00	0	108
7006-031	CONE	329:16-20	9/19/78	0	0	12.4	4.8	71	17.2	.22	0.00	0	0.00	0	185
7006-055	CONE	052:07-08	9/20/78	0	0	6.1	10.4	36	16.4	.21	0.00	0	0.00	0	284
7006-061	CONE	IDAHO	9/01/78	0	0	2.1	.7	73	2.8	.43	0.00	0	0.00	0	999
7006-074	CONE	IDAHO	9/01/78	0	0	11.4	6.2	64	17.6	.25	0.00	0	0.00	0	990
7006-074	CONE	053:07-08	9/20/78	0	0	8.5	4.1	67	12.6	.26	0.00	0	0.00	0	203
7006-092	CONE	IDAHO	9/01/78	0	0	7.7	5.5	58	13.3	.26	0.00	0	0.00	0	1007
7006-095	CONE	054:07-08	9/20/78	0	0	8.9	5.1	63	13.9	.26	0.00	0	0.00	0	208
7006-170	CONE	032:09-10	9/20/78	0	0	6.2	4.8	56	11.0	.23	0.00	0	0.00	0	209
7006-229	CONE	035:09-10	9/20/78	0	0	9.3	7.2	56	16.5	.27	0.00	0	0.00	0	278
7006-237	CONE	037:09-10	9/20/78	0	0	5.9	4.4	57	10.3	.24	0.00	0	0.00	0	324
7006-273, aroma, v.g.	CONE	IDAHO	9/01/78	0	0	6.0	1.9	76	7.8	.33	0.00	0	0.00	0	1006
7006-273	CONE	039:09-10	9/20/78	0	0	10.2	3.4	75	13.5	.25	0.00	0	0.00	0	223
7006-273	CONE	325:16-20	9/19/78	1400	103	7.4	1.9	79	9.3	.30	0.00	0	0.00	0	183
7006-276	CONE	040:09-10	9/20/78	0	0	8.2	4.3	65	12.5	.24	0.00	0	0.00	0	239

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
7006-278	CONE	224:23-27	9/18/78	0	0	8.0	3.1	72	11.1	.26	0.00	0	0.00	0	110
7006-279	CONE	041:09-10	9/20/78	0	0	6.9	3.6	65	10.4	.27	0.00	0	0.00	0	205
7006-282	CONE	042:09-10	9/20/78	0	0	7.6	6.1	55	13.7	.23	0.00	0	0.00	0	199
7006-296	CONE	230:23-27	9/18/78	2200	217	9.9	5.1	65	15.0	.25	0.00	0	0.00	0	117
7006-311	CONE	IDAHO	9/01/78	0	0	12.5	5.6	69	18.2	.24	0.00	0	0.00	0	995
7006-311	CONE	IDAHO,OBE	9/18/78	0	0	12.1	4.4	73	16.6	.24	0.00	0	0.00	0	1027
7006-321	CONE	044:09-10	9/20/78	0	0	6.6	1.9	77	8.5	.30	0.00	0	0.00	0	248
7006-326	CONE	045:09-10	9/20/78	0	0	7.2	6.4	53	13.6	.23	0.00	0	0.00	0	195
7006-330	CONE	047:09-10	9/20/78	0	0	8.8	5.2	62	13.9	.23	0.00	0	0.00	0	254
7006-331	CONE	048:09-10	9/20/78	0	0	7.7	3.9	66	11.6	.27	0.00	0	0.00	0	225
7006-344	CONE	050:09-10	9/20/78	0	0	7.7	8.0	49	15.7	.26	0.00	0	0.00	0	207
7006-353	CONE	051:09-10	9/20/78	0	0	11.2	8.4	57	19.6	.25	0.00	0	0.00	0	210
7006-370	CONE	242:23-27	9/18/78	0	0	8.0	9.1	46	17.0	.22	0.00	0	0.00	0	107
7006-382	CONE	IDAHO	9/01/78	0	0	5.3	2.1	71	7.4	.31	0.00	0	0.00	0	997
7006-382	CONE	052:09-10	9/20/78	0	0	7.2	3.1	70	10.3	.29	0.00	0	0.00	0	224
7006-406	CONE	209:28-32	9/18/78	1600	120	7.5	3.0	71	10.5	.27	0.00	0	0.00	0	120
7006-408	CONE	210:28-32	9/18/78	2400	192	8.0	3.9	67	12.0	.27	0.00	0	0.00	0	115
7006-426	CONE	031:11-12	9/20/78	0	0	12.9	3.7	77	16.6	.25	0.00	0	0.00	0	300
7006-428	CONE	032:11-12	9/20/78	0	0	5.7	1.7	76	7.4	.27	0.00	0	0.00	0	306
7006-442	CONE	033:11-12	9/20/78	0	0	7.7	3.8	67	11.5	.30	0.00	0	0.00	0	293
7006-444	CONE	034:11-12	9/20/78	0	0	7.8	5.4	59	13.3	.24	0.00	0	0.00	0	277
7006-445	CONE	IDAHO	9/01/78	0	0	8.6	7.4	53	16.0	.23	0.00	0	0.00	0	996
7006-450	CONE	IDAHO	9/01/78	0	0	9.4	4.6	67	14.0	.25	0.00	0	0.00	0	993
7006-456	CONE	216:28-32	9/18/78	1800	0	4.5	3.6	55	8.0	.23	0.00	0	0.00	0	122
7006-463	CONE	035:11-12	9/20/78	0	0	10.7	5.7	65	16.4	.24	0.00	0	0.00	0	323
7006-465	CONE	036:11-12	9/20/78	0	0	6.9	4.3	61	11.2	.22	0.00	0	0.00	0	287
7006-477	CONE	037:11-12	9/20/78	0	0	8.6	4.6	65	13.2	.23	0.00	0	0.00	0	297
7007-003	CONE	038:19-20	9/20/78	0	0	1.2	1.0	54	2.3	.35	0.00	0	0.00	0	274
7007-009	CONE	039:19-20	9/20/78	0	0	3.6	2.8	56	6.4	.29	0.00	0	0.00	0	202
7007-019	CONE	038:11-12	9/20/78	0	0	5.7	1.6	78	7.2	.25	0.00	0	0.00	0	244
7007-060	CONE	316:21-25	9/19/78	0	0	4.7	3.9	54	8.6	.30	0.00	0	0.00	0	188
7007-097	CONE	040:11-12	9/20/78	0	0	3.0	2.0	59	5.1	.34	0.00	0	0.00	0	308
7007-137	CONE	041:11-12	9/20/78	0	0	6.0	4.5	57	10.5	.24	0.00	0	0.00	0	218
7007-162	CONE	042:11-12	9/20/78	0	0	9.7	3.7	72	13.4	.25	0.00	0	0.00	0	305
7007-175	CONE	223:28-32	9/18/78	2200	142	6.5	3.3	66	9.8	.32	0.00	0	0.00	0	116

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/ 100G	COF	SERIAL NUMBER
7007-206	CONE	IDAHO	9/01/78	0	0	6.6	3.9	62	10.5	.29	0.00	0	0.00	0	1005
7007-206	CONE	230:28-32	9/18/78	1500	71	4.8	1.9	71	6.6	.32	0.00	0	0.00	0	112
7007-206	CONE	318:21-25	9/19/78	1800	102	5.7	3.6	61	9.3	.26	0.00	0	0.00	0	190
7007-229	CONE	045:11-12	9/20/78	0	0	3.0	1.8	63	4.8	.29	0.00	0	0.00	0	303
7007-255	CONE	046:11-12	9/20/78	0	0	5.4	3.4	61	8.8	.31	0.00	0	0.00	0	326
7007-262	CONE	047:11-12	9/20/78	0	0	7.2	3.8	65	10.9	.24	0.00	0	0.00	0	272
7007-281	CONE	IDAHO	9/01/78	0	0	4.6	3.2	58	7.8	.28	0.00	0	0.00	0	989
7007-324	CONE	051:11-12	9/20/78	0	0	6.3	5.1	55	11.3	.25	0.00	0	0.00	0	261
7007-339	CONE	IDAHO	9/01/78	0	0	11.8	8.2	59	20.0	.25	0.00	0	0.00	0	1001
7007-339	CONE	241:28-32	9/18/78	1600	189	11.8	5.3	69	17.1	.25	0.00	0	0.00	0	109
7101-098	CONE	310:26-30	9/19/78	1800	73	4.1	3.1	57	7.1	.32	0.00	0	0.00	0	165
7102-012	CONE	309:06-10	9/19/78	1600	58	3.6	2.5	59	6.2	.30	0.00	0	0.00	0	178
7301-001	CONE	322:26-30	9/19/78	1200	38	3.2	2.1	60	5.3	.32	0.00	0	0.00	0	189
7301-008	CONE	031:23-24	9/20/78	0	0	5.3	1.5	78	6.8	.28	0.00	0	0.00	0	258
7301-009	CONE	032:23-24	9/21/78	0	0	10.4	2.8	78	13.2	.28	0.00	0	0.00	0	374
7301-126	CONE	033:23-24	9/21/78	0	0	12.2	4.0	75	16.2	.27	0.00	0	0.00	0	379
7301-139	CONE	034:23-24	9/21/78	0	0	10.6	3.3	76	13.9	.33	0.00	0	0.00	0	380
7302-037	CONE	035:23-24	9/21/78	0	0	6.5	1.9	77	8.4	.29	0.00	0	0.00	0	375
7302-041	CONE	036:23-24	9/21/78	0	0	6.5	3.6	63	10.1	.38	0.00	0	0.00	0	377
7302-113	CONE	037:23-14	9/21/78	0	0	9.0	3.3	73	12.3	.28	0.00	0	0.00	0	381
7302-146	CONE	327:26-30	9/19/78	1200	105	8.8	3.9	69	12.7	.23	0.00	0	0.00	0	181
7302-172	CONE	038:23-24	9/21/78	0	0	7.0	3.4	67	10.4	.29	0.00	0	0.00	0	385
7302-178	CONE	039:23-24	9/21/78	0	0	6.1	3.2	65	9.3	.34	0.00	0	0.00	0	396
7303-007	CONE	139:03	9/20/78	0	0	8.0	2.7	74	10.7	.29	0.00	0	0.00	0	263
7303-007	CONE	140:24	9/20/78	0	0	10.4	3.5	74	13.9	.27	0.00	0	0.00	0	322
7303-007	CONE	141:42	9/21/78	0	0	7.4	2.4	75	9.8	.32	0.00	0	0.00	0	372
7303-007	CONE	173:48	9/26/78	0	0	9.2	3.1	75	12.2	.29	0.00	0	0.00	0	715
7303-122	CONE	040:23-24	9/21/78	0	0	9.9	4.0	71	13.9	.33	0.00	0	0.00	0	388
7303-197	CONE	041:23-24	9/21/78	0	0	6.7	2.4	73	9.2	.31	0.00	0	0.00	0	387
7303-200	CONE	042:23-24	9/21/78	0	0	5.4	5.1	51	10.5	.30	0.00	0	0.00	0	378
7304-010	CONE	043:23-24	9/21/78	0	0	8.5	3.2	72	11.7	.30	0.00	0	0.00	0	382
7304-036	CONE	044:23-24	9/21/78	0	0	11.9	3.7	76	15.6	.31	0.00	0	0.00	0	383
7304-107	CONE	045:23-24	9/21/78	0	0	9.7	2.2	81	11.9	.27	0.00	0	0.00	0	384
7305-005	CONE	047:23-24	9/21/78	0	0	9.1	4.8	65	13.9	.27	0.00	0	0.00	0	376
7305-152	CONE	049:23-24	9/21/78	0	0	6.7	4.3	61	11.0	.32	0.00	0	0.00	0	386

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/ 100G	COF	SERIAL NUMBER
7306-005	CONE	330:26-30	9/19/78	600	52	8.8	4.6	65	13.3	.25	0.00	0	0.00	0	187
7306-008	CONE	050:23-24	9/21/78	0	0	7.5	2.6	73	10.1	.31	0.00	0	0.00	0	391
7306-030	CONE	051:23-24	9/21/78	0	0	7.4	2.7	73	10.1	.32	0.00	0	0.00	0	389
7306-040	CONE	301:31-35	9/19/78	0	0	4.0	1.7	70	5.7	.29	0.00	0	0.00	0	163
7306-042	CONE	302:31-35	9/19/78	400	33	8.3	3.6	69	11.9	.28	0.00	0	0.00	0	173
7306-043	CONE	303:31-35	9/19/78	1000	68	6.8	2.4	73	9.2	.31	0.00	0	0.00	0	172
7306-044	CONE	304:31-35	9/19/78	0	0	3.5	1.1	76	4.6	.36	0.00	0	0.00	0	156
7306-091	CONE	305-31-35	9/19/78	1000	59	6.0	1.9	76	7.8	.33	0.00	0	0.00	0	152
7306-097	CONE	054:23-24	9/21/78	0	0	6.0	2.0	74	8.0	.34	0.00	0	0.00	0	390
7306-098	CONE	055:23-24	9/21/78	0	0	5.4	1.5	78	6.9	.33	0.00	0	0.00	0	410
7306-163	CONE	032:25-26	9/21/78	0	0	7.6	3.4	69	10.9	.29	0.00	0	0.00	0	426
7306-172	CONE	033:25-26	9/21/78	0	0	7.0	2.3	75	9.2	.30	0.00	0	0.00	0	397
7306-174	CONE	034:25-26	9/21/78	0	0	3.6	1.5	71	5.1	.36	0.00	0	0.00	0	398
7306-182	CONE	308:31-35	9/19/78	1200	95	8.0	5.0	61	13.0	.24	0.00	0	0.00	0	160
7306-190	CONE	035:25-26	9/21/78	0	0	8.6	3.9	68	12.6	.26	0.00	0	0.00	0	392
7306-193	CONE	036:25-26	9/21/78	0	0	7.3	2.4	75	9.7	.31	0.00	0	0.00	0	399
7306-194	CONE	037:25-26	9/21/78	0	0	5.7	3.0	65	8.7	.42	0.00	0	0.00	0	395
7307-030	CONE	038:25-26	9/21/78	0	0	7.6	2.8	73	10.4	.34	0.00	0	0.00	0	400
7307-037	CONE	039:25-26	9/21/78	0	0	4.6	1.7	72	6.3	.36	0.00	0	0.00	0	393
7307-043	CONE	040:25-26	9/21/78	0	0	7.4	3.2	69	10.5	.28	0.00	0	0.00	0	412
7307-051	CONE	310:31-35	9/19/78	400	26	6.6	2.0	76	8.5	.32	0.00	0	0.00	0	161
7307-052	CONE	041:25-26	9/21/78	0	0	5.0	2.5	66	7.5	.32	0.00	0	0.00	0	411
7308-048	CONE	312:31-35	9/19/78	400	17	4.3	1.6	72	6.0	.31	0.00	0	0.00	0	157
7308-061	CONE	042:25-26	9/21/78	0	0	6.8	3.9	63	10.8	.31	0.00	0	0.00	0	404
7308-064	CONE	043:25-26	9/21/78	0	0	7.3	3.3	69	10.6	.28	0.00	0	0.00	0	394
7309-048	CONE	044:25-26	9/21/78	0	0	6.4	2.8	69	9.1	.36	0.00	0	0.00	0	401
7309-068	CONE	046:25-26	9/21/78	0	0	7.8	3.3	70	11.1	.35	0.00	0	0.00	0	408
7310-027	CONE	047:25-26	9/21/78	0	0	5.3	2.1	71	7.4	.28	0.00	0	0.00	0	407
7310-029	CONE	048:25-26	9/21/78	0	0	5.6	3.5	61	9.1	.33	0.00	0	0.00	0	402
7311-022	CONE	049:25-26	9/21/78	0	0	8.0	3.5	69	11.4	.31	0.00	0	0.00	0	414
7311-028	CONE	050:25-26	9/21/78	0	0	14.3	4.1	77	18.4	.26	0.00	0	0.00	0	413
7311-056	CONE	051:25-26	9/21/78	0	0	9.1	3.2	73	12.3	.32	0.00	0	0.00	0	403
7311-066	CONE	316:31-35	9/19/78	1200	92	7.7	6.0	56	13.7	.24	0.00	0	0.00	0	155
7311-068	CONE	317:31-35	9/19/78	400	52	13.1	3.9	77	17.0	.27	0.00	0	0.00	0	153
7311-078	CONE	318:31-35	9/20/78	600	53	8.9	2.4	78	11.3	.27	0.00	0	0.00	0	146

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
7311-095	CONE	319:31-35	9/20/78	1200	134	11.2	3.1	78	14.3	.29	0.00	0	0.00	0	148
7311-108	CONE	320:31-35	9/20/78	800	91	11.4	3.5	76	14.9	.26	0.00	0	0.00	0	147
7312-006	CONE	323:31-35	9/20/78	0	0	6.3	3.8	62	10.1	.29	0.00	0	0.00	0	150
7312-023	CONE	326:31-35	9/20/78	800	57	7.2	3.3	68	10.5	.28	0.00	0	0.00	0	149
7312-036	CONE	143:07	9/22/78	0	0	12.6	3.4	78	16.0	.28	0.00	0	0.00	0	502
7312-036	CONE	144:25	9/22/78	0	0	13.0	3.4	79	16.4	.29	0.00	0	0.00	0	579
7312-036	CONE	147:50	9/22/78	0	0	13.3	4.4	75	17.6	.28	0.00	0	0.00	0	542
7312-042	CONE	150:10	9/22/78	0	0	6.6	2.2	75	8.9	.35	0.00	0	0.00	0	460
7312-042	CONE	150:23	9/22/78	0	0	5.8	1.8	76	7.6	.34	0.00	0	0.00	0	459
7312-042	CONE	150:34	9/22/78	0	0	7.9	2.5	75	10.4	.34	0.00	0	0.00	0	452
7312-042	CONE	173:50	9/26/78	0	0	7.2	2.3	76	9.5	.33	0.00	0	0.00	0	714
7312-042	CONE	324:06-10	9/19/78	0	0	8.0	2.5	75	10.5	.32	0.00	0	0.00	0	164
7312-044	CONE	053:23-24	9/21/78	0	0	9.1	2.5	78	11.6	.29	0.00	0	0.00	0	406
7312-051	CONE	054:25-26	9/21/78	0	0	11.7	3.5	77	15.2	.29	0.00	0	0.00	0	409
7312-053	CONE	055:25-26	9/21/78	0	0	9.3	2.8	76	12.1	.29	0.00	0	0.00	0	405
7312-057	CONE	031:27-28	9/21/78	0	0	9.7	2.1	82	11.8	.30	0.00	0	0.00	0	431
7312-060	CONE	032:27-28	9/21/78	0	0	6.5	1.8	78	8.2	.32	0.00	0	0.00	0	428
7312-078	CONE	329:31-35	9/20/78	600	52	8.8	5.3	62	14.1	.27	0.00	0	0.00	0	145
7312-081	CONE	033:27-28	9/21/78	0	0	8.0	1.9	81	9.9	.33	0.00	0	0.00	0	423
7312-083	CONE	150:47	9/22/78	0	0	8.9	2.3	79	11.3	.33	0.00	0	0.00	0	449
7312-083	CONE	154:07	9/24/78	0	0	10.0	2.9	77	12.9	.34	0.00	0	0.00	0	625
7312-083	CONE	154:07	9/25/78	0	0	10.2	2.6	79	12.8	.32	0.00	0	0.00	0	668
7312-083	CONE	157:37	9/25/78	0	0	11.1	2.9	79	14.0	.31	0.00	0	0.00	0	599
7312-083	CONE	173:51	9/26/78	0	0	10.6	3.0	77	13.5	.32	0.00	0	0.00	0	716
7312-084	CONE	034:27-28	9/21/78	0	0	11.0	3.3	76	14.3	.28	0.00	0	0.00	0	430
7312-106	CONE	035:27-28	9/21/78	0	0	8.9	2.9	75	11.8	.32	0.00	0	0.00	0	429
7312-115	CONE	036:27-28	9/21/78	0	0	9.1	2.6	77	11.7	.32	0.00	0	0.00	0	425
7312-116	CONE	037:27-28	9/21/78	0	0	8.2	2.1	79	10.3	.30	0.00	0	0.00	0	422
7312-124	CONE	039:27-28	9/21/78	0	0	8.3	2.4	77	10.8	.30	0.00	0	0.00	0	427
7312-128	CONE	040:27-28	9/21/78	0	0	10.1	2.2	82	12.3	.29	0.00	0	0.00	0	424
7312-133	CONE	041:27-28	9/21/78	0	0	7.6	2.1	78	9.7	.34	0.00	0	0.00	0	421
7312-134 control	CONE	158:41	9/25/78	0	0	8.7	2.3	79	10.9	.31	0.00	0	0.00	0	585
7312-134 control	CONE	161:25	9/25/78	0	0	6.9	2.0	77	8.9	.28	0.00	0	0.00	0	695
7312-134	CONE	164:15	9/26/78	0	0	9.7	2.4	80	12.1	.28	0.00	0	0.00	0	795
7312-134	CONE	173:52	9/26/78	0	0	4.4	1.4	75	5.8	.34	0.00	0	0.00	0	719

AT 8 % MOISTURE CONTENT (BALE) OR AS IS BASIS (CONE)

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7313-028	CONE	042:27-28	9/21/78	0	0	8.6	3.3	72	11.9	.34	0.00	0	0.00	0	420
7313-041	CONE	043:27-28	9/21/78	0	0	11.2	3.7	75	15.0	.32	0.00	0	0.00	0	419
7313-092	CONE	337:01-05	9/19/78	1400	88	6.3	6.5	49	12.8	.28	0.00	0	0.00	0	168
7313-111	CONE	044:27-28	9/21/78	0	0	9.9	4.6	68	14.4	.30	0.00	0	0.00	0	415
7314-011	CONE	339:01-05	9/19/78	1000	88	8.9	3.4	72	12.2	.29	0.00	0	0.00	0	170
7314-012	CONE	167:26	9/26/78	0	0	14.8	5.4	73	20.3	.29	0.00	0	0.00	0	825
7314-012	CONE	171:31	9/26/78	0	0	13.3	5.3	71	18.6	.27	0.00	0	0.00	0	853
7314-012	CONE	173:53	9/26/78	0	0	12.9	6.2	67	19.2	.26	0.00	0	0.00	0	720
7314-033	CONE	045:27-28	9/21/78	0	0	9.8	4.3	69	14.1	.29	0.00	0	0.00	0	416
7314-044	CONE	341:01-05	9/19/78	800	89	11.2	3.8	74	15.0	.26	0.00	0	0.00	0	154
7314-058	CONE	342:01-05	9/19/78	800	68	8.6	5.8	59	14.4	.27	0.00	0	0.00	0	158
7315-001	CONE	047:27-28	9/21/78	0	0	7.9	2.0	79	9.9	.30	0.00	0	0.00	0	418
7315-035	CONE	049:27-28	9/21/78	0	0	11.8	3.3	78	15.0	.28	0.00	0	0.00	0	417
7319-029	CONE	332:01-05	9/19/78	0	0	8.8	4.3	67	13.1	.30	0.00	0	0.00	0	184
7504-009	CONE	007:91	9/14/78	0	0	5.5	5.4	50	10.9	.23	0.00	0	0.00	0	42
7504-033	CONE	008:81	9/14/78	0	0	3.6	2.6	58	6.2	.27	.45	71	0.00	0	48
7504-045	CONE	008:93	9/14/78	0	0	7.9	3.1	71	11.0	.27	0.00	0	0.00	0	55
7504-068	CONE	009:82	9/14/78	0	0	4.4	2.4	64	6.8	.30	0.00	0	0.00	0	58
7504-111	CONE	010:91	9/14/78	0	0	7.8	5.6	57	13.4	.24	.45	71	0.00	0	53
7504-145	CONE	011:91	9/14/78	0	0	8.4	3.9	68	12.3	.25	0.00	0	0.00	0	52
7504-178	CONE	012:90	9/14/78	0	0	7.0	3.9	64	10.9	.27	0.00	0	0.00	0	59
7504-180	CONE	012:92	9/14/78	0	0	5.2	3.5	59	8.7	.25	0.00	0	0.00	0	41
7504-184	CONE	013:62	9/14/78	0	0	5.1	3.4	60	8.5	.25	0.00	0	0.00	0	44
7504-188	CONE	013:66	9/14/78	0	0	5.5	2.6	68	8.1	.27	0.00	0	0.00	0	54
7504-201	CONE	013:79	9/14/78	0	0	4.8	3.3	59	8.1	.27	0.00	0	0.00	0	51
7504-216	CONE	013:94	9/14/78	0	0	8.5	4.4	66	12.8	.23	.30	90	0.00	0	49
7504-235	CONE	014:79	9/14/78	0	0	3.6	3.4	50	7.0	.29	0.00	0	0.00	0	47
7504-243	CONE	014:87	9/14/78	0	0	4.1	2.4	63	6.4	.27	0.00	0	0.00	0	46
7504-266	CONE	015:76	9/14/78	0	0	3.0	4.0	43	7.0	.27	0.00	0	0.00	0	56
7505-003	CONE	015:81	9/14/78	0	0	5.2	5.3	49	10.5	.27	0.00	0	0.00	0	50
7505-006	CONE	015:84	9/14/78	0	0	4.4	3.2	57	7.6	.27	0.00	0	0.00	0	57
7505-033	CONE	016:77	9/14/78	0	0	4.7	5.4	46	10.1	.23	.38	79	0.00	0	45
7506-011	CONE	017:68	9/15/78	0	0	5.5	2.2	71	7.7	.26	0.00	0	0.00	0	74
7506-072	CONE	019:61	9/15/78	0	0	8.8	3.8	69	12.6	.25	.51	65	0.00	0	77
7506-131	CONE	020:86	9/15/78	0	0	7.0	4.4	61	11.4	.25	.34	84	0.00	0	78

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL MLS/ 100G	COF	SERIAL NUMBER
7506-165	CONE	021:86	9/15/78	0	0	6.5	2.4	73	8.9	.25	0.00	0	0.00	0	73
7506-173	CONE	021:94	9/15/78	0	0	3.7	8.9	29	12.5	.26	0.00	0	0.00	0	80
7506-226	CONE	023:79	9/15/78	0	0	5.9	2.5	70	8.4	.24	0.00	0	0.00	0	70
7507-055	CONE	026:71	9/15/78	0	0	6.7	2.9	69	9.7	.30	0.00	0	0.00	0	79
7507-057	CONE	026:73	9/15/78	0	0	3.9	2.9	57	6.8	.28	0.00	0	0.00	0	71
7507-060	CONE	026:76	9/15/78	0	0	6.5	5.5	54	12.0	.21	0.00	0	0.00	0	66
7507-061	CONE	026:77	9/15/78	0	0	4.6	4.0	53	8.6	.26	0.00	0	0.00	0	72
7507-065	CONE	026:81	9/15/78	0	0	5.0	3.3	60	8.3	.30	0.00	0	0.00	0	75
7601-001	CONE	139:07	9/20/78	0	0	10.0	3.8	72	13.8	.27	0.00	0	0.00	0	217
7601-003	CONE	139:09	9/20/78	0	0	8.2	2.3	78	10.5	.32	0.00	0	0.00	0	260
7601-005	CONE	139:11	9/20/78	0	0	5.0	2.1	70	7.1	.32	0.00	0	0.00	0	196
7601-006	CONE	139:12	9/20/78	0	0	9.9	1.8	84	11.7	.31	0.00	0	0.00	0	299
7601-007	CONE	139:13	9/20/78	0	0	5.3	2.1	71	7.4	.32	0.00	0	0.00	0	266
7601-008	CONE	139:14	9/20/78	0	0	5.6	2.3	70	7.9	.30	0.00	0	0.00	0	194
7601-009	CONE	139:15	9/20/78	0	0	5.4	4.3	55	9.7	.24	0.00	0	0.00	0	317
7601-011	CONE	139:17	9/20/78	0	0	4.3	1.9	69	6.1	.31	0.00	0	0.00	0	280
7601-012	CONE	139:18	9/20/78	0	0	10.1	3.2	76	13.3	.29	0.00	0	0.00	0	226
7601-014	CONE	139:20	9/20/78	0	0	5.5	2.9	65	8.4	.27	0.00	0	0.00	0	314
7601-015	CONE	139:21	9/20/78	0	0	4.3	3.7	53	8.0	.23	0.00	0	0.00	0	213
7601-016	CONE	139:22	9/20/78	0	0	9.2	2.7	76	11.9	.31	0.00	0	0.00	0	318
7601-020	CONE	139:26	9/20/78	0	0	5.3	1.5	78	6.8	.30	0.00	0	0.00	0	312
7601-021	CONE	139:27	9/20/78	0	0	3.4	2.0	63	5.4	.39	0.00	0	0.00	0	198
7601-022	CONE	139:28	9/20/78	0	0	10.9	2.3	82	13.2	.27	0.00	0	0.00	0	273
7601-023	CONE	139:29	9/20/78	0	0	3.5	1.6	69	5.1	.27	0.00	0	0.00	0	234
7601-025	CONE	139:31	9/20/78	0	0	10.2	3.8	73	14.0	.30	0.00	0	0.00	0	276
7601-030	CONE	139:36	9/20/78	0	0	3.6	1.4	72	5.0	.38	0.00	0	0.00	0	200
7601-032	CONE	139:38	9/20/78	0	0	5.4	3.4	60	8.8	.29	0.00	0	0.00	0	197
7601-033	CONE	139:39	9/20/78	0	0	7.2	2.1	77	9.2	.33	0.00	0	0.00	0	301
7601-034	CONE	139:40	9/20/78	0	0	8.7	3.9	69	12.6	.24	0.00	0	0.00	0	253
7601-035	CONE	139:41	9/20/78	0	0	8.3	2.5	77	10.7	.29	0.00	0	0.00	0	201
7601-036	CONE	139:42	9/20/78	0	0	3.3	2.6	55	5.8	.30	0.00	0	0.00	0	281
7601-037	CONE	139:43	9/20/78	0	0	3.6	1.8	66	5.4	.31	0.00	0	0.00	0	222
7601-039	CONE	139:45	9/20/78	0	0	7.8	2.3	76	10.1	.25	0.00	0	0.00	0	250
7601-044	CONE	139:50	9/20/78	0	0	7.3	3.6	66	10.9	.24	0.00	0	0.00	0	307
7601-045	CONE	139:51	9/20/78	0	0	9.9	3.6	73	13.5	.25	0.00	0	0.00	0	230

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL MLS/ 100G	COF	SERIAL NUMBER
7601-046	CONE	139:52	9/20/78	0	0	6.4	3.1	67	9.5	.26	0.00	0	0.00	0	295
7601-048	CONE	140:01	9/20/78	0	0	3.3	1.8	64	5.1	.31	0.00	0	0.00	0	257
7601-059	CONE	140:12	9/20/78	0	0	13.1	3.6	78	16.6	.26	0.00	0	0.00	0	245
7602-001	CONE	140:25	9/20/78	0	0	9.6	2.6	78	12.1	.31	0.00	0	0.00	0	233
7602-006	CONE	140:30	9/20/78	0	0	4.6	1.7	72	6.3	.36	0.00	0	0.00	0	320
7602-007	CONE	140:31	9/20/78	0	0	6.3	3.0	67	9.4	.31	0.00	0	0.00	0	268
7602-010	CONE	140:34	9/20/78	0	0	10.3	4.6	69	14.9	.26	0.00	0	0.00	0	204
7602-011	CONE	140:35	9/20/78	0	0	5.9	2.1	73	8.0	.40	0.00	0	0.00	0	219
7602-014	CONE	140:38	9/20/78	0	0	6.6	3.4	65	10.0	.26	0.00	0	0.00	0	240
7602-016	CONE	140:40	9/20/78	0	0	9.3	3.7	71	13.0	.26	0.00	0	0.00	0	438
7602-017	CONE	140:41	9/20/78	0	0	8.4	3.3	71	11.7	.28	0.00	0	0.00	0	285
7602-018	CONE	140:42	9/20/78	0	0	6.1	2.5	71	8.6	.30	0.00	0	0.00	0	291
7602-019	CONE	140:43	9/20/78	1296	43	3.3	1.4	71	4.7	.35	0.00	0	0.00	0	221
7602-020	CONE	140:44	9/20/78	0	0	5.1	2.2	69	7.4	.28	0.00	0	0.00	0	212
7602-021	CONE	140:45	9/20/78	0	0	4.9	2.1	69	7.1	.31	0.00	0	0.00	0	229
7602-025	CONE	140:49	9/20/78	0	0	7.6	2.4	76	10.0	.28	0.00	0	0.00	0	249
7602-026	CONE	140:50	9/20/78	0	0	8.3	3.6	69	11.9	.27	0.00	0	0.00	0	251
7602-028	CONE	140:52	9/20/78	0	0	7.6	3.8	66	11.3	.25	0.00	0	0.00	0	256
7602-030	CONE	141:01	9/20/78	0	0	7.8	2.3	77	10.1	.27	0.00	0	0.00	0	255
7602-031	CONE	141:02	9/20/78	0	0	4.7	1.8	72	6.6	.29	0.00	0	0.00	0	236
7602-032	CONE	141:03	9/20/78	0	0	3.5	1.3	73	4.8	.27	0.00	0	0.00	0	252
7602-035	CONE	141:06	9/20/78	0	0	6.5	1.8	78	8.2	.32	0.00	0	0.00	0	310
7602-036	CONE	141:07	9/20/78	0	0	4.3	2.1	66	6.4	.29	0.00	0	0.00	0	275
7602-037	CONE	141:08	9/20/78	0	0	6.1	2.0	75	8.1	.30	0.00	0	0.00	0	228
7602-038	CONE	141:09	9/20/78	0	0	4.1	1.5	73	5.7	.32	0.00	0	0.00	0	206
7602-039	CONE	141:10	9/20/78	0	0	5.5	1.9	74	7.4	.33	0.00	0	0.00	0	311
7602-041	CONE	141:12	9/20/78	0	0	8.9	5.0	64	13.9	.26	0.00	0	0.00	0	279
7602-044	CONE	141:15	9/20/78	0	0	10.7	4.1	72	14.8	.26	0.00	0	0.00	0	265
7602-045	CONE	141:16	9/20/78	0	0	9.1	2.7	76	11.9	.26	0.00	0	0.00	0	292
7602-047	CONE	141:18	9/20/78	0	0	6.3	2.6	71	8.8	.30	0.00	0	0.00	0	215
7602-048	CONE	141:19	9/20/78	0	0	8.1	3.3	71	11.4	.30	0.00	0	0.00	0	267
7602-055	CONE	141:26	9/20/78	0	0	7.1	2.4	74	9.5	.30	0.00	0	0.00	0	327
7602-065	CONE	141:36	9/20/78	0	0	5.0	1.7	74	6.8	.30	0.00	0	0.00	0	319
7603-002	CONE	141:44	9/21/78	0	0	7.1	3.5	67	10.5	.33	0.00	0	0.00	0	351
7603-003	CONE	141:45	9/21/78	0	0	8.0	2.3	77	10.2	.28	0.00	0	0.00	0	348

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL MLS/ 100G	COF	SERIAL NUMBER
7603-004	CONE	141:46	9/21/78	0	0	6.2	1.8	77	8.0	.34	0.00	0	0.00	0	352
7603-005	CONE	141:47	9/21/78	0	0	8.3	2.6	76	10.9	.28	0.00	0	0.00	0	355
7603-006	CONE	141:48	9/21/78	0	0	5.8	2.0	74	7.8	.32	0.00	0	0.00	0	350
7603-007	CONE	141:49	9/21/78	0	0	8.7	3.4	71	12.0	.28	0.00	0	0.00	0	349
7603-010	CONE	141:52	9/21/78	0	0	10.9	3.1	78	13.9	.31	0.00	0	0.00	0	346
7603-012	CONE	142:01	9/21/78	0	0	6.0	1.7	77	7.7	.38	0.00	0	0.00	0	361
7603-017	CONE	142:06	9/21/78	0	0	5.8	2.5	70	8.3	.30	0.00	0	0.00	0	357
7603-018	CONE	142:07	9/21/78	0	0	5.0	1.7	75	6.7	.35	0.00	0	0.00	0	358
7603-019	CONE	142:08	9/21/78	0	0	4.5	1.6	73	6.1	.36	0.00	0	0.00	0	359
7603-020	CONE	142:09	9/21/78	0	0	10.1	3.1	76	13.2	.31	0.00	0	0.00	0	362
7603-021	CONE	142:10	9/21/78	0	0	6.1	1.7	77	7.9	.35	0.00	0	0.00	0	363
7603-022	CONE	142:11	9/21/78	0	0	6.4	1.9	77	8.4	.31	0.00	0	0.00	0	360
7603-024	CONE	142:13	9/21/78	0	0	5.4	2.4	69	7.8	.34	0.00	0	0.00	0	366
7603-025	CONE	142:14	9/21/78	0	0	5.2	2.1	70	7.3	.35	0.00	0	0.00	0	373
7603-030	CONE	142:19	9/21/78	0	0	4.7	2.0	70	6.7	.32	0.00	0	0.00	0	365
7603-031	CONE	142:20	9/21/78	0	0	5.3	2.7	66	7.9	.30	0.00	0	0.00	0	369
7603-033	CONE	142:22	9/21/78	0	0	5.9	1.8	76	7.7	.36	0.00	0	0.00	0	370
7603-034	CONE	142:23	9/21/78	0	0	5.5	2.3	70	7.8	.34	0.00	0	0.00	0	356
7603-035	CONE	142:24	9/21/78	0	0	4.7	1.6	74	6.4	.33	0.00	0	0.00	0	353
7603-037	CONE	142:26	9/21/78	0	0	8.5	4.2	67	12.7	.29	0.00	0	0.00	0	354
7603-039	CONE	142:28	9/21/78	0	0	3.0	1.5	67	4.5	.40	0.00	0	0.00	0	371
7603-040	CONE	142:29	9/21/78	0	0	7.0	4.4	61	11.4	.32	0.00	0	0.00	0	367
7603-041	CONE	142:30	9/21/78	0	0	7.6	2.5	75	10.1	.32	0.00	0	0.00	0	347
7603-047	CONE	142:36	9/21/78	0	0	9.2	2.9	76	12.0	.32	0.00	0	0.00	0	364
7603-050	CONE	142:39	9/21/78	0	0	4.3	2.5	63	6.8	.32	0.00	0	0.00	0	368
7604-001	CONE	143:08	9/22/78	0	0	8.2	4.4	65	12.6	.25	0.00	0	0.00	0	504
7604-002	CONE	143:09	9/22/78	0	0	10.2	4.2	70	14.4	.27	0.00	0	0.00	0	482
7604-003	CONE	143:10	9/22/78	0	0	9.6	2.9	77	12.5	.26	0.00	0	0.00	0	506
7604-004	CONE	143:11	9/22/78	0	0	10.4	4.2	71	14.6	.25	0.00	0	0.00	0	500
7604-005	CONE	143:12	9/22/78	0	0	7.4	2.4	75	9.8	.29	0.00	0	0.00	0	507
7604-007	CONE	143:14	9/22/78	0	0	7.9	1.6	83	9.5	.28	0.00	0	0.00	0	503
7604-009	CONE	143:16	9/22/78	0	0	2.7	1.0	72	3.7	.37	0.00	0	0.00	0	508
7604-010	CONE	143:17	9/22/78	0	0	4.5	2.8	62	7.3	.28	0.00	0	0.00	0	488
7604-011	CONE	143:18	9/22/78	0	0	7.2	4.6	60	11.8	.30	0.00	0	0.00	0	510
7604-012	CONE	143:19	9/22/78	0	0	5.7	1.7	76	7.5	.38	0.00	0	0.00	0	509

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
7604-013	CONE	143:20	9/22/78	0	0	9.1	2.6	78	11.7	.28	0.00	0	0.00	0	489
7604-017	CONE	143:24	9/22/78	0	0	3.1	1.6	65	4.7	.28	0.00	0	0.00	0	479
7604-018	CONE	143:25	9/22/78	0	0	7.2	3.3	68	10.5	.32	0.00	0	0.00	0	486
7604-019	CONE	143:26	9/22/78	0	0	8.3	1.9	81	10.2	.33	0.00	0	0.00	0	512
7604-020	CONE	143:27	9/22/78	0	0	10.3	2.6	80	12.9	.30	0.00	0	0.00	0	487
7604-021	CONE	143:28	9/22/78	0	0	5.5	1.4	79	6.9	.37	0.00	0	0.00	0	484
7604-022	CONE	143:29	9/22/78	0	0	7.1	2.8	71	9.9	.29	0.00	0	0.00	0	501
7604-024	CONE	143:31	9/22/78	0	0	8.4	2.2	79	10.5	.28	0.00	0	0.00	0	485
7604-025	CONE	143:32	9/22/78	0	0	7.4	4.5	62	12.0	.28	0.00	0	0.00	0	490
7604-028	CONE	143:35	9/22/78	0	0	8.0	3.3	70	11.3	.29	0.00	0	0.00	0	511
7604-029	CONE	143:36	9/22/78	0	0	6.6	3.1	67	9.7	.24	0.00	0	0.00	0	480
7604-030	CONE	143:37	9/22/78	0	0	8.0	2.2	78	10.3	.30	0.00	0	0.00	0	493
7604-031	CONE	143:38	9/22/78	0	0	5.1	2.4	68	7.5	.28	0.00	0	0.00	0	495
7604-033	CONE	143:40	9/22/78	0	0	2.5	1.5	62	3.9	.31	0.00	0	0.00	0	481
7604-038	CONE	143:45	9/22/78	0	0	7.8	3.5	69	11.2	.27	0.00	0	0.00	0	494
7604-039	CONE	143:46	9/22/78	0	0	11.5	3.0	79	14.5	.26	0.00	0	0.00	0	496
7604-043	CONE	143:50	9/22/78	0	0	8.6	2.8	75	11.4	.26	0.00	0	0.00	0	491
7604-044	CONE	143:51	9/22/78	0	0	9.9	2.9	77	12.8	.25	0.00	0	0.00	0	497
7604-049	CONE	144:03	9/22/78	0	0	4.3	1.8	70	6.0	.31	0.00	0	0.00	0	492
7604-067	CONE	144:21	9/22/78	0	0	7.2	3.2	69	10.4	.26	0.00	0	0.00	0	498
7604-068	CONE	144:22	9/22/78	0	0	3.5	1.9	65	5.4	.32	0.00	0	0.00	0	483
7605-002	CONE	144:27	9/22/78	0	0	10.2	5.7	64	15.9	.27	0.00	0	0.00	0	577
7605-003	CONE	144:28	9/22/78	0	0	6.8	5.0	57	11.9	.26	0.00	0	0.00	0	580
7605-004	CONE	144:29	9/22/78	0	0	8.4	2.9	74	11.3	.29	0.00	0	0.00	0	572
7605-005	CONE	144:30	9/22/78	0	0	12.4	4.8	72	17.2	.26	0.00	0	0.00	0	571
7605-006	CONE	144:31	9/22/78	0	0	6.1	4.3	58	10.4	.25	0.00	0	0.00	0	568
7605-009	CONE	144:34	9/22/78	0	0	10.7	6.7	61	17.4	.27	0.00	0	0.00	0	569
7605-012	CONE	144:37	9/22/78	0	0	.9	.3	74	1.2	.63	0.00	0	0.00	0	566
7605-013	CONE	144:38	9/22/78	0	0	10.2	3.9	72	14.0	.27	0.00	0	0.00	0	574
7605-019	CONE	144:44	9/22/78	0	0	8.9	3.9	69	12.7	.28	0.00	0	0.00	0	575
7605-020	CONE	144:45	9/22/78	0	0	8.4	2.0	81	10.4	.32	0.00	0	0.00	0	570
7605-021	CONE	144:46	9/22/78	0	0	10.3	5.5	65	15.8	.26	0.00	0	0.00	0	573
7605-023	CONE	144:48	9/22/78	0	0	8.5	4.6	64	13.1	.26	0.00	0	0.00	0	567
7605-025	CONE	144:50	9/22/78	0	0	3.3	1.9	62	5.2	.32	0.00	0	0.00	0	559
7605-031	CONE	145:03	9/22/78	0	0	4.4	3.8	53	8.2	.28	0.00	0	0.00	0	545

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
7605-033	CONE	145:05	9/22/78	0	0	6.2	4.4	58	10.6	.29	0.00	0	0.00	0	562
7605-035	CONE	145:07	9/22/78	0	0	8.6	3.0	74	11.6	.31	0.00	0	0.00	0	547
7605-036	CONE	145:08	9/22/78	0	0	4.4	1.8	71	6.1	.36	0.00	0	0.00	0	549
7605-039	CONE	145:11	9/22/78	0	0	9.7	3.5	73	13.3	.29	0.00	0	0.00	0	551
7605-040	CONE	145:12	9/22/78	0	0	8.8	2.6	77	11.3	.35	0.00	0	0.00	0	554
7605-041	CONE	145:13	9/22/78	0	0	6.4	3.3	66	9.7	.27	0.00	0	0.00	0	555
7605-042	CONE	145:14	9/22/78	0	0	7.5	3.6	67	11.1	.28	0.00	0	0.00	0	565
7605-045	CONE	145:17	9/22/78	0	0	5.3	1.6	77	6.9	.38	0.00	0	0.00	0	556
7605-046	CONE	145:18	9/22/78	0	0	9.0	3.3	73	12.3	.31	0.00	0	0.00	0	546
7605-047	CONE	145:19	9/22/78	0	0	9.8	2.5	79	12.4	.26	0.00	0	0.00	0	564
7605-048	CONE	145:20	9/22/78	0	0	4.9	2.2	68	7.1	.35	0.00	0	0.00	0	544
7605-050	CONE	145:22	9/22/78	0	0	6.8	3.1	68	9.9	.29	0.00	0	0.00	0	548
7605-055	CONE	145:27	9/22/78	0	0	9.8	2.6	78	12.5	.31	0.00	0	0.00	0	550
7605-056	CONE	145:28	9/22/78	0	0	9.8	3.7	72	13.5	.30	0.00	0	0.00	0	563
7605-060	CONE	145:32	9/22/78	0	0	5.6	2.2	71	7.8	.33	0.00	0	0.00	0	552
7605-061	CONE	145:33	9/22/78	0	0	6.2	1.9	76	8.1	.34	0.00	0	0.00	0	553
7605-062	CONE	145:34	9/22/78	0	0	6.4	1.7	79	8.1	.33	0.00	0	0.00	0	557
7605-064	CONE	145:36	9/22/78	0	0	6.2	3.5	64	9.7	.29	0.00	0	0.00	0	561
7605-065	CONE	145:37	9/22/78	0	0	2.3	.8	74	3.1	.39	0.00	0	0.00	0	560
7605-068	CONE	145:40	9/22/78	0	0	8.6	2.3	79	10.9	.31	0.00	0	0.00	0	558
7605-073	CONE	145:45	9/22/78	0	0	10.2	4.8	68	14.9	.32	0.00	0	0.00	0	578
7605-074	CONE	145:46	9/22/78	0	0	7.8	3.1	71	11.0	.28	0.00	0	0.00	0	576
7605-083	CONE	146:02	9/22/78	0	0	5.4	2.0	72	7.5	.31	0.00	0	0.00	0	468
7605-092	CONE	146:11	9/22/78	0	0	6.7	1.6	80	8.3	.32	0.00	0	0.00	0	471
7605-093	CONE	146:12	9/22/78	0	0	8.1	3.1	72	11.2	.29	0.00	0	0.00	0	467
7605-094	CONE	146:13	9/22/78	0	0	5.7	1.3	81	7.0	.32	0.00	0	0.00	0	473
7605-102	CONE	146:21	9/22/78	0	0	4.8	2.2	68	7.0	.33	0.00	0	0.00	0	472
7605-106	CONE	146:25	9/22/78	0	0	4.5	1.9	70	6.4	.30	0.00	0	0.00	0	464
7605-108	CONE	146:27	9/22/78	0	0	7.7	2.3	76	10.0	.27	0.00	0	0.00	0	463
7605-111	CONE	146:30	9/22/78	0	0	9.8	4.5	68	14.3	.24	0.00	0	0.00	0	466
7605-117	CONE	146:36	9/22/78	0	0	6.3	2.7	70	9.0	.31	0.00	0	0.00	0	465
7605-120	CONE	146:39	9/22/78	0	0	7.2	3.7	66	10.9	.29	0.00	0	0.00	0	476
7605-127	CONE	146:46	9/22/78	0	0	5.3	2.4	69	7.7	.29	0.00	0	0.00	0	474
7605-133	CONE	146:52	9/22/78	0	0	2.7	1.2	70	3.9	.35	0.00	0	0.00	0	475
7605-148	CONE	147:14	9/22/78	0	0	5.9	1.6	78	7.5	.35	0.00	0	0.00	0	470

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
7605-149	CONE	147:15	9/22/78	0	0	3.6	1.2	74	4.8	.36	0.00	0	0.00	0	462
7605-154	CONE	147:20	9/22/78	0	0	7.5	4.4	62	11.9	.28	0.00	0	0.00	0	469
7605-158	CONE	147:24	9/22/78	0	0	4.4	1.4	75	5.8	.31	0.00	0	0.00	0	477
7605-166	CONE	147:32	9/22/78	0	0	4.7	1.8	71	6.6	.33	0.00	0	0.00	0	478
7606-001	CONE	147:51	9/22/78	0	0	6.4	2.1	75	8.6	.30	0.00	0	0.00	0	538
7606-002	CONE	147:52	9/22/78	0	0	8.6	2.9	75	11.5	.30	0.00	0	0.00	0	539
7606-003	CONE	147:53	9/22/78	0	0	9.1	3.7	71	12.7	.30	0.00	0	0.00	0	543
7606-005	CONE	148:02	9/22/78	0	0	12.8	4.4	74	17.3	.33	0.00	0	0.00	0	531
7606-006	CONE	148:03	9/22/78	0	0	6.3	1.4	81	7.7	.31	0.00	0	0.00	0	528
7606-007	CONE	148:04	9/22/78	0	0	7.3	3.0	70	10.3	.31	0.00	0	0.00	0	533
7606-011	CONE	148:08	9/22/78	0	0	8.3	1.7	83	10.0	.30	0.00	0	0.00	0	535
7606-012	CONE	148:10	9/22/78	0	0	5.5	1.7	76	7.3	.35	0.00	0	0.00	0	527
7606-018	CONE	148:15	9/22/78	0	0	9.2	2.4	79	11.6	.32	0.00	0	0.00	0	534
7606-020	CONE	148:17	9/22/78	0	0	5.6	1.3	81	6.9	.33	0.00	0	0.00	0	537
7606-022	CONE	148:19	9/22/78	0	0	9.1	2.5	78	11.7	.28	0.00	0	0.00	0	536
7606-023	CONE	148:20	9/22/78	0	0	7.9	4.3	64	12.2	.29	0.00	0	0.00	0	530
7606-024	CONE	148:21	9/22/78	0	0	5.3	1.7	76	7.0	.34	0.00	0	0.00	0	532
7606-025	CONE	148:22	9/22/78	0	0	6.2	1.9	76	8.1	.28	0.00	0	0.00	0	519
7606-027	CONE	148:24	9/22/78	0	0	4.6	2.1	68	6.8	.47	0.00	0	0.00	0	523
7606-030	CONE	148:27	9/22/78	0	0	5.5	3.1	63	8.6	.30	0.00	0	0.00	0	517
7606-031	CONE	148:28	9/22/78	1080	129	12.0	4.0	74	16.0	.29	0.00	0	0.00	0	529
7606-032	CONE	148:29	9/22/78	0	0	7.3	1.7	81	9.0	.35	0.00	0	0.00	0	513
7606-033	CONE	148:30	9/22/78	0	0	7.9	2.5	75	10.4	.27	0.00	0	0.00	0	520
7606-035	CONE	148:32	9/22/78	0	0	11.0	3.1	78	14.1	.34	0.00	0	0.00	0	516
7606-037	CONE	148:34	9/22/78	0	0	8.7	2.1	80	10.8	.32	0.00	0	0.00	0	521
7606-038	CONE	148:35	9/22/78	0	0	7.7	2.2	78	9.9	.36	0.00	0	0.00	0	525
7606-039	CONE	148:36	9/22/78	0	0	8.4	2.2	79	10.7	.32	0.00	0	0.00	0	518
7606-040	CONE	148:37	9/22/78	0	0	6.9	4.3	61	11.2	.24	0.00	0	0.00	0	522
7606-042	CONE	148:39	9/22/78	0	0	6.6	2.3	74	8.8	.32	0.00	0	0.00	0	526
7606-048	CONE	148:45	9/22/78	0	0	11.5	3.0	79	14.5	.30	0.00	0	0.00	0	514
7606-050	CONE	148:47	9/22/78	0	0	7.9	2.6	75	10.5	.37	0.00	0	0.00	0	524
7606-051	CONE	148:48	9/22/78	0	0	7.2	2.3	76	9.5	.34	0.00	0	0.00	0	515
7606-065	CONE	149:09	9/22/78	0	0	5.4	2.3	70	7.7	.34	0.00	0	0.00	0	540
7606-066	CONE	149:10	9/22/78	0	0	6.3	2.3	73	8.7	.32	0.00	0	0.00	0	235
7606-075	CONE	149:19	9/22/78	0	0	8.5	2.8	75	11.3	.30	0.00	0	0.00	0	441

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
7606-086	CONE	149:30	9/22/78	0	0	12.7	5.5	69	18.2	.26	0.00	0	0.00	0	442
7606-088	CONE	149:32	9/22/78	0	0	4.0	1.3	76	5.2	.36	0.00	0	0.00	0	443
7606-094	CONE	149:38	9/22/78	0	0	9.6	3.2	74	12.8	.28	0.00	0	0.00	0	444
7606-099	CONE	149:43	9/22/78	0	0	4.9	1.8	72	6.7	.32	0.00	0	0.00	0	445
7606-110	CONE	150:01	9/22/78	0	0	7.3	2.5	74	9.7	.28	0.00	0	0.00	0	541
7607-001	CONE	150:11	9/22/78	0	0	4.7	1.8	72	6.4	.31	0.00	0	0.00	0	456
7607-010	CONE	150:20	9/22/78	0	0	7.5	2.6	74	10.0	.36	0.00	0	0.00	0	458
7607-011	CONE	150:21	9/22/78	0	0	5.2	1.7	75	6.9	.34	0.00	0	0.00	0	457
7607-012	CONE	150:22	9/22/78	0	0	6.6	2.2	75	8.8	.33	0.00	0	0.00	0	448
7608-003	CONE	150:26	9/22/78	0	0	2.2	3.1	41	5.3	.37	0.00	0	0.00	0	447
7608-005	CONE	150:28	9/22/78	0	0	6.1	1.9	76	8.0	.33	0.00	0	0.00	0	461
7609-008	CONE	150:42	9/22/78	0	0	2.6	1.5	63	4.0	.36	0.00	0	0.00	0	454
7610-002	CONE	150:49	9/22/78	0	0	9.2	2.7	77	11.9	.29	0.00	0	0.00	0	455
7610-003	CONE	150:50	9/22/78	0	0	6.4	3.8	62	10.2	.26	0.00	0	0.00	0	451
7610-005	CONE	150:52	9/22/78	0	0	8.0	2.7	74	10.7	.28	0.00	0	0.00	0	450
7610-009	CONE	151:03	9/24/78	0	0	11.8	4.0	74	15.8	.29	0.00	0	0.00	0	639
7610-013	CONE	151:07	9/24/78	0	0	5.5	2.3	70	7.8	.29	0.00	0	0.00	0	638
7610-015	CONE	151:09	0/24/78	0	0	6.4	1.5	80	7.9	.35	0.00	0	0.00	0	640
7610-016	CONE	151-10	9/24/78	0	0	7.6	1.9	79	9.5	.31	0.00	0	0.00	0	626
7610-019	CONE	151:13	9/24/78	0	0	9.8	3.3	74	13.1	.27	0.00	0	0.00	0	630
7610-020	CONE	151:14	9/24/78	0	0	10.9	3.8	74	14.7	.31	0.00	0	0.00	0	623
7610-025	CONE	151:19	9/24/78	0	0	8.8	2.6	77	11.4	.31	0.00	0	0.00	0	622
7610-028	CONE	151:22	9/24/78	0	0	8.2	2.7	75	10.8	.29	0.00	0	0.00	0	633
7610-030	CONE	151:24	9/24/78	0	0	5.7	1.6	78	7.3	.30	0.00	0	0.00	0	629
7610-032	CONE	151:26	9/24/78	0	0	5.0	1.3	78	6.4	.34	0.00	0	0.00	0	636
7610-034	CONE	151:28	9/24/78	0	0	3.3	1.0	76	4.3	.40	0.00	0	0.00	0	634
7610-036	CONE	151:30	9/24/78	0	0	9.6	3.4	73	13.0	.30	0.00	0	0.00	0	632
7610-038	CONE	151:32	9/24/78	0	0	7.9	3.7	68	11.5	.28	0.00	0	0.00	0	637
7610-040	CONE	151:34	9/24/78	0	0	9.4	2.4	79	11.8	.30	0.00	0	0.00	0	627
7610-045	CONE	151:39	9/24/78	0	0	9.7	2.9	77	12.5	.27	0.00	0	0.00	0	641
7610-049	CONE	151:43	9/24/78	0	0	7.8	3.6	68	11.4	.34	0.00	0	0.00	0	624
7610-050	CONE	151:44	9/24/78	0	0	6.9	1.8	78	8.7	.31	0.00	0	0.00	0	635
7610-051	CONE	151:45	9/24/78	0	0	10.0	3.9	71	13.9	.34	0.00	0	0.00	0	621
7610-052	CONE	151:46	9/24/78	0	0	0.0	8.7	0	8.7	3.51	0.00	0	0.00	0	619
7610-053	CONE	151:47	9/24/78	0	0	8.7	2.5	77	11.2	.26	0.00	0	0.00	0	617

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
7610-057	CONE	151:51	9/24/78	0	0	8.1	3.3	71	11.5	.28	0.00	0	0.00	0	614
7610-063	CONE	152:04	9/24/78	0	0	7.5	2.5	74	10.0	.34	0.00	0	0.00	0	609
7610-068	CONE	152:09	9/24/78	0	0	6.6	2.3	74	8.9	.31	0.00	0	0.00	0	604
7610-069	CONE	152:10	9/24/78	0	0	9.3	3.4	73	12.6	.29	0.00	0	0.00	0	611
7610-072	CONE	152:13	9/24/78	0	0	9.6	2.6	79	12.2	.30	0.00	0	0.00	0	610
7610-073	CONE	152:14	9/24/78	0	0	7.0	2.7	72	9.7	.30	0.00	0	0.00	0	620
7610-076	CONE	152:17	9/24/78	0	0	6.2	2.1	74	8.3	.36	0.00	0	0.00	0	618
7610-094	CONE	152:35	9/24/78	0	0	7.1	3.1	69	10.2	.33	0.00	0	0.00	0	608
7610-095	CONE	152:36	9/24/78	0	0	9.7	2.9	77	12.5	.27	0.00	0	0.00	0	615
7610-097	CONE	152:38	9/24/78	0	0	12.1	3.7	76	15.7	.31	0.00	0	0.00	0	613
7610-098	CONE	152:39	9/24/78	0	0	7.2	2.1	77	9.3	.32	0.00	0	0.00	0	616
7610-104	CONE	152:45	9/24/78	0	0	9.2	2.6	78	11.8	.31	0.00	0	0.00	0	612
7610-109	CONE	152:50	9/24/78	0	0	9.2	3.2	74	12.4	.28	0.00	0	0.00	0	631
7610-124	CONE	153:12	9/24/78	0	0	10.8	3.2	77	14.0	.28	0.00	0	0.00	0	607
7610-126	CONE	153:14	9/24/78	0	0	8.5	3.2	72	11.7	.31	0.00	0	0.00	0	606
7610-138	CONE	153:26	9/24/78	0	0	6.2	1.7	78	7.8	.33	0.00	0	0.00	0	602
7610-152	CONE	153:40	9/24/78	0	0	7.8	3.1	71	11.0	.29	0.00	0	0.00	0	605
7610-155	CONE	152:43	9/24/78	0	0	5.3	2.0	72	7.3	.32	0.00	0	0.00	0	603
7610-160	CONE	153:48	9/24/78	0	0	9.7	2.2	81	11.9	.32	0.00	0	0.00	0	601
7610-170	CONE	154:05	9/24/78	0	0	8.1	3.7	68	11.9	.27	0.00	0	0.00	0	628
7611-001	CONE	154:08	9/25/78	0	0	10.9	3.7	74	14.6	.27	0.00	0	0.00	0	676
7611-005	CONE	154:12	9/25/78	0	0	12.2	2.9	80	15.0	.30	0.00	0	0.00	0	682
7611-006	CONE	154:13	9/25/78	0	0	6.5	2.1	75	8.5	.31	0.00	0	0.00	0	681
7611-010	CONE	154:17	9/25/78	0	0	6.1	1.4	80	7.5	.29	0.00	0	0.00	0	678
7611-012	CONE	154:19	9/25/78	0	0	14.3	4.0	78	18.2	.30	0.00	0	0.00	0	659
7611-015	CONE	154:22	9/25/78	0	0	7.8	2.9	72	10.7	.26	0.00	0	0.00	0	674
7611-017	CONE	154:24	9/25/78	0	0	12.1	4.6	72	16.7	.24	0.00	0	0.00	0	671
7611-018	CONE	154:25	9/25/78	0	0	5.1	1.6	76	6.7	.33	0.00	0	0.00	0	670
7611-021	CONE	154:28	9/25/78	0	0	4.9	2.2	68	7.1	.35	0.00	0	0.00	0	660
7611-022	CONE	154:29	9/25/78	0	0	4.0	1.2	77	5.2	.33	0.00	0	0.00	0	669
7611-023	CONE	154:30	9/25/78	0	0	5.9	1.7	77	7.5	.30	0.00	0	0.00	0	675
7611-024	CONE	154:31	9/25/78	0	0	6.2	2.2	74	8.3	.26	0.00	0	0.00	0	673
7611-025	CONE	154:32	9/25/78	0	0	6.4	1.7	79	8.0	.30	0.00	0	0.00	0	665
7611-026	CONE	154:33	9/25/78	0	0	9.3	4.0	70	13.3	.26	0.00	0	0.00	0	661
7611-028	CONE	154:35	9/25/78	0	0	6.7	2.0	76	8.7	.29	0.00	0	0.00	0	680

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
7611-030	CONE	154:37	9/25/78	0	0	5.6	2.4	70	8.0	.34	0.00	0	0.00	0	656
7611-033	CONE	154:40	9/25/78	0	0	7.7	1.8	81	9.5	.29	0.00	0	0.00	0	677
7611-039	CONE	154:46	9/25/78	0	0	6.8	2.6	72	9.4	.27	0.00	0	0.00	0	672
7611-040	CONE	154:47	9/25/78	0	0	6.6	2.2	75	8.8	.29	0.00	0	0.00	0	679
7611-043	CONE	154:50	9/25/78	0	0	5.8	2.1	73	7.9	.31	0.00	0	0.00	0	667
7611-044	CONE	154:51	9/25/78	0	0	5.1	2.3	69	7.4	.31	0.00	0	0.00	0	664
7611-048	CONE	155:02	9/25/78	0	0	8.5	3.3	71	11.8	.26	0.00	0	0.00	0	648
7611-053	CONE	155:07	9/25/78	0	0	13.7	3.7	78	17.3	.31	0.00	0	0.00	0	643
7611-056	CONE	155:10	9/25/78	0	0	5.2	1.5	76	6.7	.36	0.00	0	0.00	0	649
7611-057	CONE	155:11	9/25/78	0	0	5.7	1.8	75	7.5	.39	0.00	0	0.00	0	642
7611-063	CONE	155:17	9/25/78	0	0	6.4	2.2	74	8.6	.29	0.00	0	0.00	0	653
7611-067	CONE	155:21	9/25/78	0	0	9.8	5.5	63	15.3	.25	0.00	0	0.00	0	647
7611-069	CONE	155:23	9/25/78	0	0	11.7	2.6	81	14.4	.32	0.00	0	0.00	0	644
7611-076	CONE	155:30	9/25/78	0	0	10.6	3.6	74	14.2	.27	0.00	0	0.00	0	651
7611-084	CONE	155:38	9/25/78	0	0	9.0	2.9	75	11.9	.35	0.00	0	0.00	0	646
7611-108	CONE	156:09	9/25/78	0	0	13.6	3.6	79	17.3	.33	0.00	0	0.00	0	654
7611-111	CONE	156:12	9/25/78	0	0	9.8	2.7	78	12.5	.28	0.00	0	0.00	0	663
7611-117	CONE	156:18	9/25/78	0	0	7.9	2.4	77	10.3	.29	0.00	0	0.00	0	645
7611-123	CONE	156:24	9/25/78	0	0	12.5	4.1	75	16.6	.34	0.00	0	0.00	0	657
7611-134	CONE	156:35	9/25/78	0	0	13.0	3.2	80	16.2	.27	0.00	0	0.00	0	655
7611-143	CONE	156:44	9/25/78	0	0	9.8	3.3	74	13.1	.30	0.00	0	0.00	0	652
7611-158	CONE	157:06	9/25/78	0	0	13.2	3.6	78	16.9	.27	0.00	0	0.00	0	658
7611-170	CONE	157:18	9/25/78	0	0	5.7	1.8	76	7.5	.25	0.00	0	0.00	0	886
7611-174	CONE	157:22	9/25/78	0	0	8.0	2.6	75	10.6	.27	0.00	0	0.00	0	666
7611-178	CONE	157:26	9/25/78	0	0	6.6	1.8	78	8.4	.33	0.00	0	0.00	0	650
7611-183	CONE	157:31	9/25/78	0	0	6.6	3.0	68	9.6	.29	0.00	0	0.00	0	662
7612-001	CONE	157:38	9/25/78	0	0	7.0	2.5	73	9.5	.28	0.00	0	0.00	0	598
7612-002	CONE	157:39	9/25/78	0	0	7.8	2.4	76	10.2	.31	0.00	0	0.00	0	596
7612-003	CONE	157:40	9/25/78	0	0	10.0	3.8	72	13.9	.26	0.00	0	0.00	0	588
7612-005	CONE	157:42	9/25/78	0	0	6.2	1.6	79	7.8	.28	0.00	0	0.00	0	600
7612-008	CONE	157:45	9/25/78	0	0	11.3	4.2	73	15.4	.26	0.00	0	0.00	0	594
7612-010	CONE	157:47	9/25/78	0	0	4.5	1.3	78	5.8	.41	0.00	0	0.00	0	595
7612-013	CONE	157:50	9/25/78	0	0	8.9	3.3	72	12.2	.27	0.00	0	0.00	0	590
7612-020	CONE	158:04	9/25/78	0	0	4.6	1.4	76	6.0	.38	0.00	0	0.00	0	581
7612-022	CONE	158:06	9/25/78	0	0	10.0	3.6	73	13.5	.28	0.00	0	0.00	0	583

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
7612-027	CONE	158:11	9/25/78	0	0	7.9	3.2	71	11.1	.28	0.00	0	0.00	0	591
7612-028	CONE	158:12	9/25/78	0	0	5.6	1.6	78	7.2	.33	0.00	0	0.00	0	592
7612-032	CONE	158:16	9/25/78	0	0	9.5	2.7	78	12.2	.29	0.00	0	0.00	0	589
7612-035	CONE	158:19	9/25/78	0	0	9.1	2.3	79	11.4	.28	0.00	0	0.00	0	587
7612-038	CONE	158:22	9/25/78	0	0	6.5	4.2	60	10.6	.26	0.00	0	0.00	0	593
7612-041	CONE	158:25	9/25/78	0	0	9.7	3.6	72	13.3	.30	0.00	0	0.00	0	584
7612-044	CONE	158:28	9/25/78	0	0	11.7	4.0	74	15.7	.28	0.00	0	0.00	0	582
7613-001	CONE	158:42	9/25/78	0	0	2.0	.8	71	2.8	.45	0.00	0	0.00	0	713
7613-007	CONE	158:48	9/25/78	0	0	4.1	1.6	72	5.7	.36	0.00	0	0.00	0	711
7613-009	CONE	158:50	9/25/78	0	0	8.9	3.3	72	12.2	.32	0.00	0	0.00	0	704
7613-010	CONE	158:51	9/25/78	0	0	9.8	4.1	70	13.9	.22	0.00	0	0.00	0	698
7613-014	CONE	159:02	9/25/78	0	0	6.5	2.4	72	8.9	.20	0.00	0	0.00	0	692
7613-015	CONE	159:03	9/25/78	0	0	7.4	2.6	73	10.0	.29	0.00	0	0.00	0	709
7613-017	CONE	159:05	9/25/78	0	0	6.6	1.8	78	8.4	.24	0.00	0	0.00	0	696
7613-019	CONE	159:07	9/25/78	0	0	6.4	3.0	68	9.3	.31	0.00	0	0.00	0	706
7613-029	CONE	159:17	9/25/78	0	0	7.2	3.1	69	10.3	.26	0.00	0	0.00	0	710
7613-032	CONE	159:20	9/25/78	0	0	6.3	1.6	79	7.9	.26	0.00	0	0.00	0	688
7613-035	CONE	159:23	9/25/78	0	0	11.1	2.9	79	14.0	.28	0.00	0	0.00	0	701
7613-037	CONE	159:25	9/25/78	0	0	10.0	2.3	81	12.3	.26	0.00	0	0.00	0	694
7613-038	CONE	159:26	9/25/78	0	0	6.6	2.0	76	8.6	.27	0.00	0	0.00	0	697
7613-039	CONE	159:27	9/25/78	0	0	8.3	2.7	75	10.9	.25	0.00	0	0.00	0	708
7613-044	CONE	159:32	9/25/78	0	0	8.7	4.1	67	12.9	.22	0.00	0	0.00	0	693
7613-046	CONE	159:34	9/25/78	0	0	9.3	3.1	74	12.4	.27	0.00	0	0.00	0	705
7613-050	CONE	159:38	9/25/78	0	0	5.6	3.4	62	9.0	.34	0.00	0	0.00	0	700
7613-051	CONE	151:39	9/25/78	0	0	7.0	2.5	74	9.5	.33	0.00	0	0.00	0	702
7613-054	CONE	159:42	9/25/78	0	0	8.3	4.0	67	12.3	.30	0.00	0	0.00	0	707
7613-061	CONE	159:49	9/25/78	0	0	9.3	3.6	71	13.0	.27	0.00	0	0.00	0	703
7613-069	CONE	160:04	9/25/78	0	0	4.4	2.0	69	6.4	.25	0.00	0	0.00	0	689
7613-072	CONE	160:07	9/25/78	0	0	10.8	2.5	81	13.3	.25	0.00	0	0.00	0	690
7613-073	CONE	160:08	9/25/78	0	0	4.8	1.5	76	6.4	.23	0.00	0	0.00	0	691
7613-080	CONE	160:15	9/25/78	0	0	4.0	1.1	78	5.1	.34	0.00	0	0.00	0	685
7613-083	CONE	160:18	9/25/78	0	0	4.1	1.6	71	5.7	.24	0.00	0	0.00	0	687
7613-090	CONE	160:25	9/25/78	0	0	4.9	2.1	70	6.9	.25	0.00	0	0.00	0	686
7613-102	CONE	150:37	9/25/78	0	0	3.9	1.1	78	5.0	.35	0.00	0	0.00	0	684
7613-116	CONE	160:51	9/25/78	0	0	8.6	3.4	71	12.0	.25	0.00	0	0.00	0	683

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL MLS/ 100G	COF	SERIAL NUMBER
7613-130	CONE	161:12	9/25/78	0	0	8.1	2.4	77	10.4	.29	0.00	0	0.00	0	712
7613-134	CONE	161:16	9/25/78	0	0	6.3	1.3	82	7.6	.30	0.00	0	0.00	0	699
7614-003	CONE	161:28	9/25/78	0	0	3.5	1.3	73	4.8	.35	0.00	0	0.00	0	764
7614-004	CONE	161:29	1/61/:2	0	0	6.7	3.3	67	10.0	.29	0.00	0	0.00	0	748
7614-008	CONE	161:33	9/25/78	0	0	9.2	2.5	78	11.7	.30	0.00	0	0.00	0	755
7614-009	CONE	161:34	9/25/78	0	0	3.7	1.3	74	5.0	.33	0.00	0	0.00	0	759
7614-016	CONE	161:41	9/25/78	0	0	12.8	3.7	77	16.5	.30	0.00	0	0.00	0	765
7614-017	CONE	161:42	9/25/78	0	0	11.1	3.9	74	15.0	.26	0.00	0	0.00	0	753
7614-022	CONE	161:47	9/25/78	0	0	6.9	2.6	72	9.5	.31	0.00	0	0.00	0	758
7614-023	CONE	161:48	9/25/78	0	0	8.5	3.4	71	11.9	.26	0.00	0	0.00	0	756
7614-027	CONE	161:52	9/25/78	0	0	8.5	2.7	76	11.2	.26	0.00	0	0.00	0	752
7614-028	CONE	161:53	9/25/78	0	0	3.8	1.0	79	4.8	.41	0.00	0	0.00	0	767
7614-031	CONE	162:03	9/25/78	0	0	11.8	3.4	77	15.2	.30	0.00	0	0.00	0	773
7614-035	CONE	162:07	9/25/78	0	0	6.4	2.0	76	8.5	.29	0.00	0	0.00	0	751
7614-038	CONE	162:10	9/25/78	0	0	7.5	2.1	78	9.6	.31	0.00	0	0.00	0	763
7614-039	CONE	162:11	9/25/78	0	0	4.9	2.7	64	7.5	.28	0.00	0	0.00	0	772
7614-040	CONE	162:12	9/25/78	0	0	5.6	2.1	72	7.7	.30	0.00	0	0.00	0	775
7614-041	CONE	162:13	9/25/78	0	0	6.4	2.2	74	8.6	.29	0.00	0	0.00	0	762
7614-042	CONE	162:14	9/25/78	0	0	4.1	1.7	70	5.8	.30	0.00	0	0.00	0	761
7614-046	CONE	162:18	9/25/78	0	0	8.0	3.0	73	10.9	.27	0.00	0	0.00	0	749
7614-049	CONE	162:21	9/25/78	0	0	6.2	1.5	80	7.6	.36	0.00	0	0.00	0	769
7614-050	CONE	162:22	9/25/78	0	0	5.7	1.6	77	7.3	.40	0.00	0	0.00	0	776
7614-055	CONE	162:27	9/25/78	0	0	8.9	2.0	81	10.9	.26	0.00	0	0.00	0	757
7614-056	CONE	162:28	9/25/78	0	0	15.8	5.6	73	21.4	.26	0.00	0	0.00	0	750
7614-057	CONE	162:29	9/25/78	0	0	7.8	2.9	72	10.7	.32	0.00	0	0.00	0	754
7614-063	CONE	162:35	9/25/78	0	0	3.7	2.5	59	6.1	.29	0.00	0	0.00	0	760
7614-064	CONE	162:36	9/25/78	0	0	9.6	3.1	75	12.6	.26	0.00	0	0.00	0	770
7614-083	CONE	163:02	9/25/78	0	0	9.3	2.6	77	11.9	.30	0.00	0	0.00	0	766
7614-090	CONE	163:09	9/25/78	0	0	7.4	2.5	74	9.9	.31	0.00	0	0.00	0	771
7614-097	CONE	163:16	9/25/78	0	0	7.1	2.0	77	9.1	.29	0.00	0	0.00	0	768
7614-101	CONE	163:20	9/25/78	0	0	9.7	2.3	81	11.9	.29	0.00	0	0.00	0	774
7615-004	CONE	164:19	9/26/78	0	0	7.7	2.4	76	10.2	.29	0.00	0	0.00	0	801
7615-007	CONE	164:22	9/26/78	0	0	6.6	2.4	73	9.1	.32	0.00	0	0.00	0	802
7615-010	CONE	164:25	9/26/78	0	0	5.4	1.5	78	6.9	.32	0.00	0	0.00	0	787
7615-012	CONE	164:27	9/26/78	0	0	5.3	1.5	78	6.8	.32	0.00	0	0.00	0	799

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL MLS/ 100G	COF	SERIAL NUMBER
7615-015	CONE	164:30	9/26/78	0	0	9.4	2.9	76	12.3	.31	0.00	0	0.00	0	777
7615-019	CONE	164:34	9/26/78	0	0	4.6	1.6	74	6.3	.31	0.00	0	0.00	0	781
7615-029	CONE	164:44	9/26/78	0	0	7.4	2.8	72	10.2	.29	0.00	0	0.00	0	794
7615-031	CONE	164:46	9/26/78	0	0	9.5	2.8	77	12.3	.30	0.00	0	0.00	0	792
7615-033	CONE	164:48	9/26/78	0	0	4.5	1.4	76	5.8	.34	0.00	0	0.00	0	784
7615-038	CONE	164:53	9/26/78	0	0	9.8	3.7	72	13.5	.29	0.00	0	0.00	0	796
7615-043	CONE	165:05	9/26/78	0	0	3.6	1.6	68	5.3	.27	0.00	0	0.00	0	797
7615-044	CONE	165:06	9/26/78	0	0	9.2	3.4	72	12.6	.28	0.00	0	0.00	0	790
7615-046	CONE	165:08	9/26/78	0	0	6.0	1.8	76	7.8	.31	0.00	0	0.00	0	780
7615-049	CONE	165:11	9/26/78	0	0	8.9	3.3	73	12.2	.26	0.00	0	0.00	0	786
7615-056	CONE	165:18	9/26/78	0	0	11.4	3.0	79	14.4	.31	0.00	0	0.00	0	779
7615-059	CONE	165:21	9/26/78	0	0	11.1	3.4	76	14.4	.25	0.00	0	0.00	0	778
7615-063	CONE	165:25	9/26/78	0	0	11.8	4.2	73	16.0	.28	0.00	0	0.00	0	793
7615-067	CONE	165:29	9/26/78	0	0	6.9	2.0	77	8.9	.29	0.00	0	0.00	0	803
7615-069	CONE	165:31	9/26/78	0	0	4.4	1.5	74	5.8	.32	0.00	0	0.00	0	789
7615-073	CONE	165:35	9/26/78	0	0	7.3	2.3	76	9.6	.27	0.00	0	0.00	0	791
7615-074	CONE	165:36	9/26/78	0	0	11.0	2.9	79	13.9	.26	0.00	0	0.00	0	804
7615-075	CONE	165:37	9/26/78	0	0	6.5	2.4	73	8.9	.32	0.00	0	0.00	0	800
7615-083	CONE	165:45	9/26/78	0	0	6.6	1.7	79	8.2	.34	0.00	0	0.00	0	798
7615-085	CONE	165:47	9/26/78	0	0	7.5	3.3	69	10.8	.28	0.00	0	0.00	0	788
7615-108	CONE	166:17	9/26/78	0	0	3.3	2.2	60	5.5	.36	0.00	0	0.00	0	783
7615-111	CONE	166:20	9/26/78	0	0	6.9	2.1	76	9.0	.33	0.00	0	0.00	0	782
7615-113	CONE	166:22	9/26/78	0	0	8.3	3.0	73	11.3	.26	0.00	0	0.00	0	805
7615-134	CONE	166:43	9/26/78	0	0	10.9	3.4	76	14.3	.25	0.00	0	0.00	0	785
7616-002	CONE	167:28	9/26/78	0	0	9.9	2.6	79	12.4	.29	0.00	0	0.00	0	829
7616-003	CONE	167:29	9/26/78	0	0	12.5	3.5	78	16.0	.29	0.00	0	0.00	0	813
7616-011	CONE	167:37	9/26/78	0	0	7.2	3.2	69	10.4	.33	0.00	0	0.00	0	822
7616-015	CONE	167:41	9/26/78	0	0	7.1	2.1	77	9.1	.29	0.00	0	0.00	0	828
7616-016	CONE	167:42	9/26/78	0	0	12.3	4.0	75	16.3	.29	0.00	0	0.00	0	815
7616-018	CONE	167:44	9/26/78	0	0	6.7	2.9	69	9.6	.30	0.00	0	0.00	0	814
7616-024	CONE	167:50	9/26/78	0	0	6.8	3.5	65	10.3	.26	0.00	0	0.00	0	818
7616-029	CONE	168:02	9/26/78	0	0	11.4	4.0	74	15.4	.28	0.00	0	0.00	0	817
7616-036	CONE	168:09	9/26/78	0	0	7.3	2.2	76	9.5	.34	0.00	0	0.00	0	826
7616-037	CONE	168:10	9/26/78	0	0	8.9	4.1	68	13.0	.26	0.00	0	0.00	0	827
7616-038	CONE	168:11	9/26/78	0	0	8.8	3.0	74	11.7	.33	0.00	0	0.00	0	820

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/ 100G	COF	SERIAL NUMBER
7616-040	CONE	168:13	9/26/78	0	0	5.0	2.3	68	7.4	.32	0.00	0	0.00	0	830
7616-044	CONE	168:17	9/26/78	0	0	6.9	2.9	70	9.8	.31	0.00	0	0.00	0	808
7616-047	CONE	168:20	9/26/78	0	0	9.4	2.9	76	12.3	.29	0.00	0	0.00	0	810
7616-054	CONE	168:27	9/26/78	0	0	8.4	2.6	76	11.0	.31	0.00	0	0.00	0	823
7616-056	CONE	168:29	9/26/78	0	0	7.9	2.0	80	9.8	.28	0.00	0	0.00	0	811
7616-063	CONE	168:36	9/26/78	0	0	7.3	2.2	76	9.5	.30	0.00	0	0.00	0	821
7616-064	CONE	168:37	9/26/78	0	0	13.7	4.6	75	18.3	.28	0.00	0	0.00	0	831
7616-065	CONE	168:38	9/26/78	0	0	9.8	4.2	69	14.0	.30	0.00	0	0.00	0	816
7616-067	CONE	168:40	9/26/78	0	0	10.5	2.8	79	13.3	.30	0.00	0	0.00	0	806
7616-074	CONE	168:47	9/26/78	0	0	10.9	3.0	78	14.0	.27	0.00	0	0.00	0	812
7616-075	CONE	168:48	9/26/78	0	0	11.5	3.6	76	15.0	.27	0.00	0	0.00	0	809
7616-079	CONE	168:52	9/26/78	0	0	13.3	4.8	73	18.1	.27	0.00	0	0.00	0	824
7616-080	CONE	168:53	9/26/78	0	0	9.9	3.8	72	13.7	.33	0.00	0	0.00	0	819
7616-091	CONE	169:11	9/26/78	0	0	9.9	5.8	63	15.7	.27	0.00	0	0.00	0	807
7617-002	CONE	169:27	9/26/78	0	0	9.9	3.0	76	12.9	.28	0.00	0	0.00	0	839
7617-004	CONE	169:29	9/26/78	0	0	12.0	3.8	75	15.9	.26	0.00	0	0.00	0	835
7617-007	CONE	169:32	9/26/78	0	0	12.4	4.6	73	16.9	.26	0.00	0	0.00	0	832
7617-009	CONE	169:34	9/26/78	0	0	11.2	4.5	71	15.7	.26	0.00	0	0.00	0	833
7617-012	CONE	169:37	9/26/78	0	0	8.0	4.0	66	12.0	.28	0.00	0	0.00	0	834
7617-014	CONE	169:39	9/26/78	0	0	7.1	2.4	74	9.5	.29	0.00	0	0.00	0	841
7617-019	CONE	169:40	9/26/78	0	0	12.5	6.4	65	18.9	.27	0.00	0	0.00	0	851
7617-019	CONE	169:44	9/26/78	0	0	10.2	3.7	73	13.9	.28	0.00	0	0.00	0	843
7617-029	CONE	170:01	9/26/78	0	0	13.3	5.6	70	18.8	.29	0.00	0	0.00	0	856
7617-040	CONE	170:12	9/26/78	0	0	10.9	3.9	73	14.8	.26	0.00	0	0.00	0	836
7617-045	CONE	170:17	9/26/78	0	0	7.5	2.7	73	10.2	.28	0.00	0	0.00	0	858
7617-048	CONE	170:20	9/26/78	0	0	9.5	4.5	67	14.0	.28	0.00	0	0.00	0	844
7617-050	CONE	170:22	9/26/78	0	0	10.3	6.6	60	16.9	.26	0.00	0	0.00	0	848
7617-051	CONE	170:23	9/26/78	0	0	7.6	2.8	73	10.4	.28	0.00	0	0.00	0	854
7617-053	CONE	170:25	9/26/78	0	0	9.7	3.5	73	13.2	.27	0.00	0	0.00	0	840
7617-059	CONE	170:31	9/26/78	0	0	6.2	2.6	70	8.7	.29	0.00	0	0.00	0	855
7617-065	CONE	170:37	9/26/78	0	0	11.5	3.5	76	15.0	.26	0.00	0	0.00	0	849
7617-066	CONE	170:38	9/26/78	0	0	5.3	2.2	70	7.5	.31	0.00	0	0.00	0	857
7617-067	CONE	170:39	9/26/78	0	0	12.5	6.6	65	19.1	.25	0.00	0	0.00	0	842
7617-068	CONE	170:40	9/26/78	0	0	7.5	3.1	70	10.6	.28	0.00	0	0.00	0	838
7617-071	CONE	170:43	9/26/78	0	0	9.3	3.5	72	12.8	.26	0.00	0	0.00	0	859

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
7617-075	CONE	170:47	9/26/78	0	0	10.8	4.0	73	14.7	.28	0.00	0	0.00	0	850
7617-079	CONE	170:51	9/26/78	0	0	8.0	3.0	72	10.9	.28	0.00	0	0.00	0	845
7617-080	CONE	170:52	9/26/78	0	0	8.4	3.2	72	11.6	.26	0.00	0	0.00	0	837
7617-083	CONE	171:02	9/26/78	0	0	10.0	3.2	75	13.2	.29	0.00	0	0.00	0	846
7617-095	CONE	171:14	9/26/78	0	0	6.7	2.6	71	9.3	.29	0.00	0	0.00	0	847
7617-101	CONE	171:20	9/26/78	0	0	10.4	4.0	72	14.4	.27	0.00	0	0.00	0	852
7618-002	CONE	171:33	9/26/78	0	0	6.2	3.2	66	9.4	.30	0.00	0	0.00	0	744
7618-007	CONE	171:38	9/26/78	0	0	5.7	3.7	60	9.4	.28	0.00	0	0.00	0	742
7618-011	CONE	171:42	9/26/78	0	0	10.7	5.1	67	15.8	.31	0.00	0	0.00	0	733
7618-013	CONE	171:44	9/26/78	0	0	7.9	5.1	60	13.0	.26	0.00	0	0.00	0	745
7618-015	CONE	171:46	9/26/78	0	0	5.0	2.8	64	7.8	.29	0.00	0	0.00	0	734
7618-018	CONE	171:49	9/26/78	0	0	11.0	6.0	64	16.9	.23	0.00	0	0.00	0	728
7618-019	CONE	171:50	9/26/78	0	0	10.5	4.4	70	14.9	.29	0.00	0	0.00	0	741
7618-020	CONE	171:51	9/26/78	0	0	5.0	2.5	66	7.5	.30	0.00	0	0.00	0	746
7618-021	CONE	171:52	9/26/78	0	0	13.5	5.0	73	18.5	.25	0.00	0	0.00	0	727
7618-031	CONE	172:09	9/26/78	0	0	8.6	4.7	64	13.3	.27	0.00	0	0.00	0	718
7618-036	CONE	172:14	9/26/78	0	0	11.6	4.8	70	16.4	.28	0.00	0	0.00	0	729
7618-039	CONE	172:17	9/26/78	0	0	6.7	3.5	65	10.1	.27	0.00	0	0.00	0	722
7618-040	CONE	172:18	9/26/78	0	0	11.0	3.5	75	14.5	.26	0.00	0	0.00	0	730
7618-042	CONE	172:20	9/26/78	0	0	12.3	4.3	74	16.6	.28	0.00	0	0.00	0	737
7618-045	CONE	172:23	9/26/78	0	0	10.0	2.9	77	12.8	.28	0.00	0	0.00	0	724
7618-047	CONE	172:25	9/26/78	0	0	7.3	2.3	75	9.6	.28	0.00	0	0.00	0	738
7618-048	CONE	172:26	9/26/78	0	0	13.0	4.5	74	17.5	.29	0.00	0	0.00	0	739
7618-049	CONE	172:27	9/26/78	0	0	8.8	3.5	71	12.3	.26	0.00	0	0.00	0	717
7618-050	CONE	172:28	9/26/78	0	0	6.6	2.8	70	9.4	.28	0.00	0	0.00	0	726
7618-060	CONE	172:38	9/26/78	0	0	9.4	2.7	77	12.1	.27	0.00	0	0.00	0	721
7618-061	CONE	172:39	9/26/78	0	0	9.7	3.8	71	13.5	.27	0.00	0	0.00	0	732
7618-062	CONE	172:40	9/26/78	0	0	4.0	1.8	69	5.8	.30	0.00	0	0.00	0	725
7618-065	CONE	172:43	9/26/78	0	0	8.8	2.9	75	11.7	.28	0.00	0	0.00	0	740
7618-068	CONE	172:46	9/26/78	0	0	11.4	4.6	71	16.0	.29	0.00	0	0.00	0	736
7618-070	CONE	172:48	9/26/78	0	0	5.1	2.0	72	7.1	.31	0.00	0	0.00	0	743
7618-072	CONE	172:50	9/26/78	0	0	7.8	3.3	70	11.1	.27	0.00	0	0.00	0	747
7618-117	CONE	173:42	9/26/78	0	0	10.8	3.3	76	14.2	.28	0.00	0	0.00	0	731

1978 Males:

SUMMARY AS OF 79/04/03. PAGE 1

3 hr crush HSI<0.40=v.good LUPULIN ANALYSES + Storage
Safe Period: > 4 hrs=v.good

NURSERY OR ACCESSION NUMBER	LOCATION	HARVEST DATE	% ALPHA	% BETA	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX$_0$	CRUSH 3 HRS HSI	SAFE PERIOD (HRS)	PERM	CALC 6 MONTH HSI$_6$	CALC % A+B REMAIN	COF	SERIAL NUMBER
19046M	032:05-06	7/26/78	3.6	50.9	6	54.5	.21	1.59	1.90	0.00	0.00	0	0	218
19058M	018:53-54	7/28/78	26.6	50.1	34	76.7	.22	.75	0.00	0.00	0.00	0	0	257
19058M	007:82	8/01/78	23.8	42.4	35	66.2	.32	2.40	0.00	0.00	0.00	0	0	307
19058M	028:80	8/01/78	26.7	52.3	33	79.0	.22	2.27	0.00	0.00	0.00	0	0	318
21135M	039:59-60	7/25/78	41.7	24.7	62	66.5	.29	.38	2.90	0.00	0.00	0	0	150
21136M	028:82	7/17/78	37.3	31.7	54	69.0	.26	.33	2.10	0.00	0.00	0	0	35
21136M	041:57-58	8/01/78	40.9	35.2	53	76.0	.27	.38	2.80	0.00	0.00	0	0	309
21137M	028:83	7/17/78	30.7	41.9	42	72.5	.25	2.35	0.00	0.00	0.00	0	0	33
21137M	024:84	7/28/78	30.2	35.6	45	65.8	.22	2.17	0.00	0.00	0.00	0	0	225
21137M	043:57-58	7/29/78	29.1	34.8	45	63.9	.22	.47	2.40	0.00	0.00	0	0	229
63015M	032:03-04	7/26/78	48.9	20.4	70	69.4	.26	.32	8.20	0.00	0.00	0	0	210
64036M	028:81	7/17/78	21.2	35.1	37	56.3	.25	2.23	0.00	0.00	0.00	0	0	40
64036M	003:57-58	8/07/78	22.0	47.4	31	69.4	.24	2.17	0.00	0.00	0.00	0	0	326
7301-081M	031:53-54	8/02/78	45.0	22.2	66	67.2	.30	.36	9.90	0.00	0.00	0	0	321
7301-191M	032:53-54	7/18/78	41.2	23.1	64	64.3	.29	2.50	0.00	0.00	0.00	0	0	88
7302-016M	033:53-54	7/18/78	43.6	21.9	66	65.5	.28	.39	2.80	0.00	0.00	0	0	79
7302-036M	034:53-54	7/18/78	54.2	20.0	73	74.2	.28	2.55	0.00	0.00	0.00	0	0	89
7302-052M	035:53-54	7/18/78	53.1	23.2	69	76.3	.26	.46	3.60	0.00	0.00	0	0	91
7302-063M	036:53-54	7/27/78	47.1	20.1	70	67.2	.28	2.40	0.00	0.00	0.00	0	0	244
7302-077M	037:53-54	7/31/78	47.5	18.0	72	65.5	.35	.61	3.50	0.00	0.00	0	0	313
7302-095M	038:53-54	8/04/78	58.8	13.2	81	72.0	.31	.53	0.00	0.00	0.00	0	0	320
7302-105M	039:53-54	7/18/78	51.1	20.9	70	72.1	.27	.54	4.00	0.00	0.00	0	0	92
7302-125M	040:53-54	7/27/78	45.1	19.2	70	64.3	.30	1.07	0.00	0.00	0.00	0	0	235
7302-127M	041:53-54	7/18/78	34.9	21.2	62	56.0	.33	.87	0.00	0.00	0.00	0	0	87
7302-144M	042:53-54	7/27/78	33.8	14.7	69	48.5	.30	2.09	0.00	0.00	0.00	0	0	242
7302-153M	043:53-54	7/18/78	53.5	17.3	75	70.9	.28	.80	3.60	0.00	0.00	0	0	80
7302-155M	044:53-54	7/27/78	48.2	17.3	73	65.5	.29	1.68	0.00	0.00	0.00	0	0	250
7302-166M	045:53-54	7/27/78	49.3	18.0	73	67.2	.30	.64	2.70	0.00	0.00	0	0	256
7302-171M	046:53-54	7/18/78	52.3	18.7	73	71.0	.29	2.16	0.00	0.00	0.00	0	0	77
7302-174M	047:53-54	8/04/78	54.6	24.9	68	79.5	.27	.44	9.90	0.00	0.00	0	0	319
7302-183M	048:53-54	7/19/78	48.0	22.7	67	70.7	.27	2.23	0.00	0.00	0.00	0	0	56
7302-184M	049:53-54	7/18/78	51.1	21.2	70	72.3	.26	1.14	0.00	0.00	0.00	0	0	45
7302-186M	050:53-54	7/31/78	32.5	14.1	69	46.6	.38	.60	9.00	0.00	0.00	0	0	308
7303-028M	053:53-54	7/18/78	43.0	22.4	65	65.4	.28	1.63	0.00	0.00	0.00	0	0	44
7303-046M	054:53-54	7/18/78	37.6	21.6	63	59.2	.32	.63	5.20	0.00	0.00	0	0	90

NURSERY OR ACCESSION NUMBER	LOCATION	HARVEST DATE	% ALPHA	% BETA	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX$_0$	CRUSH 3 HRS HSI	SAFE PERIOD (HRS)	PERM	CALC 6 MONTH HSI$_6$	CALC % A+B REMAIN	COF	SERIAL NUMBER
7303-052M	055:53-54	7/25/78	45.1	18.7	70	63.8	.29	.37	3.60	0.00	0.00	0	0	145
7303-105M	031:55-56	8/04/78	54.7	15.7	77	70.4	.29	.34	9.90	0.00	0.00	0	0	324
7303-135M	032:55-56	7/27/78	51.9	14.6	78	66.5	.27	.40	3.60	0.00	0.00	0	0	231
7303-138M	033:55-56	7/27/78	52.3	16.2	76	68.6	.30	.42	3.60	0.00	0.00	0	0	246
7303-149M	034:55-56	7/27/78	43.4	15.6	73	58.9	.33	.39	5.00	0.00	0.00	0	0	234
7303-153M	035:55-56	7/28/78	34.4	18.0	65	52.3	.30	1.91	0.00	0.00	0.00	0	0	236
7303-159M	036:55-56	7/19/78	53.3	16.8	76	70.1	.25	.38	4.90	.80	.70	50	0	54
7303-165M	150:07	7/14/78	26.5	32.6	44	59.1	.32	.62	0.00	0.00	0.00	0	0	2
7303-165M	139:04	7/14/78	31.8	17.3	64	49.2	.30	0.00	0.00	0.00	0.00	0	0	16
7303-165M	158:38	7/18/78	41.4	21.0	66	62.5	.31	.89	0.00	0.00	0.00	0	0	74
7303-165M	037:55-56	7/19/78	47.0	20.9	69	67.9	.25	.36	2.20	0.00	0.00	0	0	58
7304-085M	038:55-56	7/19/78	51.3	16.3	75	67.6	.28	2.46	0.00	0.00	0.00	0	0	52
7304-092M	039:55-56	7/19/78	48.8	18.7	72	67.5	.27	.34	4.50	.83	.75	47	0	55
7304-105M	040:55-56	7/27/78	42.9	19.0	69	61.9	.30	.35	4.60	0.00	0.00	0	0	260
7304-123M	041:55-56	7/19/78	57.8	18.1	76	75.9	.25	.34	2.40	0.00	0.00	0	0	53
7304-148M	042:55-56	7/27/78	46.1	15.7	74	61.8	.29	.36	9.90	0.00	0.00	0	0	255
7304-165M	043:55-56	7/27/78	36.6	17.7	67	54.3	.32	.48	3.80	0.00	0.00	0	0	254
7304-177M	044:55-56	7/27/78	26.8	14.2	65	41.0	.33	.26	0.00	0.00	0.00	0	0	263
7304-197M	046:55-56	7/19/78	38.1	14.7	72	52.8	.29	.59	0.00	0.00	0.00	0	0	59
7306-013M	048:55-56	7/27/78	45.1	14.1	76	59.3	.30	.34	9.90	0.00	0.00	0	0	241
7306-117M	049:55-56	8/07/78	44.5	15.1	74	59.6	.30	0.00	0.00	0.00	0.00	0	0	327
7306-138M	050:55-56	7/31/78	41.4	16.8	71	58.2	.35	.41	9.90	0.00	0.00	0	0	315
7307-024M	051:55-56	7/27/78	38.6	15.7	71	54.3	.31	.36	4.50	0.00	0.00	0	0	240
7307-035M	052:55-56	7/25/78	47.9	21.6	68	69.5	.28	.36	4.00	0.00	0.00	0	0	140
7308-009M	053:55-56	7/25/78	36.9	13.5	73	50.4	.31	.37	4.90	0.00	0.00	0	0	175
7308-020M	054:55-56	7/19/78	19.7	8.1	70	27.8	.31	1.04	0.00	0.00	0.00	0	0	57
7308-023M	173:46	7/21/78	39.0	16.8	69	55.8	.30	.86	5.30	.85	.72	49	0	118
7308-023M	150:08	7/25/78	26.4	11.3	70	37.7	.35	.63	3.50	0.00	0.00	0	0	193
7308-023M	139:05	7/27/78	33.3	13.1	71	46.4	.35	.54	3.80	0.00	0.00	0	0	205
7308-023M	055:55-56	8/01/78	31.7	12.3	72	44.0	.40	.64	0.00	0.00	0.00	0	0	311
7308-037M	002:59-60	7/25/78	43.1	15.2	73	58.3	.29	.55	0.00	0.00	0.00	0	0	146
7309-004M	003:59-60	7/21/78	19.1	6.2	75	25.3	.39	.53	3.70	0.00	0.00	0	0	110
7309-034M	004:59-60	7/24/78	35.8	20.8	63	56.6	.39	.69	3.60	0.00	0.00	0	0	151
7309-045M	005:59-60	7/21/78	22.6	6.0	79	28.6	.34	1.05	0.00	0.00	0.00	0	0	102
7309-102M	006:59-60	7/24/78	32.6	11.2	74	43.8	.30	1.26	0.00	0.00	0.00	0	0	181

SUMMARY AS OF 79/04/03.
LUPULIN ANALYSES

NURSERY OR ACCESSION NUMBER	LOCATION	HARVEST DATE	% ALPHA	% BETA	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX$_0$	CRUSH 3 HRS HSI	SAFE PERIOD (HRS)	PERM	CALC 6 MONTH HSI$_6$	CALC % A+B REMAIN	COF	SERIAL NUMBER
7310-007M	007:59-60	7/27/78	24.4	13.3	64	37.7	.32	1.86	0.00	0.00	0.00	0	0	253
7311-012M	008:59-60	7/24/78	40.8	19.2	68	60.0	.34	.39	9.90	0.00	0.00	0	0	153
7311-020M	009:59-60	7/31/78	38.1	15.8	70	53.9	.30	.39	5.80	0.00	0.00	0	0	264
7311-046M	010:59-60	7/24/78	23.1	7.9	74	31.0	.30	.63	2.70	0.00	0.00	0	0	137
7311-087M	011:59-60	7/28/78	40.8	17.7	69	58.6	.30	.38	0.00	0.00	0.00	0	0	259
7311-114M	012:59-60	7/28/78	39.1	13.6	74	52.7	.30	.44	5.00	0.00	0.00	0	0	230
7311-122M	013:59-60	7/31/78	55.3	16.0	77	71.3	.27	.34	0.00	0.00	0.00	0	0	278
7311-135M	014:59-60	7/28/78	43.6	13.1	76	56.6	.27	.37	5.90	0.00	0.00	0	0	226
7311-135M	014:59-60	8/07/78	51.8	12.3	80	64.0	.29	.37	0.00	0.00	0.00	0	0	328
7311-141M	139:06	7/18/78	42.3	14.7	74	57.0	.28	.39	5.50	0.00	0.00	0	0	60
7311-141M	015:59-60	7/24/78	51.3	20.6	71	71.9	.26	.33	9.90	0.00	0.00	0	0	136
7311-141M	173:47	7/29/78	26.0	12.7	67	38.7	.32	2.21	0.00	0.00	0.00	0	0	269
7311-141M	158:40	7/30/78	51.2	23.3	68	74.5	.27	.34	5.00	0.00	0.00	0	0	282
7311-142M	016:59-60	7/24/78	38.4	16.8	69	55.2	.36	.42	9.90	0.00	0.00	0	0	147
7312-017M	017:59-60	7/24/78	43.6	17.6	71	61.2	.34	.40	9.90	0.00	0.00	0	0	148
7312-028M	018:59-60	7/28/78	53.0	17.4	75	70.4	.28	.39	4.90	0.00	0.00	0	0	243
7312-029M	019:59-60	7/31/78	38.5	19.1	66	57.5	.29	.60	4.90	0.00	0.00	0	0	275
7312-033M	020:59-60	7/21/78	24.2	13.6	64	37.8	.33	.59	4.20	0.00	0.00	0	0	112
7312-043M	021:59-60	7/31/78	49.2	19.7	71	68.9	.28	.40	5.60	0.00	0.00	0	0	283
7312-079M	022:59-60	7/28/78	51.8	16.7	75	68.5	.26	.40	3.30	0.00	0.00	0	0	232
7312-088M	023:59-60	7/28/78	44.4	18.6	70	63.0	.29	.40	0.00	0.00	0.00	0	0	248
7312-105M	024:59-60	7/31/78	52.9	17.8	74	70.7	.30	.75	5.50	0.00	0.00	0	0	314
7312-126M	025:59-60	7/24/78	41.7	23.8	63	65.5	.29	.62	5.40	0.00	0.00	0	0	142
7313-015M	026:59-60	7/24/78	34.9	20.1	63	54.9	.33	.45	4.70	0.00	0.00	0	0	157
7313-047M	028:59-60	7/27/78	36.2	14.5	71	50.7	.29	.62	3.20	0.00	0.00	0	0	233
7313-098M	029:59-60	7/25/78	42.7	18.4	69	61.1	.29	.59	0.00	0.00	0.00	0	0	135
7314-004M	030:59-60	7/21/78	41.1	17.3	70	58.4	.30	.40	4.40	.39	.39	78	0	100
7314-019M	031:59-60	7/21/78	22.4	8.5	72	30.9	.42	.78	2.70	0.00	0.00	0	0	101
7314-019M	031:59-60	7/25/78	36.1	15.8	69	51.9	.35	.60	0.00	0.00	0.00	0	0	152
7314-048M	033:59-60	7/31/78	31.7	16.7	65	48.5	.40	.60	9.90	0.00	0.00	0	0	310
7314-086M	034:59-60	7/25/78	39.8	16.8	70	56.6	.33	.52	0.00	0.00	0.00	0	0	154
7314-106M	035:59-60	7/25/78	23.4	14.5	61	37.9	.37	.73	0.00	0.00	0.00	0	0	149
7314-109M	036:59-60	7/25/78	22.7	10.3	68	33.0	.34	1.11	0.00	0.00	0.00	0	0	156
7315-031M	037:59-60	7/27/78	38.5	19.4	66	57.8	.30	.35	4.00	0.00	0.00	0	0	249
7315-051M	038:59-60	7/25/78	51.4	20.7	71	72.0	.29	.34	9.90	0.00	0.00	0	0	155

SUMMARY AS OF 79/04/03.
LUPULIN ANALYSES

NURSERY OR ACCESSION NUMBER	LOCATION	HARVEST DATE	% ALPHA	% BETA	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX$_0$	CRUSH 3 HRS HSI	SAFE PERIOD (HRS)	PERM	CALC 6 MONTH HSI$_6$	CALC % A+B REMAIN	COF	SERIAL NUMBER
7504-020M	008:68	7/17/78	8.4	17.0	32	25.4	.38	1.29	0.00	0.00	0.00	0	0	23
7504-040M	008:88	7/17/78	18.9	24.1	43	43.0	.26	0.00	1.10	0.00	0.00	0	0	28
7504-086M	010:66	7/28/78	34.2	36.8	48	71.1	.25	.31	3.10	0.00	0.00	0	0	247
7504-104M	010:84	7/28/78	13.7	52.1	20	65.9	.23	.46	1.00	0.00	0.00	0	0	252
7504-124M	011:70	7/28/78	13.8	14.2	49	28.0	.31	.83	1.70	0.00	0.00	0	0	239
7504-136M	011:82	8/02/78	18.0	27.7	39	45.7	.27	.39	1.00	0.00	0.00	0	0	323
7504-159M	012:71	7/17/78	21.7	37.2	36	58.9	.26	2.29	0.00	0.00	0.00	0	0	24
7504-224M	014:68	7/28/78	11.5	57.4	16	68.9	.24	.58	0.00	0.00	0.00	0	0	251
7504-263M	015:73	7/17/78	33.1	38.2	46	71.3	.26	.30	3.40	0.00	0.00	0	0	22
7505-022M	016:66	8/07/78	35.1	31.7	52	66.8	.26	.33	3.00	0.00	0.00	0	0	329
7505-036M	016:80	7/17/78	27.5	39.0	41	66.4	.24	.57	0.00	0.00	0.00	0	0	31
7506-014M	017:71	8/04/78	60.0	16.6	78	76.6	.26	.32	0.00	0.00	0.00	0	0	322
7506-017M	017:74	7/28/78	17.7	52.1	25	69.8	.24	.81	1.70	0.00	0.00	0	0	258
7506-027M	017:84	7/17/78	36.7	36.1	50	72.8	.25	.31	4.40	0.00	0.00	0	0	38
7506-031M	017:88	7/28/78	35.1	21.6	61	56.7	.28	.42	1.00	0.00	0.00	0	0	245
7506-057M	018:80	8/02/78	39.0	19.8	66	58.8	.29	.94	2.60	0.00	0.00	0	0	316
7506-079M	019:68	8/01/78	47.5	17.2	73	64.8	.34	2.48	0.00	0.00	0.00	0	0	312
7506-081M	019:70	7/28/78	50.1	21.6	69	71.6	.21	.30	3.30	0.00	0.00	0	0	227
7506-085M	019:74	7/17/78	50.2	32.3	60	82.5	.24	.32	4.60	0.00	0.00	0	0	32
7506-093M	019:82	7/17/78	28.0	44.7	38	72.6	.23	.39	2.00	0.00	0.00	0	0	37
7506-096M	019:85	7/28/78	46.4	24.3	65	70.6	.26	.36	4.90	0.00	0.00	0	0	237
7506-100M	019:89	7/17/78	43.1	28.4	60	71.5	.25	.31	3.40	0.00	0.00	0	0	39
7506-161M	021:82	7/17/78	40.6	33.7	54	74.3	.24	1.34	0.00	0.00	0.00	0	0	26
7506-162M	021:83	7/17/78	32.2	45.7	41	77.9	.24	.69	0.00	0.00	0.00	0	0	34
7506-182M	022:69	7/17/78	22.1	44.9	33	67.1	.24	2.31	0.00	0.00	0.00	0	0	27
7506-207M	022:94	7/17/78	35.0	27.3	56	62.3	.26	.89	0.00	0.00	0.00	0	0	30
7506-235M	023:88	7/17/78	31.1	31.9	49	62.9	.25	.38	2.00	0.00	0.00	0	0	29
7507-104M	027:86	7/17/78	28.8	38.8	42	67.6	.32	.31	2.30	0.00	0.00	0	0	25
7507-107M	027:89	7/28/78	34.8	18.6	65	53.4	.28	.41	0.00	0.00	0.00	0	0	238
7507-117M	028:65	7/17/78	32.6	48.1	40	80.7	.23	1.48	0.00	0.00	0.00	0	0	36
7601-002M	139:08	7/14/78	12.8	12.4	50	25.2	.43	1.95	0.00	0.00	0.00	0	0	15
7601-019M	139:25	7/27/78	29.5	18.5	61	47.9	.37	.48	4.40	0.00	0.00	0	0	200
7601-029M	139:35	7/14/78	12.7	23.5	35	36.2	.35	.49	0.00	0.00	0.00	0	0	20
7601-051M	140:04	7/27/78	15.6	18.2	46	33.8	.40	1.95	0.00	0.00	0.00	0	0	204
7601-052M	140:05	7/14/78	9.9	24.4	28	34.3	.41	1.93	0.00	0.00	0.00	0	0	6

SUMMARY AS OF 79/04/03.
LUPULIN ANALYSES

NURSERY OR ACCESSION NUMBER	LOCATION	HARVEST DATE	% ALPHA	% BETA	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX$_o$	CRUSH 3 HRS HSI	SAFE PERIOD (HRS)	PERM	CALC 6 MONTH HSI$_6$	CALC % A+B REMAIN	COF	SERIAL NUMBER
7602-002M	140:26	7/27/78	15.2	13.6	52	28.8	.39	.67	0.00	0.00	0.00	0	0	203
7602-008M	140:32	7/27/78	12.3	12.2	50	24.5	.39	1.94	0.00	0.00	0.00	0	0	201
7602-022M	140:46	7/14/78	16.1	18.2	47	34.3	.34	.88	0.00	0.00	0.00	0	0	12
7602-029M	140:53	7/18/78	35.7	16.7	68	52.4	.30	.44	0.00	0.00	0.00	0	0	75
7602-046M	141:17	7/26/78	8.3	8.4	49	16.8	.45	1.52	0.00	0.00	0.00	0	0	208
7603-036M	142:25	7/26/78	21.7	11.8	64	33.5	.31	.66	0.00	0.00	0.00	0	0	223
7603-038M	142:27	7/26/78	13.3	9.5	58	22.9	.40	1.95	0.00	0.00	0.00	0	0	214
7603-042M	142:31	7/18/78	17.5	14.0	55	31.5	.38	1.86	0.00	0.00	0.00	0	0	76
7603-053M	142:42	7/18/78	13.5	11.8	53	25.3	.33	1.64	0.00	0.00	0.00	0	0	51
7604-006M	143:13	7/26/78	13.2	11.9	52	25.0	.41	.65	0.00	0.00	0.00	0	0	217
7604-008M	143:15	7/14/78	22.4	11.3	66	33.7	.35	.49	0.00	0.00	0.00	0	0	11
7604-014M	143:21	7/26/78	35.8	20.9	63	56.7	.28	.44	0.00	0.00	0.00	0	0	209
7604-015M	143:22	7/26/78	14.1	14.0	50	28.1	.33	.60	0.00	0.00	0.00	0	0	224
7604-016M	143:23	7/26/78	7.8	7.6	50	15.5	.28	1.90	0.00	0.00	0.00	0	0	220
7604-032M	143:39	7/26/78	20.1	29.3	40	49.4	.34	1.26	0.00	0.00	0.00	0	0	206
7604-035M	143:42	7/26/78	16.8	22.4	42	39.2	.31	.46	0.00	0.00	0.00	0	0	215
7604-040M	143:47	7/26/78	8.1	11.2	41	19.4	.38	1.08	0.00	0.00	0.00	0	0	216
7604-041M	143:48	7/27/78	36.5	16.6	68	53.1	.36	.42	5.00	0.00	0.00	0	0	202
7604-042M	143:49	7/14/78	11.8	17.1	40	29.0	.36	1.14	0.00	0.00	0.00	0	0	21
7604-045M	143:52	7/14/78	.5	4.3	11	4.9	.53	1.67	0.00	0.00	0.00	0	0	9
7604-048M	144:02	7/26/78	19.3	14.5	57	33.8	.28	.62	0.00	0.00	0.00	0	0	221
7604-050M	144:04	7/26/78	40.0	21.8	64	61.8	.26	.39	0.00	0.00	0.00	0	0	212
7604-054M	144:08	7/14/78	19.1	16.1	54	35.1	.34	1.98	0.00	0.00	0.00	0	0	18
7604-057M	144:11	7/26/78	26.7	18.7	58	45.4	.34	.49	0.00	0.00	0.00	0	0	207
7604-060M	144:14	7/26/78	10.1	22.9	30	33.0	.37	1.55	0.00	0.00	0.00	0	0	213
7605-011M	144:36	7/26/78	21.9	16.7	56	38.6	.32	1.61	0.00	0.00	0.00	0	0	219
7605-014M	144:39	7/14/78	24.1	31.9	42	56.0	.29	.41	0.00	0.00	0.00	0	0	8
7605-016M	144:41	8/01/78	52.2	32.9	61	85.1	.40	1.18	0.00	0.00	0.00	0	0	325
7605-017M	144:42	7/26/78	13.0	11.4	53	24.4	.32	.72	0.00	0.00	0.00	0	0	222
7605-024M	144:49	7/18/78	27.8	33.2	45	61.0	.25	1.59	0.00	0.00	0.00	0	0	43
7605-034M	145:06	7/26/78	19.3	16.6	53	35.9	.34	.59	0.00	0.00	0.00	0	0	211
7605-037M	145:09	8/01/78	37.9	27.5	57	65.4	.28	.43	0.00	0.00	0.00	0	0	303
7605-038M	145:10	7/25/78	6.2	5.9	51	12.1	.60	1.19	0.00	0.00	0.00	0	0	185
7605-044M	145:16	7/25/78	47.5	17.8	72	65.3	.28	.46	0.00	0.00	0.00	0	0	131
7605-067M	145:39	7/25/78	33.6	16.5	67	50.1	.31	.51	0.00	0.00	0.00	0	0	189

NURSERY OR ACCESSION NUMBER	LOCATION	HARVEST DATE	% ALPHA	% BETA	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX$_o$	CRUSH 3 HRS HSI	SAFE PERIOD (HRS)	PERM	CALC 6 MONTH HSI$_c$	CALC % A+B REMAIN	COF	SERIAL NUMBER
7605-073M	145:41	7/25/78	27.5	18.7	59	46.2	.33	.46	0.00	0.00	0.00	0	0	127
7605-076M	145:48	7/18/78	30.5	26.1	53	56.6	.29	.43	0.00	0.00	0.00	0	0	46
7605-076M	145:48	7/25/78	33.5	19.9	62	53.4	.29	.44	0.00	0.00	0.00	0	0	124
7605-087M	146:06	7/14/78	36.5	21.5	62	58.0	.31	0.00	0.00	0.00	0.00	0	0	5
7605-091M	146:10	7/25/78	34.5	20.4	62	54.9	.31	0.00	0.00	0.00	0.00	0	0	198
7605-097M	146:16	7/14/78	12.0	19.3	38	31.3	.35	0.00	0.00	0.00	0.00	0	0	10
7605-100M	146:19	7/25/78	22.6	12.6	64	35.2	.36	0.00	0.00	0.00	0.00	0	0	129
7605-109M	146:28	7/25/78	17.2	21.1	44	38.3	.31	0.00	0.00	0.00	0.00	0	0	132
7605-112M	146:31	7/25/78	6.0	16.0	27	22.0	.42	0.00	0.00	0.00	0.00	0	0	188
7605-114M	146:33	7/25/78	20.7	12.9	61	33.6	.32	0.00	0.00	0.00	0.00	0	0	125
7605-115M	146:34	7/25/78	19.4	16.2	54	35.6	.35	0.00	0.00	0.00	0.00	0	0	187
7605-123M	146:43	7/25/78	7.7	13.3	36	20.9	.38	0.00	0.00	0.00	0.00	0	0	133
7605-125M	146:44	7/25/78	7.6	4.6	62	12.2	.41	0.00	0.00	0.00	0.00	0	0	128
7605-130M	146:49	7/25/78	24.0	17.3	58	41.3	.34	0.00	0.00	0.00	0.00	0	0	126
7605-141M	147:07	7/14/78	9.1	14.7	38	23.7	.47	0.00	0.00	0.00	0.00	0	0	7
7605-150M	147:16	8/01/78	16.9	26.3	39	43.3	.41	0.00	0.00	0.00	0.00	0	0	300
7605-159M	147:25	7/25/78	12.4	14.4	46	26.8	.42	0.00	0.00	0.00	0.00	0	0	139
7605-162M	147:28	7/25/78	25.6	15.5	62	41.1	.33	0.00	0.00	0.00	0.00	0	0	141
7605-165M	147:31	7/25/78	20.1	17.2	53	37.3	.34	0.00	0.00	0.00	0.00	0	0	143
7605-174M	147:40	7/30/78	23.7	11.4	67	35.0	.34	0.00	0.00	0.00	0.00	0	0	272
7606-010M	148:07	7/25/78	32.0	17.7	64	49.7	.33	0.00	0.00	0.00	0.00	0	0	134
7606-014M	148:11	7/30/78	35.2	30.9	53	66.1	.30	0.00	0.00	0.00	0.00	0	0	297
7606-081M	149:25	7/30/78	23.3	14.1	62	37.5	.34	0.00	0.00	0.00	0.00	0	0	279
7608-007M	150:30	7/14/78	21.3	26.5	44	47.8	.35	0.00	0.00	0.00	0.00	0	0	1
7609-005M	150:39	7/18/78	41.9	22.9	64	64.8	.24	0.00	0.00	0.00	0.00	0	0	73
7609-007M	150:41	7/18/78	30.2	10.2	74	40.4	.30	0.00	0.00	0.00	0.00	0	0	49
7609-009M	150:43	7/25/78	26.7	13.9	65	40.6	.33	0.00	0.00	0.00	0.00	0	0	173
7609-010M	150:44	7/25/78	28.6	20.5	58	49.1	.34	0.00	0.00	0.00	0.00	0	0	144
7610-018M	151:12	7/18/78	35.3	15.9	68	51.2	.32	0.00	0.00	0.00	0.00	0	0	94
7610-021M	151:15	7/25/78	36.2	14.1	71	50.3	.31	0.00	0.00	0.00	0.00	0	0	191
7610-023M	151:17	7/25/78	12.3	13.8	47	26.1	.37	0.00	0.00	0.00	0.00	0	0	170
7610-041M	151:35	7/25/78	17.9	27.7	39	45.6	.25	0.00	0.00	0.00	0.00	0	0	166
7610-046M	151:40	7/25/78	17.8	15.4	53	33.2	.30	0.00	0.00	0.00	0.00	0	0	178
7610-056M	151:50	7/18/78	11.6	14.7	44	26.3	.43	0.00	0.00	0.00	0.00	0	0	72
7610-061M	152:02	7/25/78	41.0	21.9	65	62.9	.28	0.00	0.00	0.00	0.00	0	0	164

SUMMARY AS OF 79/04/03.
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NURSERY OR ACCESSION NUMBER	LOCATION	HARVEST DATE	% ALPHA	% BETA	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX$_{\sigma}$	CRUSH 3 HRS HSI	SAFE PERIOD (HRS)	PERM	CALC 6 MONTH HSI$_{\delta}$	CALC % A+B REMAIN	COF	SERIAL NUMBER
7610-075M	152:16	7/30/78	19.5	8.5	69	28.0	.52	0.00	0.00	0.00	0.00	0	0	291
7610-081M	152:22	7/25/78	37.5	17.9	67	55.4	.32	0.00	0.00	0.00	0.00	0	0	192
7610-091M	152:32	7/25/78	23.5	21.4	52	44.9	.31	0.00	0.00	0.00	0.00	0	0	165
7610-102M	152:43	7/25/78	27.5	16.4	62	43.9	.29	0.00	0.00	0.00	0.00	0	0	169
7610-112M	152:53	7/18/78	54.1	18.1	74	72.2	.25	0.00	0.00	0.00	0.00	0	0	47
7610-117M	153:05	7/24/78	4.2	4.2	50	8.4	.55	0.00	0.00	0.00	0.00	0	0	186
7610-129M	153:17	7/25/78	30.6	13.8	68	44.4	.30	0.00	0.00	0.00	0.00	0	0	167
7610-149M	153:37	7/25/78	29.6	22.8	56	52.4	.28	0.00	0.00	0.00	0.00	0	0	138
7610-161M	153:49	7/25/78	16.7	17.5	48	34.3	.36	0.00	0.00	0.00	0.00	0	0	163
7610-168M	154:03	7/30/78	49.8	20.3	71	70.1	.31	0.00	0.00	0.00	0.00	0	0	292
7611-031M	154:38	7/25/78	15.1	12.3	55	27.3	.36	0.00	0.00	0.00	0.00	0	0	161
7611-034M	154:41	7/25/78	32.7	16.5	66	49.1	.30	0.00	0.00	0.00	0.00	0	0	182
7611-035M	154:42	7/25/78	13.3	11.2	54	24.4	.38	0.00	0.00	0.00	0.00	0	0	177
7611-037M	154:44	7/18/78	21.7	12.1	64	33.9	.32	0.00	0.00	0.00	0.00	0	0	48
7611-038M	154:45	7/25/78	19.8	33.4	37	53.2	.25	0.00	0.00	0.00	0.00	0	0	172
7611-052M	155:06	7/24/78	6.4	7.9	44	14.3	.49	0.00	0.00	0.00	0.00	0	0	130
7611-055M	155:09	7/18/78	24.6	14.5	62	39.1	.39	0.00	0.00	0.00	0.00	0	0	85
7611-070M	155:24	7/25/78	17.4	16.3	51	33.7	.36	0.00	0.00	0.00	0.00	0	0	168
7611-071M	155:25	7/18/78	23.2	17.3	57	40.5	.36	0.00	0.00	0.00	0.00	0	0	82
7611-072M	155:26	7/18/78	7.9	6.5	55	14.4	.49	0.00	0.00	0.00	0.00	0	0	95
7611-074M	155:28	7/25/78	18.3	18.3	49	36.6	.30	0.00	0.00	0.00	0.00	0	0	171
7611-086M	155:40	7/18/78	19.6	11.8	62	31.3	.38	0.00	0.00	0.00	0.00	0	0	69
7611-089M	155:43	7/25/78	12.7	13.9	47	26.6	.33	0.00	0.00	0.00	0.00	0	0	174
7611-090M	155:44	7/18/78	27.9	23.6	54	51.4	.33	0.00	0.00	0.00	0.00	0	0	71
7611-102M	156:03	7/18/78	45.8	20.5	69	66.3	.27	0.00	0.00	0.00	0.00	0	0	63
7611-107M	156:08	7/18/78	48.1	23.6	67	71.6	.25	0.00	0.00	0.00	0.00	0	0	64
7611-120M	156:21	8/01/78	38.4	19.7	66	58.1	.31	0.00	0.00	0.00	0.00	0	0	301
7611-133M	156:34	8/01/78	43.1	13.7	75	56.8	.33	0.00	0.00	0.00	0.00	0	0	304
7611-135M	156:36	7/25/78	8.9	6.4	58	15.3	.39	0.00	0.00	0.00	0.00	0	0	179
7611-146M	156:47	7/18/78	13.0	7.8	62	20.7	.37	0.00	0.00	0.00	0.00	0	0	50
7611-151M	156:52	7/25/78	19.4	7.3	72	26.8	.35	0.00	0.00	0.00	0.00	0	0	176
7611-152M	156:53	7/25/78	14.7	8.4	63	23.1	.39	0.00	0.00	0.00	0.00	0	0	180
7611-165M	157:13	7/24/78	44.3	19.9	69	64.2	.30	0.00	0.00	0.00	0.00	0	0	190
7611-179M	157:27	7/24/78	13.2	13.0	50	26.3	.44	0.00	0.00	0.00	0.00	0	0	183
7612-004M	157:41	7/18/78	49.2	18.3	72	67.5	.28	0.00	0.00	0.00	0.00	0	0	70

NURSERY OR ACCESSION NUMBER	LOCATION	HARVEST DATE	% ALPHA	% BETA	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX$_0$	CRUSH 3 HRS HSI	SAFE PERIOD (HRS)	PERM	CALC 6 MONTH HSI$_6$	CALC % A+B REMAIN	COF	SERIAL NUMBER
7612-007M	157:44	7/24/78	20.8	15.9	56	36.7	.32	0.00	0.00	0.00	0.00	0	0	158
7612-014M	157:51	7/24/78	5.9	6.5	47	12.4	.44	0.00	0.00	0.00	0.00	0	0	197
7613-003M	158:44	7/29/78	34.3	14.4	70	48.8	.29	0.00	0.00	0.00	0.00	0	0	273
7613-004M	158:45	7/29/78	24.6	11.8	67	36.4	.30	0.00	0.00	0.00	0.00	0	0	266
7613-011M	158:52	7/24/78	27.5	11.9	69	39.3	.33	0.00	0.00	0.00	0.00	0	0	196
7613-024M	159:12	7/18/78	12.0	6.1	66	18.1	.46	0.00	0.00	0.00	0.00	0	0	86
7613-025M	159:13	8/01/78	46.6	13.7	77	60.3	.34	0.00	0.00	0.00	0.00	0	0	298
7613-053M	159:41	7/29/78	18.0	12.5	59	30.5	.33	0.00	0.00	0.00	0.00	0	0	280
7613-065M	159:53	7/24/78	23.5	15.3	60	38.7	.34	0.00	0.00	0.00	0.00	0	0	194
7613-074M	160:09	7/24/78	15.0	11.9	55	26.9	.37	0.00	0.00	0.00	0.00	0	0	199
7613-077M	160:12	7/18/78	32.0	14.6	68	46.6	.32	0.00	0.00	0.00	0.00	0	0	98
7613-084M	160:19	7/18/78	39.3	18.8	67	58.1	.27	0.00	0.00	0.00	0.00	0	0	66
7613-089M	160:24	7/24/78	41.0	18.5	68	59.4	.29	0.00	0.00	0.00	0.00	0	0	159
7613-104M	160:39	7/30/78	39.9	13.6	74	53.5	.28	0.00	0.00	0.00	0.00	0	0	284
7613-105M	160:40	7/30/78	25.1	16.7	60	41.8	.35	0.00	0.00	0.00	0.00	0	0	281
7613-128M	161:10	8/01/78	36.3	13.1	73	49.4	.33	0.00	0.00	0.00	0.00	0	0	302
7613-131M	161:13	7/21/78	37.8	21.9	63	59.6	.28	0.00	0.00	0.00	0.00	0	0	121
7614-005M	161:30	7/21/78	22.7	9.6	70	32.3	.38	0.00	0.00	0.00	0.00	0	0	99
7614-011M	161:36	7/30/78	4.1	3.8	51	7.9	.44	0.00	0.00	0.00	0.00	0	0	277
7614-025M	161:50	7/24/78	23.0	12.8	64	35.9	.32	0.00	0.00	0.00	0.00	0	0	160
7614-026M	161:51	7/24/78	33.9	14.4	70	48.3	.31	0.00	0.00	0.00	0.00	0	0	184
7614-030M	162:02	7/29/78	37.2	17.8	67	55.0	.29	0.00	0.00	0.00	0.00	0	0	267
7614-032M	162:04	7/18/78	22.6	9.1	71	31.7	.37	0.00	0.00	0.00	0.00	0	0	81
7614-034M	162:06	7/29/78	36.8	22.3	62	59.1	.26	0.00	0.00	0.00	0.00	0	0	265
7614-037M	162:09	7/21/78	12.2	7.7	61	19.9	.42	0.00	0.00	0.00	0.00	0	0	107
7614-044M	162:16	7/21/78	46.7	24.8	65	71.5	.28	.38	3.80	0.00	0.00	0	0	106
7614-047M	162:19	8/01/78	53.3	14.2	78	67.5	.30	0.00	0.00	0.00	0.00	0	0	306
7614-051M	162:23	7/21/78	2.5	9.7	20	12.2	.88	0.00	0.00	0.00	0.00	0	0	103
7614-052M	162:24	7/29/78	47.0	18.1	72	65.0	.27	0.00	0.00	0.00	0.00	0	0	271
7614-060M	162:32	7/29/78	32.5	10.9	74	43.4	.32	0.00	0.00	0.00	0.00	0	0	294
7614-065M	162:37	7/29/78	7.5	6.3	54	13.8	.42	0.00	0.00	0.00	0.00	0	0	293
7614-098M	163:17	7/14/78	13.3	7.5	64	20.8	.47	0.00	0.00	0.00	0.00	0	0	4
7614-104M	163:23	7/29/78	29.4	11.7	71	41.1	.33	0.00	0.00	0.00	0.00	0	0	270
7614-108M	163:27	7/29/78	14.7	3.7	79	18.4	.39	0.00	0.00	0.00	0.00	0	0	289
7614-121M	163:40	7/21/78	20.1	8.9	69	28.9	.36	0.00	0.00	0.00	0.00	0	0	105

NURSERY OR ACCESSION NUMBER	LOCATION	HARVEST DATE	% ALPHA	% BETA	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX$_0$	CRUSH 3 HRS HSI	SAFE PERIOD (HRS)	PERM	CALC 6 MONTH HSI$_6$	CALC % A+B REMAIN	COF	SERIAL NUMBER
7614-131M	163:50	7/21/78	44.2	18.2	70	62.4	.29	0.00	0.00	0.00	0.00	0	0	120
7614-134M	163:53	7/24/78	6.0	5.4	52	11.4	.46	0.00	0.00	0.00	0.00	0	0	162
7614-135M	164:01	7/18/78	21.0	12.4	62	33.4	.36	0.00	0.00	0.00	0.00	0	0	78
7614-143M	164:09	7/29/78	37.3	15.0	71	52.2	.33	0.00	0.00	0.00	0.00	0	0	287
7614-145M	164:11	8/01/78	26.9	30.5	46	57.4	.34	0.00	0.00	0.00	0.00	0	0	305
7615-071M	165:33	8/01/78	44.3	15.8	73	60.0	.33	0.00	0.00	0.00	0.00	0	0	299
7615-082M	165:44	8/01/78	42.5	16.4	72	58.8	.30	0.00	0.00	0.00	0.00	0	0	317
7615-091M	165:53	7/24/78	12.2	13.6	47	25.8	.42	0.00	0.00	0.00	0.00	0	0	195
7615-094M	166:03	7/21/78	41.8	14.3	74	56.1	.27	0.00	0.00	0.00	0.00	0	0	114
7615-119M	166:28	7/29/78	21.9	12.6	63	34.5	.41	0.00	0.00	0.00	0.00	0	0	295
7615-133M	166:42	7/14/78	22.7	16.5	57	39.2	.37	0.00	0.00	0.00	0.00	0	0	19
7615-143M	166:52	7/21/78	27.4	13.8	66	41.2	.31	0.00	0.00	0.00	0.00	0	0	108
7615-146M	167:02	7/29/78	5.4	4.1	56	9.5	.39	0.00	0.00	0.00	0.00	0	0	276
7615-147M	167:03	7/18/78	22.4	9.6	69	32.0	.24	0.00	0.00	0.00	0.00	0	0	65
7615-154M	167:10	7/29/78	32.6	11.4	74	44.0	.31	0.00	0.00	0.00	0.00	0	0	296
7615-159M	167:15	7/29/78	25.6	15.9	61	41.6	.28	0.00	0.00	0.00	0.00	0	0	285
7615-161M	167:17	7/21/78	42.6	16.4	72	59.0	.28	0.00	0.00	0.00	0.00	0	0	116
7616-008M	167:34	7/18/78	19.9	7.6	72	27.5	.38	0.00	0.00	0.00	0.00	0	0	93
7616-010M	167:36	7/21/78	5.4	10.5	33	15.8	.42	0.00	0.00	0.00	0.00	0	0	115
7616-034M	168:07	7/21/78	15.1	11.5	56	26.7	.36	0.00	0.00	0.00	0.00	0	0	109
7616-069M	168:42	7/14/78	11.1	26.9	29	38.0	.33	0.00	0.00	0.00	0.00	0	0	3
7616-090M	169:10	7/21/78	29.8	34.1	46	63.9	.25	0.00	0.00	0.00	0.00	0	0	113
7616-095M	169:15	7/21/78	17.2	12.1	58	29.4	.36	0.00	0.00	0.00	0.00	0	0	111
7616-103M	169:23	7/18/78	15.1	11.7	56	26.8	.36	0.00	0.00	0.00	0.00	0	0	96
7617-036M	170:08	7/14/78	17.6	16.1	52	33.7	.33	0.00	0.00	0.00	0.00	0	0	14
7617-037M	170:09	7/14/78	30.7	19.2	61	50.0	.29	0.00	0.00	0.00	0.00	0	0	13
7617-042M	170:14	7/29/78	19.5	29.0	40	48.5	.40	0.00	0.00	0.00	0.00	0	0	288
7617-049M	170:21	7/21/78	11.4	10.7	51	22.2	.41	0.00	0.00	0.00	0.00	0	0	123
7617-054M	170:26	7/18/78	26.7	24.9	51	51.6	.26	0.00	0.00	0.00	0.00	0	0	61
7617-055M	170:27	7/21/78	25.2	53.1	32	78.3	.31	0.00	0.00	0.00	0.00	0	0	117
7617-060M	170:32	7/18/78	22.9	18.4	55	41.3	.38	0.00	0.00	0.00	0.00	0	0	84
7617-062M	170:34	7/14/78	8.3	7.7	51	16.1	.36	0.00	0.00	0.00	0.00	0	0	17
7617-070M	170:42	7/21/78	24.4	28.4	46	52.8	.28	0.00	0.00	0.00	0.00	0	0	119
7617-099M	171:18	7/21/78	22.8	36.5	38	59.3	.29	0.00	0.00	0.00	0.00	0	0	104
7617-105M	171:24	7/18/78	30.6	22.0	58	52.6	.29	0.00	0.00	0.00	0.00	0	0	97

LUPULIN ANALYSES

NURSERY OR ACCESSION NUMBER	LOCATION	HARVEST DATE	% ALPHA	% BETA	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX$_0$	CRUSH 3 HRS HSI	SAFE PERIOD (HRS)	PERM	CALC 6 MONTH HSI$_6$	CALC % A+B REMAIN	COF	SERIAL NUMBER
7618-009M	171:40	7/29/78	4.2	2.9	59	7.1	.62	0.00	0.00	0.00	0.00	0	0	290
7618-010M	171:41	7/18/78	30.8	24.5	55	55.3	.30	0.00	0.00	0.00	0.00	0	0	68
7618-041M	172:19	7/18/78	41.6	15.9	72	57.5	.31	0.00	0.00	0.00	0.00	0	0	83
7618-052M	172:30	7/29/78	30.9	25.8	54	56.6	.29	0.00	0.00	0.00	0.00	0	0	262
7618-054M	172:32	7/18/78	23.7	13.8	63	37.6	.26	0.00	0.00	0.00	0.00	0	0	67
7618-067M	172:45	7/21/78	21.4	12.4	63	33.8	.32	0.00	0.00	0.00	0.00	0	0	122
7618-083M	173:08	7/29/78	28.3	14.8	65	43.1	.31	0.00	0.00	0.00	0.00	0	0	286
7618-091M	173:16	7/29/78	14.0	14.0	50	28.1	.59	0.00	0.00	0.00	0.00	0	0	274
7618-116M	173:41	7/29/78	33.3	16.4	66	49.8	.29	0.00	0.00	0.00	0.00	0	0	261

1978: BALE SAMPLES SELECTED GENOTYPES AS OF 79/02/13. PAGE 1

$\alpha > 12\%$

SORTED BY ALPHA

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
7312-009	BALE	324:31-35	9/06/78	0	0	17.7	5.2	77	22.9	.26	0.00	0	2.84	0	921
7312-041	BALE	328:31-35	9/06/78	0	0	16.5	5.9	73	22.3	.27	0.00	0	2.45	0	920
7313-083	BALE	336:01-05	8/30/78	0	0	15.7	6.3	71	22.0	.26	0.00	0	2.14	0	36
7311-152	BALE	321:31-35	9/06/78	0	0	14.5	3.8	79	18.4	.28	0.00	0	2.37	0	942
21055	BALE	316:06-10	8/28/78	0	0	14.4	4.1	77	18.5	.28	.34	84	0.00	0	19
7315-063	BALE	343:01-05	8/30/78	0	0	13.7	4.3	76	18.0	.25	0.00	0	1.49	0	945
7006-398	BALE	306:21-25	9/01/78	0	0	13.6	7.5	64	21.1	.24	0.00	0	1.75	0	332
7312-083	BALE	325:06-10	9/19/78	0	0	13.5	4.4	75	17.8	.28	.40	80	0.00	0	1082
7312-129	BALE	344:01-05	8/30/78	0	0	13.5	6.0	69	19.4	.29	0.00	0	2.84	0	25
7311-031	BALE	314:31-35	9/06/78	0	0	13.5	4.1	76	17.6	.26	0.00	0	3.28	0	926
7006-311= 21194	BALE	043:09-10	9/20/78	0	0	13.4	5.3	71	18.6	.25	.84	36	2.85	0	1167
7303-019	BALE	329:26-30	9/07/78	0	0	13.3	3.6	78	16.9	.27	0.00	0	0.00	0	1118
21055	BALE	212:01-10	8/23/78	1024	134	13.1	4.6	74	17.6	.29	.37	89	1.67	0	865
7007-339	BALE	321:21-25	9/01/78	0	0	13.1	6.5	66	19.6	.25	0.00	0	3.17	0	874
7006-450	BALE	312:21-25	9/01/78	0	0	13.0	5.0	72	18.1	.24	0.00	0	2.76	0	22
7313-009	BALE	331:01-05	8/30/78	0	0	13.0	5.3	70	18.3	.27	0.00	0	1.75	0	33
7006-398	BALE	206:28-32	9/18/78	845	109	13.0	8.7	59	21.7	.23	0.00	0	2.31	0	955
7311-032	BALE	315:31-35	9/06/78	0	0	12.7	3.4	78	16.2	.26	0.00	0	0.00	0	867
7301-034	BALE	324:26-30	9/07/78	0	0	12.7	4.1	75	16.7	.24	0.00	0	0.00	0	1102
21182 Galena	BALE	301:21-25	9/01/78	0	0	12.3	8.4	59	20.7	.23	.30	88	1.13	0	896
7006-296	BALE	330:16-20	8/31/78	0	0	12.2	6.6	65	18.8	.24	0.00	0	2.87	0	334
7313-032	BALE	333:01-05	8/30/78	0	0	12.2	4.6	72	16.8	.26	0.00	0	0.00	0	940
7311-177	BALE	322:31-35	9/06/78	0	0	12.1	3.7	76	15.8	.28	0.00	0	2.35	0	909
21056 v.f,Bullion 10A	BALE	206:01-10	8/28/78	2653	319	12.1	5.7	67	17.7	.25	.83	37	2.00	0	938

1978: 5-cone samples: Hop genotypes with alpha above 12%

1978: CONE SAMPLES $\alpha \geq 12\%$ SELECTED GENOTYPES AS OF 79/02/13. SORTED BY ALPHA

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX$_0$	6 MONTH HSI$_6$	% A+B REMAIN	OIL ML9/ 100G	COF	SERIAL NUMBER
21182 Galena	CONE	IDAHO	9/01/78	0	0	16.0	8.8	64	24.8	.23	0.00	0	0.00	0	1010
7614-056	CONE	162:28	9/25/78	0	0	15.8	5.6	73	21.4	.26	0.00	0	0.00	0	750
7314-012	CONE	167:26	9/26/78	0	0	14.8	5.4	73	20.3	.29	0.00	0	0.00	0	825
7311-028	CONE	050:25-26	9/21/78	0	0	14.3	4.1	77	18.4	.26	0.00	0	0.00	0	413
7611-012	CONE	154:19	9/25/78	0	0	14.3	4.0	78	18.2	.30	0.00	0	0.00	0	659
7616-064	CONE	168:37	9/26/78	0	0	13.7	4.6	75	18.3	.28	0.00	0	0.00	0	831
7611-053	CONE	155:07	9/25/78	0	0	13.7	3.7	78	17.3	.31	0.00	0	0.00	0	643
7611-108	CONE	156:09	9/25/78	0	0	13.6	3.6	79	17.3	.33	0.00	0	0.00	0	654
7618-021	CONE	171:52	9/26/78	0	0	13.6	4.8	73	18.4	.27	0.00	0	0.00	0	727
7616-079	CONE	168:52	9/26/78	0	0	13.3	4.8	73	18.1	.27	0.00	0	0.00	0	824
7314-012	CONE	171:31	9/26/78	0	0	13.3	5.3	71	18.6	.27	0.00	0	0.00	0	853
7312-036	CONE	147:50	9/22/78	0	0	13.3	4.4	75	17.6	.28	0.00	0	0.00	0	542
7617-029	CONE	170:01	9/26/78	0	0	13.3	5.6	70	18.8	.29	0.00	0	0.00	0	856
7611-158	CONE	157:06	9/25/78	0	0	13.2	3.6	78	16.9	.27	0.00	0	0.00	0	658
7311-068	CONE	317:31-35	9/19/78	0	0	13.1	3.9	77	17.0	.27	0.00	0	0.00	0	153
7601-059	CONE	140:12	9/20/78	0	0	13.1	3.6	78	16.6	.26	0.00	0	0.00	0	245
7618-048	CONE	172:26	9/26/78	0	0	13.0	4.5	74	17.5	.29	0.00	0	0.00	0	739
7312-036	CONE	144:25	9/22/78	0	0	13.0	3.4	79	16.4	.29	0.00	0	0.00	0	579
7611-134	CONE	156:34	9/25/78	0	0	13.0	3.2	80	16.2	.27	0.00	0	0.00	0	655
7314-012	CONE	173:53	9/26/78	0	0	13.0	6.1	67	19.1	.27	0.00	0	0.00	0	720
7006-426	CONE	031:11-12	9/20/78	0	0	12.9	3.7	77	16.6	.25	0.00	0	0.00	0	300
7606-005	CONE	148:02	9/22/78	0	0	12.8	4.4	74	17.3	.33	0.00	0	0.00	0	531
7614-016	CONE	161:41	9/25/78	0	0	12.8	3.7	77	16.5	.30	0.00	0	0.00	0	765
7606-086	CONE	149:30	9/22/78	0	0	12.7	5.5	69	18.2	.26	0.00	0	0.00	0	442
7312-036	CONE	143:07	9/22/78	0	0	12.6	3.4	78	16.0	.28	0.00	0	0.00	0	502
7006-311	CONE	IDAHO	9/01/78	0	0	12.5	5.6	69	18.2	.24	0.00	0	0.00	0	995
7611-123	CONE	156:24	9/25/78	0	0	12.5	4.1	75	16.6	.34	0.00	0	0.00	0	657
7616-003	CONE	167:29	9/26/78	0	0	12.5	3.5	78	16.0	.29	0.00	0	0.00	0	813
7617-067	CONE	170:39	9/26/78	0	0	12.5	6.6	65	19.1	.25	0.00	0	0.00	0	842
7617-019	CONE	169:40	9/26/78	0	0	12.5	6.4	65	18.9	.27	0.00	0	0.00	0	851
7605-005	CONE	144:30	9/22/78	0	0	12.4	4.8	72	17.2	.26	0.00	0	0.00	0	571
7617-007	CONE	169:32	9/26/78	0	0	12.4	4.6	73	16.9	.26	0.00	0	0.00	0	832
7006-031	CONE	329:16-20	9/19/78	0	0	12.4	4.8	71	17.2	.22	0.00	0	0.00	0	185
7616-016	CONE	167:42	9/26/78	0	0	12.3	4.0	75	16.3	.29	0.00	0	0.00	0	815
7618-042	CONE	172:20	9/26/78	0	0	12.3	4.3	74	16.6	.28	0.00	0	0.00	0	737
7301-126	CONE	033:23-24	9/21/78	0	0	12.2	4.0	75	16.2	.27	0.00	0	0.00	0	379
7005-205	CONE	IDAHO	9/01/78	0	0	12.2	5.6	68	17.8	.23	0.00	0	0.00	0	1002
7611-005	CONE	154:12	9/25/78	0	0	12.2	2.9	80	15.0	.30	0.00	0	0.00	0	682
7611-017	CONE	154:24	9/25/78	0	0	12.1	4.6	72	16.7	.24	0.00	0	0.00	0	671
7006-311	CONE	IDAHO,OBE	9/18/78	0	0	12.1	4.4	73	16.6	.24	0.00	0	0.00	0	1027
7610-097	CONE	152:38	9/24/78	0	0	12.1	3.7	76	15.7	.31	0.00	0	0.00	0	613
7617-004	CONE	169:29	9/26/78	0	0	12.0	3.8	75	15.9	.26	0.00	0	0.00	0	835

1978: 22 Males with a ratio >70, Safe period >4 hours.

TABLE 1978LUPULIN SAMPLES WITH RATIO >70,AND SP>4 HR

LUPULIN ANALYSES AS OF 79/11/01.

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
63015M	032:03-04	7/26/78	48.9	20.4	70	69.4	.26	.32	8.20	0.00	0.00	0	0	210
7302-105M	039:53-54	7/18/78	51.1	20.9	70	72.1	.27	.54	4.00	0.00	0.00	0	0	92
7303-105M	031:55-56	8/04/78	54.7	15.7	77	70.4	.29	.34	9.90	0.00	0.00	0	0	324
7303-149M	034:55-56	7/27/78	43.4	15.6	73	58.9	.33	.39	5.00	0.00	0.00	0	0	234
7303-159M	036:55-56	7/19/78	53.3	16.8	76	70.1	.25	.38	4.90	.80	.70	50	0	54
7304-092M	039:55-56	7/19/78	48.8	18.7	72	67.5	.27	.34	4.50	.83	.75	47	0	55
7304-148M	042:55-56	7/27/78	46.1	15.7	74	61.8	.29	.36	9.90	0.00	0.00	0	0	255
7306-013M	048:55-56	7/27/78	45.1	14.1	76	59.3	.30	.34	9.90	0.00	0.00	0	0	241
7306-138M	050:55-56	7/31/78	41.4	16.8	71	58.2	.35	.41	9.90	0.00	0.00	0	0	315
7307-024M	051:55-56	7/27/78	38.6	15.7	71	54.3	.31	.36	4.50	0.00	0.00	0	0	240
7308-009M	053:55-56	7/25/78	36.9	13.5	73	50.4	.31	.37	4.90	0.00	0.00	0	0	175
7311-020M	009:59-60	7/31/78	38.1	15.8	70	53.9	.30	.39	5.80	0.00	0.00	0	0	264
7311-114M	012:59-60	7/28/78	39.1	13.6	74	52.7	.30	.44	5.00	0.00	0.00	0	0	230
7311-135M	014:59-60	7/28/78	43.6	13.1	76	56.6	.27	.37	5.90	0.00	0.00	0	0	226
7311-141M	139:06	7/18/78	42.3	14.7	74	57.0	.28	.39	5.50	0.00	0.00	0	0	60
7311-141M	015:59-60	7/24/78	51.3	20.6	71	71.9	.26	.33	9.90	0.00	0.00	0	0	136
7312-017M	017:59-60	7/24/78	43.6	17.6	71	61.2	.34	.40	9.90	0.00	0.00	0	0	148
7312-028M	018:59-60	7/28/78	53.0	17.4	75	70.4	.28	.39	4.90	0.00	0.00	0	0	243
7312-043M	021:59-60	7/31/78	49.2	19.7	71	68.9	.28	.40	5.60	0.00	0.00	0	0	283
7312-105M	024:59-60	7/31/78	52.9	17.8	74	70.7	.30	.75	5.50	0.00	0.00	0	0	314
7314-004M	030:59-60	7/21/78	41.1	17.3	70	58.4	.30	.40	4.40	.39	.39	78	0	100
7315-051M	038:59-60	7/25/78	51.4	20.7	71	72.0	.29	.34	9.90	0.00	0.00	0	0	155

Total Male lupulin samples analyzed in 1978 324

Male genotypes with alpha ratio above 70 86

Male genotypes with alpha ratio above 70 and safe-period> 4 ... 22

1978: 18 Males with a ratio >70, 3 hr. crush >0.4, Safe period >4 hrs.

TABLE 1978 LUPULIN SAMPLES WITH RATIO >70, CRUSH 3 HR <.4 AND SP >4 HR.
LUPULIN ANALYSES AS OF 79/11/01.
SORTED BY RATIO

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
7303-105M	031:55-56	8/04/78	54.7	15.7	77	70.4	.29	.34	9.90	0.00	0.00	0	0	324
7311-135M	014:59-60	7/28/78	43.6	13.1	76	56.6	.27	.37	5.90	0.00	0.00	0	0	226
7303-159M	036:55-56	7/19/78	53.3	16.8	76	70.1	.25	.38	4.90	.80	.70	50	0	54
7306-013M	048:55-56	7/27/78	45.1	14.1	76	59.3	.30	.34	9.90	0.00	0.00	0	0	241
7312-028M	018:59-60	7/28/78	53.0	17.4	75	70.4	.28	.39	4.90	0.00	0.00	0	0	243
7311-141M	139:06	7/18/78	42.3	14.7	74	57.0	.28	.39	5.50	0.00	0.00	0	0	60
7304-148M	042:55-56	7/27/78	46.1	15.7	74	61.8	.29	.36	9.90	0.00	0.00	0	0	255
7308-009M	053:55-56	7/25/78	36.9	13.5	73	50.4	.31	.37	4.90	0.00	0.00	0	0	175
7303-149M	034:55-56	7/27/78	43.4	15.6	73	58.9	.33	.39	5.00	0.00	0.00	0	0	234
7304-092M	039:55-56	7/19/78	48.8	18.7	72	67.5	.27	.34	4.50	.83	.75	47	0	55
7315-051M	038:59-60	7/25/78	51.4	20.7	71	72.0	.29	.34	9.90	0.00	0.00	0	0	155
7307-024M	051:55-56	7/27/78	38.6	15.7	71	54.3	.31	.36	4.50	0.00	0.00	0	0	240
7312-043M	021:59-60	7/31/78	49.2	19.7	71	68.9	.28	.40	5.60	0.00	0.00	0	0	283
7311-141M	015:59-60	7/24/78	51.3	20.6	71	71.9	.26	.33	9.90	0.00	0.00	0	0	136
7312-017M	017:59-60	7/24/78	43.6	17.6	71	61.2	.34	.40	9.90	0.00	0.00	0	0	148
7311-020M	009:59-60	7/31/78	38.1	15.8	70	53.9	.30	.39	5.80	0.00	0.00	0	0	264
7314-004M	030:59-60	7/21/78	41.1	17.3	70	58.4	.30	.40	4.40	.39	.39	78	0	100
63015M	032:03-04	7/26/78	48.9	20.4	70	69.4	.26	.32	8.20	0.00	0.00	0	0	210

Total Male lupulin samples analyzed in 1978 324

Male genotypes with alpha ratio above 70 86

Male genotypes with 3-hour crush test above 0.4 and alpha ratio of 70 or more..... 26

Males with 3 hr crush test above 0.4, alpha ratio above 70 and Safe-period > 4 ... 18

TABLE 1977 SAMPLE WITH ALPHA-ACIDS GREATER THAN 12% AND STORAGE DATA.

1977 q : α > 12%

SELECTED GENOTYPES AS OF 79/10/30.

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX$_0$	6 MONTH HSI$_6$	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
21055	6806-080	CONE	042:01-02	9/06/77	0	0	13.2	3.4	79	16.5	.32	.42	74	0.00	43	478
21055	6806-080	BALE	316:06-10	9/12/77	139	17	12.8	4.2	75	17.0	.33	.43	87	2.18	0	949
21055	6806-080	BALE	042:01-02	9/08/77	0	0	13.4	3.5	79	16.8	.32	.44	82	1.56	0	1008
21055	6806-080	BALE	212:01-10	9/01/77	1194	179	15.0	4.5	76	19.5	.30	.40	79	2.29	0	912
21056	BULLION 10A VF	BALE	206:01-10	8/31/77	3054	382	12.5	5.8	68	18.4	.25	.77	42	1.95	0	913
30-11A		CONE	IDAHO	9/12/77	0	0	13.0	6.4	66	19.4	.25	.60	58	0.00	0	883
43-16	Galena 21182	CONE	IDAHO	9/12/77	0	0	13.6	8.9	60	22.5	.26	.34	84	0.00	0	895
7004-003		CONE	IDAHO	9/12/77	0	0	12.4	4.7	72	17.1	.25	.67	52	0.00	0	831
7005-070		BALE	238:17-21	9/14/77	2261	287	12.7	7.5	62	20.3	.29	.59	60	2.46	0	936
7005-087		CONE	314:16-20	9/14/77	0	0	12.5	3.5	78	15.9	.27	.70	50	0.00	0	742
7005-087		CONE	IDAHO	9/12/77	0	0	14.6	7.3	66	21.8	.28	.53	63	0.00	0	837
7005-194		CONE	051:07-08	9/08/77	0	0	12.1	4.5	73	16.6	.26	.44	72	0.00	14	445
7005-194		BALE	051:07-08	9/08/77	0	0	12.3	4.4	73	16.7	.28	.44	78	2.15	0	1012
7005-201		BALE	319:16-20	9/12/77	1664	216	13.0	5.9	68	18.9	.25	.73	43	1.85	0	979
7005-205		BALE	210:23-27	9/06/77	1382	197	14.3	6.0	70	20.3	.25	.63	51	2.00	0	938
7006-074		CONE	IDAHO	9/12/77	0	0	12.2	6.3	65	18.5	.26	.47	68	0.00	0	849
7006-296		BALE	230:23-27	9/06/77	2005	274	13.7	6.8	66	20.4	.25	.90	34	3.06	0	1040
7006-311		CONE	329:16-20	9/14/77	0	0	13.9	5.7	70	19.6	.24	.32	86	0.00	21	760
7006-311		BALE	043:09-10	9/08/77	0	0	13.4	4.5	74	17.9	.26	.62	54	2.20	0	1013
7006-311		CONE	IDAHO	9/12/77	0	0	15.5	4.5	77	20.1	.24	.63	55	0.00	0	855
7006-353		CONE	051:09-10	9/08/77	0	0	14.0	8.9	61	22.9	.24	.68	51	0.00	0	446
7006-398		CONE	306:21-25	9/14/77	0	0	12.7	5.7	68	18.4	.26	.60	57	0.00	0	732
7006-406		CONE	209:28-32	9/15/77	0	0	12.4	4.1	75	16.6	.26	.52	64	0.00	0	774
7006-450		BALE	IAREC,WN	8/30/77	0	0	12.3	4.1	75	16.4	.28	.57	63	1.45	0	1033
7006-450		BALE	312:21-25	9/08/77	921	120	13.1	4.5	74	17.6	.29	.88	37	3.21	0	985
7006-450		BALE	215:28-32	9/06/77	1655	234	14.2	5.0	74	19.1	.27	.75	42	2.43	0	941
7007-339		BALE	321:21-25	9/08/77	864	109	12.7	5.9	68	18.6	.31	.63	62	1.14	0	987
7007-339		CONE	IDAHO	9/12/77	0	0	12.5	5.5	69	18.0	.27	.55	61	0.00	0	867
7007-339		BALE	241:28-32	9/06/77	1297	177	13.7	6.5	67	20.2	.29	.57	62	2.65	0	943
7506-131		CONE	020:86	9/02/77	0	0	12.0	4.9	71	16.9	.27	.63	55	0.00	0	260

TABLE 1977 BALE AND 5-CONE SAMPLES WITH ALPHA ACIDS GREATER THAN 12%. (N=32)

1977 ♀ : α > 12%

SELECTED GENOTYPES AS OF 79/11/01.

SORTED BY ALPHA

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
7006-311		CONE	IDAHO	9/12/77	0	0	15.5	4.5	77	20.1	.24	.63	55	0.00	0	855
21055	6806-080	BALE	212:01-10	9/01/77	1194	179	15.0	4.5	76	19.5	.30	.40	79	2.29	0	912
7005-087		CONE	IDAHO	9/12/77	0	0	14.6	7.3	66	21.8	.28	.53	63	0.00	0	837
7005-205		BALE	210:23-27	9/06/77	1382	197	14.3	6.0	70	20.3	.25	.63	51	2.00	0	938
7006-450		BALE	215:28-32	9/06/77	1655	234	14.2	5.0	74	19.1	.27	.75	42	2.43	0	941
7006-353		CONE	051:09-10	9/08/77	0	0	14.0	8.9	61	22.9	.24	.68	51	0.00	0	446
7006-311		CONE	329:16-20	9/14/77	0	0	13.9	5.7	70	19.6	.24	.32	86	0.00	21	760
43-16	Galena 21182	BALE	PARMA,ID	9/00/77	0	0	13.8	8.6	61	22.3	.27	0.00	0	0.00	0	1098
7007-339		BALE	241:28-32	9/06/77	1297	177	13.7	6.5	67	20.2	.29	.57	62	2.65	0	943
7006-296		BALE	230:23-27	9/06/77	2005	274	13.7	6.8	66	20.4	.25	.90	34	3.06	0	1040
43-16	Galena 21182	CONE	IDAHO	9/12/77	0	0	13.6	8.9	60	22.5	.26	.34	84	0.00	0	895
7006-311		BALE	043:09-10	9/08/77	0	0	13.4	4.5	74	17.9	.26	.62	54	2.20	0	1013
21055	6806-080	BALE	042:01-02	9/08/77	0	0	13.4	3.5	79	16.8	.32	.44	82	1.56	0	1008
21055	6806-080	CONE	042:01-02	9/06/77	0	0	13.2	3.4	79	16.5	.32	.42	74	0.00	43	478
7006-450		BALE	312:21-25	9/08/77	921	120	13.1	4.5	74	17.6	.29	.88	37	3.21	0	985
7005-201		BALE	319:16-20	9/12/77	1664	216	13.0	5.9	68	18.9	.25	.73	43	1.85	0	979
30-11A		CONE	IDAHO	9/12/77	0	0	13.0	6.4	66	19.4	.25	.60	58	0.00	0	883
21055	6806-080	BALE	316:06-10	9/12/77	139	17	12.8	4.2	75	17.0	.33	.43	87	2.18	0	949
7005-070		BALE	238:17-21	9/14/77	2261	287	12.7	7.5	62	20.3	.29	.59	60	2.46	0	936
7007-339		BALE	321:21-25	9/08/77	864	109	12.7	5.9	68	18.6	.31	.63	62	1.14	0	987
7006-398		CONE	306:21-25	9/14/77	0	0	12.7	5.7	68	18.4	.26	.60	57	0.00	0	732
21056	BULLION 10A VF	BALE	206:01-10	8/31/77	3054	382	12.5	5.8	68	18.4	.25	.77	42	1.95	0	913
7007-339		CONE	IDAHO	9/12/77	0	0	12.5	5.5	69	18.0	.27	.55	61	0.00	0	867
7005-087		CONE	314:16-20	9/14/77	0	0	12.5	3.5	78	15.9	.27	.70	50	0.00	0	742
7006-406		CONE	209:28-32	9/15/77	0	0	12.4	4.1	75	16.6	.26	.52	64	0.00	0	774
7004-003		CONE	IDAHO	9/12/77	0	0	12.4	4.7	72	17.1	.25	.67	52	0.00	0	831
7006-450		BALE	IAREC,WN	8/30/77	0	0	12.3	4.1	75	16.4	.28	.57	63	1.45	0	1033
7005-194		BALE	051:07-08	9/08/77	0	0	12.3	4.4	73	16.7	.28	.44	78	2.15	0	1012
7006-074		CONE	IDAHO	9/12/77	0	0	12.2	6.3	65	18.5	.26	.47	68	0.00	0	849
7005-194		CONE	051:07-08	9/08/77	0	0	12.1	4.5	73	16.6	.26	.44	72	0.00	14	445
31-11A		BALE	PARMA,ID	9/00/77	0	0	12.1	5.7	68	17.7	.29	0.00	0	0.00	0	1094
7506-131		CONE	020:86	9/02/77	0	0	12.0	4.9	71	16.9	.27	.63	55	0.00	0	260

TABLE 1976 BALE AND 5-CONE SAMPLES WITH ALPHA ACIDS GREATER THAN 12%. (N=104)

1976 ♀: α > 12%

SELECTED GENOTYPES AS OF 79/11/01.
SORTED BY ALPHA

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
7006-456		BALE	216:28-32	9/09/76	1092	209	19.1	4.7	66	13.9	.26	.41	75	1.09	0	1195
7312-041		CONE	033:33A	9/20/76	0	0	18.1	4.9	79	23.1	.26	.40	76	0.00	0	579
21055	6806-080	CONE	036:32A	9/20/76	0	0	16.4	5.5	75	21.8	.30	.39	79	0.00	0	1202
7314-044		CONE	041:31A	9/20/76	0	0	15.9	4.8	77	20.6	.26	.42	74	0.00	0	633
7006-311		BALE	IAREC,WN	9/17/76	0	0	15.9	5.7	74	21.5	.25	.64	46	0.00	0	1003
7007-060		BALE	221:28-32	9/07/76	2167	342	15.8	6.7	46	12.5	.28	.66	58	1.18	0	1196
7312-083		CONE	034:38A	9/21/76	0	0	15.6	4.4	78	20.0	.26	0.00	0	0.00	0	806
7006-311		CONE	043:09-10	8/31/76	5	0	15.5	4.9	76	20.4	.21	0.00	0	0.00	0	73
7313-083		CONE	038:42A	9/22/76	0	0	15.5	4.6	77	20.1	.30	.53	64	0.00	0	923
7313-032		CONE	037:32B	9/20/76	0	0	15.3	4.1	79	19.4	.26	.60	58	0.00	0	606
7315-063		CONE	045:34A	9/22/76	0	0	14.6	3.9	79	18.5	.24	.44	72	0.00	0	951
7006-311		BALE	043:09-10	9/02/76	832	120	14.5	5.4	73	19.9	.25	.57	55	1.22	0	1184
7312-026		CONE	032:41B	9/20/76	0	0	14.5	6.0	71	20.4	.27	.36	81	0.00	0	572
7308-015		CONE	020:26A	9/15/76	0	0	14.4	4.8	75	19.2	.25	.31	90	0.00	0	453
7315-030		CONE	044:33B	9/21/76	0	0	14.3	3.5	80	17.7	.25	.39	79	0.00	0	660
21055	6806-080	BALE	212:01-10	8/27/76	772	109	14.2	5.8	71	20.0	.27	.42	78	1.82	0	1066
7306-139		CONE	018:19B	9/21/76	0	0	14.0	5.0	74	19.0	.25	.41	76	0.00	0	745
21055	6806-080	CONE	046:46B	9/21/76	0	0	14.0	4.8	75	18.8	.25	.43	73	0.00	0	639
7314-012		CONE	040:31A	9/20/76	0	0	14.0	6.1	70	20.0	.25	.41	76	0.00	0	616
21055	6806-080	CONE	043:34B	9/21/76	0	0	14.0	4.5	76	18.5	.25	.36	81	0.00	0	638
21055	6806-080	CONE	039:40B	9/20/76	0	0	13.9	4.4	76	18.3	.27	.44	72	0.00	0	610
7306-005		CONE	016:19B	9/15/76	0	0	13.9	4.1	77	17.9	.25	.39	79	0.00	0	401
7302-029		CONE	004:29B	9/13/76	0	0	13.8	3.1	82	17.0	.24	.38	80	0.00	0	292
7306-043		CONE	016:38B	9/21/76	0	0	13.8	5.1	73	18.9	.25	.43	73	0.00	0	706
7312-050		CONE	033:37B	9/21/76	0	0	13.8	7.3	65	21.1	.25	.43	73	0.00	0	785
7301-139		CONE	003:17B	9/21/76	0	0	13.8	4.0	78	17.8	.31	.62	57	0.00	0	673
7312-129		CONE	035:45A	9/21/76	0	0	13.8	5.9	70	19.7	.25	.55	62	0.00	0	836
7312-134		CONE	036:31B	9/21/76	0	0	13.8	3.3	81	17.0	.25	.33	85	0.00	0	841
7301-003		CONE	001:16B	9/10/76	0	0	13.8	5.8	70	19.6	.25	.40	78	0.00	0	255
7315-035		CONE	044:36A	9/21/76	0	0	13.7	3.6	79	17.4	.25	0.00	0	0.00	0	662
7312-036		CONE	032:46B	9/20/76	0	0	13.7	4.0	77	17.7	.28	.42	74	0.00	0	577
7311-108		CONE	029:39B	9/22/76	0	0	13.7	4.9	74	18.6	.25	.55	62	0.00	0	888
7303-018		CONE	007:24A	9/13/76	0	0	13.6	3.2	81	16.8	.27	.57	62	0.00	0	320
7312-009		CONE	032:33A	9/20/76	0	0	13.5	4.8	74	18.4	.25	.41	76	0.00	0	566
7312-086		CONE	034:39B	9/21/76	0	0	13.5	4.8	74	18.3	.27	.40	78	0.00	0	809

TABLE 1976 BALE AND 5-CONE SAMPLES WITH ALPHA ACIDS GREATER THAN 12%. (N=104)
continued: SELECTED GENOTYPES AS OF 79/11/01.
SORTED BY ALPHA

NURSERY OR ACCESSION NUMBER		TYPE LOCATION	HARVEST DATE	YIELD LB/AC	ALPHA LB/AC	AT 8 % MOISTURE CONTENT(BALE) OR AS IS BASIS (CONE) % ALPHA	% BETA	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
7309-023		CONE 021:32A	9/16/76	0	0	13.5	5.1	72	18.3	.25	.43	73	0.00	0	476
7312-049		CONE 033:37A	9/21/76	0	0	13.5	3.8	78	17.2	.26	.36	81	0.00	0	784
7006-318		BALE 236:23-27	9/16/76	1075	144	13.4	5.5	71	18.9	.25	.80	45	2.04	0	1185
7005-194		BALE IAREC,WN	9/17/76	0	0	13.3	5.0	73	18.3	.25	.50	69	0.00	0	997
7303-019		CONE 007:24B	9/13/76	0	0	13.3	3.2	80	16.5	.25	.41	76	0.00	0	321
7311-177		CONE 031:42A	9/22/76	0	0	13.2	4.8	74	18.0	.30	0.00	0	0.00	0	914
7312-078		CONE 034:35B	9/21/76	0	0	13.2	3.8	77	17.0	.27	0.00	0	0.00	0	803
7313-009		CONE 036:37A	9/20/76	0	0	13.1	5.5	71	18.6	.27	.35	83	0.00	0	592
7302-041		CONE 004:35B	9/21/76	0	0	13.1	4.1	76	17.3	.30	.35	83	0.00	0	676
7306-182		CONE 018:41A	9/21/76	0	0	13.1	4.3	75	17.4	.25	.51	65	0.00	0	765
7302-041		CONE 004:35B	9/21/76	0	0	13.1	4.1	76	17.3	.30	.35	82	0.00	0	676
7312-060		CONE 033:42B	9/21/76	0	0	13.1	3.5	79	16.6	.27	.41	75	0.00	0	791
7006-296		BALE 230:23-27	9/16/76	1092	142	13.1	7.0	65	20.1	.27	.87	33	2.84	0	1182
7313-029		CONE 037:31A	9/20/76	0	0	13.1	5.7	70	18.7	.25	.53	63	0.00	0	604
7302-172		CONE 006:34A	9/21/76	0	0	12.9	4.5	74	17.4	.26	.42	74	0.00	0	691
7306-044		CONE 016:39A	9/21/76	0	0	12.9	3.0	81	15.9	.25	.35	83	0.00	0	707
7006-273		CONE 039:09-10	9/01/76	3	0	12.9	3.4	79	16.3	.25	0.00	0	0.00	0	97
7312-051		CONE 033:38A	9/21/76	0	0	12.9	4.1	76	17.0	.28	.39	79	0.00	0	786
21055	6806-080	CONE 026:33A	9/20/76	0	0	12.9	4.4	75	17.3	.30	.51	66	0.00	0	529
7311-028		CONE 027:31B	9/20/76	0	0	12.8	5.5	70	18.3	.25	.41	76	0.00	0	550
7005-194		BALE 051:07-08	9/02/76	821	105	12.8	4.9	72	17.7	.25	.36	83	1.04	0	1171
7315-024		CONE 043:46B	9/21/76	0	0	12.8	3.4	79	16.2	.25	.42	74	0.00	0	658
7312-027		CONE 032:42A	9/20/76	0	0	12.8	5.1	71	17.9	.28	.47	70	0.00	0	573
21056	BULLION 10A VF	BALE 206:01-10	8/30/76	2517	320	12.7	6.1	68	18.8	.25	.66	49	2.23	0	1067
7312-073		CONE 034:33A	9/21/76	0	0	12.7	4.3	75	17.0	.26	0.00	0	0.00	0	800
7006-382		BALE 052:09-10	9/02/76	661	84	12.7	4.9	72	17.6	.27	.36	85	1.25	0	1188
7303-122		CONE 008:42B	9/21/76	0	0	12.7	4.9	72	17.6	.26	.55	62	0.00	0	696
7308-034		CONE 020:35B	9/15/76	0	0	12.7	4.8	72	17.5	.25	.34	84	0.00	0	462
7302-019		CONE 004:24B	9/13/76	0	0	12.7	4.0	76	16.7	.27	.33	86	0.00	0	288
7303-027		CONE 007:28B	9/13/76	0	0	12.6	4.3	75	16.9	.28	.47	71	0.00	0	326
7005-194		CONE 051:07-08	8/31/76	3	0	12.6	4.5	74	17.1	.23	.27	93	0.00	0	66
21055	6806-080	CONE 042:01-02	8/30/76	0	0	12.6	3.9	76	16.5	.25	0.00	0	0.00	0	16
7311-031		CONE 027:33A	9/20/76	0	0	12.6	4.2	75	16.8	.28	.76	47	0.00	0	554
7312-098		CONE 034:48B	9/21/76	0	0	12.6	3.5	78	16.1	.27	.44	72	0.00	0	814
21055	6806-080	CONE 031:44A	9/20/76	0	0	12.6	4.2	75	16.7	.28	.41	76	0.00	0	559

TABLE 1976 BALE AND 5-CONE SAMPLES WITH ALPHA ACIDS GREATER THAN 12%. (N=104)
concluded: SELECTED GENOTYPES AS OF 79/11/01.
SORTED BY ALPHA
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	ALPHA RATIO	%ALPHA PLUS BETA	HOF STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/ 100G	COF	SERIAL NUMBER
7306-008	CONE	016:21A	9/15/76	0	0	12.6	4.4	74	17.0	.25	.55	62	0.00	0	403
7006-096	CONE	055:07-08	8/31/76	3	0	12.6	5.9	68	18.4	.23	0.00	0	0.00	0	70
7312-106	CONE	035:33B	9/21/76	0	0	12.5	3.3	79	15.8	.28	.41	75	0.00	0	819
7006-339	BALE	IAREC,WN	9/17/76	0	0	12.5	6.3	66	18.9	.26	.98	32	0.00	0	1004
7313-017	CONE	036:41A	9/20/76	0	0	12.5	4.1	75	16.5	.27	.48	69	0.00	0	597
7006-406	BALE	209:28-32	9/16/76	1135	141	12.4	6.3	66	18.7	.25	.67	47	2.12	0	1190
7306-042	CONE	016:38A	9/21/76	0	0	12.4	4.3	75	16.7	.25	.47	70	0.00	0	705
7007-339	BALE	241:28-32	9/03/76	1425	177	12.4	7.6	62	20.0	.26	.87	36	2.06	0	1201
7005-087	BALE	241:17-21	9/13/76	1333	165	12.4	3.9	76	16.3	.26	.67	50	.78	0	1168
7006-463	CONE	035:11-12	9/01/76	0	0	12.4	5.8	68	18.3	.21	0.00	0	0.00	0	103
7314-021	CONE	040:35B	9/20/76	0	0	12.4	5.1	71	17.5	.26	.43	73	0.00	0	620
43-16	BALE	PARMA,ID	9/00/76	0	0	12.4	8.1	60	20.5	.23	.41	72	0.00	0	983
7311-107	CONE	029:39A	9/22/76	0	0	12.4	3.7	77	16.1	.25	.42	74	0.00	0	887
7312-133	CONE	036:31A	9/21/76	0	0	12.4	3.4	78	15.8	.25	.35	83	0.00	0	840
7312-068	CONE	033:46B	9/21/76	0	0	12.3	5.9	67	18.3	.25	.49	68	0.00	0	798
7313-040	CONE	037:36B	9/20/76	0	0	12.3	6.2	67	18.5	.30	0.00	0	0.00	0	609
7311-078	CONE	028:40B	9/22/76	0	0	12.3	3.8	76	16.1	.27	.40	76	0.00	0	875
7312-111	CONE	035:36A	9/21/76	0	0	12.2	3.1	80	15.3	.26	.34	84	0.00	0	823
7312-006	CONE	032:31B	9/20/76	0	0	12.2	3.5	78	15.7	.28	.34	84	0.00	0	564
7311-066	CONE	028:34B	9/22/76	0	0	12.2	5.2	70	17.4	.25	.67	52	0.00	0	869
7311-032	CONE	027:33B	9/20/76	0	0	12.2	3.3	79	15.4	.25	.36	81	0.00	0	555
7313-110	CONE	039:39B	9/22/76	0	0	12.2	2.9	81	15.1	.30	.39	79	0.00	0	930
7311-181	CONE	031:43B	9/22/76	0	0	12.2	3.6	77	15.7	.28	.43	73	0.00	0	915
7006-273	BALE	039:09-10	9/02/76	832	101	12.2	3.5	78	15.6	.26	.35	90	.96	0	1180
7005-182	BALE	207:23-27	9/10/76	1280	155	12.2	6.0	67	18.2	.25	.49	69	2.04	0	1170
7312-120	CONE	035:40B	9/21/76	0	0	12.1	3.7	77	15.8	.27	.32	88	0.00	0	829
7312-053	CONE	033:39A	9/21/76	0	0	12.1	2.4	83	14.6	.27	.55	62	0.00	0	787
7312-123	CONE	035:42A	9/21/76	0	0	12.1	5.0	71	17.1	.27	.41	75	0.00	0	832
7006-408	BALE	210:28-32	9/03/76	912	110	12.1	5.8	68	17.9	.26	.36	87	1.10	0	1191
7302-003	CONE	004:16B	9/13/76	0	0	12.1	3.6	77	15.7	.38	.38	80	0.00	0	279
7302-146	CONE	006:21A	9/21/76	0	0	12.1	3.8	76	15.8	.25	0.00	0	0.00	0	689
7006-450	BALE	IAREC,WN	9/03/76	0	0	12.0	4.3	74	16.3	.26	.66	51	0.00	0	1009
7313-041	CONE	037:37A	9/22/76	0	0	12.0	4.7	72	16.8	.33	.55	62	0.00	0	916
7312-115	CONE	035:38A	9/21/76	0	0	12.0	3.4	78	15.4	.26	.42	74	0.00	0	826

TABLE 1975 BALE AND 5-CONE SAMPLES WITH ALPHA ACIDS GREATER THAN 12%. (n=123)

1975 ♀ : α > 12%

SELECTED GENOTYPES AS OF 79/11/01.

SORTED BY ALPHA

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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
7312-042		CONE 033:33B	9/22/75	0	0	18.7	5.6	77	24.2	.25	.39	0	0.00	0	1000
7006-311		CONE 160:18	9/18/75	0	0	16.8	5.5	75	22.2	.24	.57	0	0.00	26	563
7301-126		CONE 002:44B	9/18/75	0	0	15.7	5.7	74	21.4	.25	.49	0	0.00	0	670
7306-042		CONE 016:38A	9/16/75	0	0	15.7	5.2	75	20.9	.28	.38	0	0.00	0	428
21055	6806-080	BALE 212:01-10	8/29/75	1523	238	15.6	6.1	72	21.7	.28	.47	70	1.98	0	1287
7312-083		CONE 034:38A	9/22/75	0	0	15.6	4.1	79	19.7	.28	.40	0	0.00	0	1006
7303-007		CONE 007:18B	9/19/75	0	0	15.5	4.7	77	20.1	.37	.48	0	0.00	0	706
7301-034		CONE 001:32A	9/18/75	0	0	15.4	4.1	79	19.5	.29	.48	0	0.00	0	667
7308-015		CONE 020:26A	9/17/75	0	0	15.3	4.5	77	19.8	.26	.47	0	0.00	0	763
7006-426		CONE 162:31	9/18/75	0	0	15.2	4.4	78	19.5	.26	.31	0	0.00	0	583
7303-019		CONE 007:24B	9/19/75	0	0	15.1	3.9	80	19.0	.27	.69	0	0.00	0	714
7302-041		CONE 004:35B	9/19/75	1	0	14.9	5.8	72	20.7	.28	.39	0	0.00	0	698
7312-041		CONE 033:33A	9/22/75	0	0	14.9	4.7	76	19.5	.27	.45	0	0.00	0	999
7312-036		CONE 032:46B	9/22/75	0	0	14.8	3.0	83	17.9	.24	.42	0	0.00	0	997
21055	6806-080	CONE 026:33A	9/20/75	0	0	14.8	4.2	79	19.0	.30	.43	0	0.00	0	942
7007-339		BALE 241:28-32	9/08/75	2237	328	14.7	7.8	73	22.5	.26	.56	60	2.94	0	1323
7312-037		CONE 033:31A	9/22/75	0	0	14.6	4.9	75	19.5	.28	.36	0	0.00	0	998
7303-027		CONE 007:28B	9/19/75	0	0	14.5	4.2	77	18.8	.26	0.00	0	0.00	0	720
7303-200		CONE 010:14B	9/19/75	0	0	14.5	5.7	72	20.1	.30	0.00	0	0.00	0	730
7006-450		BALE 215:28-32	9/08/75	2111	305	14.5	5.2	74	19.6	.25	.42	71	2.18	0	1317
7304-036		CONE 010:33A	9/19/75	0	0	14.5	5.2	73	19.7	.28	1.76	0	0.00	0	742
7312-009		CONE 032:33A	9/22/75	0	0	14.4	5.1	74	19.5	.27	.40	0	0.00	0	987
7006-450		CONE 163:02	9/18/75	1	0	14.4	4.6	76	19.0	.26	.65	0	0.00	0	592
21055	6806-080	CONE 031:44A	9/20/75	0	0	14.3	4.3	77	18.6	.29	0.00	0	0.00	0	867
7006-318		CONE 160:25	9/18/75	0	0	14.3	5.8	71	20.0	.25	.38	0	0.00	24	565
7312-134		CONE 036:31B	9/22/75	0	0	14.3	3.1	82	17.4	.27	.32	0	0.00	0	1015
7302-133		CONE 006:14B	9/19/75	0	0	14.2	4.1	77	18.3	.26	.39	0	0.00	0	701
7306-040		CONE 016:37A	9/16/75	0	0	14.2	5.0	74	19.1	.29	.33	0	0.00	0	427
7006-326		CONE 160:33	9/18/75	0	0	14.2	3.4	81	17.5	.29	.49	0	0.00	0	567
7005-205		BALE 210:23-27	9/11/75	1958	274	14.0	6.4	69	20.4	.25	.49	63	2.10	0	1313
7311-108		CONE 029:39B	9/20/75	0	0	13.8	4.5	75	18.4	.26	.81	0	0.00	0	875
7303-025		CONE 007:27B	9/19/75	0	0	13.8	3.8	79	17.6	.26	1.07	0	0.00	0	718
7006-353		CONE 161:09	9/18/75	1	0	13.8	8.8	61	22.6	.24	.63	0	0.00	0	574
7302-146		CONE 006:21A	9/19/75	0	0	13.6	3.9	78	17.5	.24	.48	0	0.00	0	703

TABLE 1975 BALE AND 5-CONE SAMPLES WITH ALPHA ACIDS GREATER THAN 12%.
continued: SELECTED GENOTYPES AS OF 79/11/01.
SORTED BY ALPHA
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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
7006-296		CONE 160:03	9/18/75	1	0	13.6	5.0	73	18.7	.27	.80	0	0.00	0	516
7311-031		CONE 027:33A	9/20/75	0	0	13.6	4.8	74	18.4	.28	.75	0	0.00	0	966
7303-015		CONE 007:22B	9/19/75	0	0	13.6	5.0	73	18.6	.27	.86	0	0.00	0	712
7006-398		BALE 206:28-32	9/11/75	1242	167	13.5	8.0	63	21.4	.25	.35	85	1.35	0	1331
7005-116		BALE 242:17-21	9/05/75	1827	246	13.5	4.5	75	18.0	.26	.51	65	2.24	0	1307
7312-027		CONE 032:42A	9/22/75	0	0	13.4	3.7	78	17.1	.28	.43	0	0.00	0	993
7005-182		CONE 155:29	9/15/75	0	0	13.4	5.1	73	18.4	.31	.33	0	0.00	0	473
7302-037		CONE 004:33B	9/19/75	0	0	13.3	4.7	74	18.0	.25	0.00	0	0.00	0	694
7005-116		CONE 154:12	9/15/75	0	0	13.3	3.8	78	17.1	.25	.46	0	0.00	0	463
7311-095		CONE 029:33A	9/20/75	0	0	13.3	3.2	81	16.4	.29	.45	0	0.00	0	868
7007-206		CONE 167:29	9/19/75	0	0	13.3	6.8	66	20.0	.28	.43	0	0.00	36	620
7304-010		CONE 010:20A	9/19/75	0	0	13.2	4.8	74	18.0	.29	1.09	0	0.00	0	733
7311-177		CONE 031:42A	9/20/75	0	0	13.2	4.6	74	17.8	.28	0.00	0	0.00	0	890
7006-463		CONE 163:15	9/18/75	0	0	13.1	5.3	71	18.4	.26	.36	0	0.00	0	594
7006-096		CONE 157:22	9/17/75	0	0	13.1	6.5	70	21.7	.26	.44	0	0.00	29	485
7006-339		CONE 160:46	9/18/75	0	0	13.1	7.2	65	20.4	.24	.36	0	0.00	26	573
7302-039		CONE 004:34B	9/19/75	0	0	13.1	4.5	74	17.6	.29	.37	0	0.00	0	696
7006-061		CONE 157:12	9/17/75	0	0	13.1	3.7	79	17.5	.29	.79	0	0.00	20	483
7006-371		CONE 161:27	9/18/75	0	0	13.0	6.7	65	19.7	.24	.61	0	0.00	0	577
7307-043		CONE 019:38B	9/17/75	0	0	13.0	3.9	77	16.8	.28	.34	0	0.00	0	555
7311-032		CONE 027:33B	9/20/75	0	0	13.0	4.0	76	17.0	.27	.35	0	0.00	0	967
7306-139		CONE 018:19B	9/16/75	0	0	13.0	4.3	75	17.2	.28	.37	0	0.00	0	443
7305-032		CONE 013:31A	9/19/75	0	0	12.9	5.0	72	17.9	.25	.48	0	0.00	0	855
7311-162		CONE 031:34B	9/20/75	0	0	12.9	4.4	74	17.3	.28	0.00	0	0.00	0	885
7007-339		CONE 170:07	9/19/75	1	0	12.9	5.9	69	18.8	.26	.48	0	0.00	0	635
7007-281		CONE 168:53	9/19/75	0	0	12.9	7.0	65	19.8	.26	.40	0	0.00	0	629
7301-003		CONE 001:16B	9/18/75	0	0	12.9	4.2	75	17.1	.25	.46	0	0.00	0	644
62013	COMET	CONE 001:14B	9/18/75	0	0	12.8	4.3	75	17.2	.25	.59	0	0.00	0	641
7006-134		CONE 157:26	9/17/75	0	0	12.8	4.0	76	16.8	.28	.45	0	0.00	0	486
7303-018		CONE 007:24A	9/19/75	0	0	12.8	3.4	79	16.2	.28	1.06	0	0.00	0	713
7006-074		CONE 157:17	9/17/75	0	0	12.7	5.1	71	17.8	.29	.53	0	0.00	35	484
7006-392		CONE 161:48	9/18/75	4	0	12.7	7.1	64	19.8	.24	.31	0	0.00	34	579
7006-273		CONE 159:33	9/17/75	0	0	12.7	3.1	80	15.8	.28	.32	0	0.00	23	507
7005-072		CONE 153:21	9/15/75	0	0	12.7	6.7	65	19.4	.22	.52	0	0.00	32	460
7006-435		CONE 162:40	9/18/75	0	0	12.7	5.7	69	18.4	.26	.35	0	0.00	0	585

TABLE 1975 BALE AND 5-CONE SAMPLES WITH ALPHA ACIDS GREATER THAN 12%.
concluded: SELECTED GENOTYPES AS OF 79/11/01. PAGE 3
SORTED BY ALPHA
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	ALPHA RATIO	%ALPHA PLUS BETA	HOP STORAGE INDEX	6 MONTH HSI	% A+B REMAIN	OIL ML/S/ 100G	COF	SERIAL NUMBER
7301-026		CONE	001:28A	9/18/75	0	0	12.7	3.4	79	16.1	.26	.45	0	0.00	0	663
7302-011		CONE	004:20B	9/19/75	0	0	12.6	4.7	73	17.3	.25	.79	0	0.00	0	680
7006-023		CONE	214:23-27	9/09/75	1800	227	12.6	5.0	71	17.6	.25	.55	0	0.00	0	261
7311-028		CONE	027:31B	9/20/75	0	0	12.6	4.2	75	16.8	.27	.46	0	0.00	0	963
7013-024		CONE	185:40	9/03/75	0	0	12.6	9.4	57	22.0	.21	0.00	0	0.00	0	62
21055	6806-080	CONE	036:32A	9/22/75	0	0	12.6	4.1	76	16.6	.35	.44	0	0.00	0	1017
7312-111		CONE	035:36A	9/22/75	0	0	12.6	3.1	80	15.7	.28	.32	0	0.00	0	1011
7304-022		CONE	010:26A	9/19/75	0	0	12.5	3.7	77	16.2	.27	1.07	0	0.00	0	736
7311-152		CONE	030:45B	9/20/75	0	0	12.5	3.1	80	15.6	.27	.48	0	0.00	0	882
7301-009		CONE	001:19B	9/18/75	0	0	12.5	4.0	76	16.4	.26	.54	0	0.00	0	650
7006-215		CONE	158:26	9/17/75	0	0	12.5	6.1	67	18.6	.23	.50	0	0.00	0	493
7006-406		BALE	209:28-32	9/11/75	1746	218	12.5	5.4	70	17.9	.25	.49	66	1.97	0	1320
7312-128		CONE	035:44B	9/22/75	0	0	12.4	3.5	78	15.9	.28	.38	0	0.00	0	1013
7311-081		CONE	028:42A	9/20/75	0	0	12.4	4.8	72	17.1	.26	.47	0	0.00	0	978
7006-435		BALE	211:28-32	9/11/75	1331	164	12.4	6.6	65	18.9	.25	.35	79	0.00	0	1310
7303-011		CONE	007:20B	9/19/75	0	0	12.3	5.8	68	18.1	.29	1.09	0	0.00	0	709
7312-023		CONE	032:40A	9/22/75	0	0	12.3	2.7	82	15.0	.28	.32	0	0.00	0	992
7312-015		CONE	032:36A	9/22/75	0	0	12.3	3.4	78	15.7	.29	.41	0	0.00	0	990
7302-031		CONE	004:30B	9/19/75	0	0	12.3	2.8	81	15.1	.25	.60	0	0.00	0	690
7311-056		CONE	027:45B	9/20/75	0	0	12.3	4.1	75	16.2	.27	.47	0	0.00	0	974
7307-001		CONE	019:17B	9/17/75	0	0	12.3	3.9	76	16.2	.28	.40	0	0.00	0	532
7311-001		CONE	026:34A	9/20/75	0	0	12.2	5.8	68	18.1	.28	.75	0	0.00	0	944
7311-068		CONE	028:35B	9/20/75	0	0	12.2	3.6	77	15.9	.28	.43	0	0.00	0	976
7005-070		BALE	238:17-21	9/05/75	2313	282	12.2	7.4	62	19.6	.27	.49	69	2.10	0	1316
7308-034		CONE	020:35B	9/17/75	0	0	12.2	3.9	76	14.1	.28	.54	0	0.00	0	772
21056	BULLION 10A VF	BALE	206:01-10	9/02/75	3570	434	12.2	5.7	68	17.9	.25	.56	58	0.00	0	1286
7311-033		CONE	027:34A	9/20/75	0	0	12.2	4.4	74	16.5	.29	.76	0	0.00	0	968
7306-008		CONE	016:21A	9/16/75	0	0	12.2	5.0	71	17.1	.25	.40	0	0.00	0	406
7006-276		CONE	159:36	9/17/75	0	0	12.2	5.9	67	18.1	.25	.42	0	0.00	0	508
7307-047		CONE	019:41A	9/17/75	0	0	12.1	3.8	76	15.9	.27	.37	0	0.00	0	556
7301-001		CONE	001:15B	9/18/75	0	0	12.1	3.5	78	15.6	.28	.38	0	0.00	0	642
7302-022		CONE	004:26A	9/19/75	0	0	12.1	3.5	77	15.7	.26	.56	0	0.00	0	684
7309-023		CONE	021:32A	9/18/75	0	0	12.1	4.6	73	16.7	.25	.40	0	0.00	0	789
7305-005		CONE	013:17B	9/19/75	0	0	12.1	5.1	71	17.1	.25	.50	0	0.00	0	843
7302-009		CONE	004:19B	9/19/75	0	0	12.1	2.7	82	14.8	.26	.75	0	0.00	0	679
7303-044		CONE	007:37A	9/19/75	0	0	12.1	6.0	67	18.0	.28	0.00	0	0.00	0	729
7307-037		CONE	019:35B	9/17/75	0	0	12.0	4.0	75	16.0	.27	.37	0	0.00	0	551
7005-072		BALE	239:17-21	9/15/75	1913	230	12.0	6.3	66	18.3	.24	.69	46	2.00	0	1261

ANNUAL RESEARCH PROGRESS REPORT (FY 1978)

I. Research Unit: Field Crops Breeding and Production Research

USDA, SEA-AR
2080 Cordley 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: Selections 7003-143 and 7003-243, 7005-194, 7006-311, and 7006-408 received new permanent USDA Accession numbers: 21180, 21181, 21193, 21194, 21195. They are now in our permanent germplasm collection at Corvallis. Genotype 21193 is slated for expanded off-station trials in Oregon and in the Yakima Valley, WA. It has had consistently good alpha-acid content, a good yield record, is resistant to DM, and also has good storage stability of the resins. (A. Haunold)

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

Progress: Bale quantities of the early maturing triploid Fuggle type USDA 21091 were shipped to the cooperating brewer for plant scale evaluation. Yields of 21091 averaged 1303 lbs/acre, 30% above the Fuggle average in 1978, but still rather low. (A. Haunold)

c. Objective: Evaluate triploid males for use as pollinators in commercial hop yards.

Progress: The following 8 triploid male genotypes, ranging in maturity from medium-early to late were recommended as pollinators for Oregon hop yards: 21102M, 21104M, 21105M, 21106M, 21175M, 21176M, 21177M, and 21178M. All are resistant to downy mildew, have good vigor, and produce large amounts of pollen. (A. Haunold)

d. Objective: Determine inheritance of zero alpha trait.

Progress: Data from two years of studies has been collected but analyses not yet completed. (A. Haunold)

e. Objective: Test and select aroma types from the 1976 Cascade nursery.

Progress: Selections from a nursery of crosses on Cascade and males with good storage stability of the resins were made after the second year of field testing. Selections will be planted in a seedless test location in 5 or 10 hill plots. Initial indications are that these selections have improved alpha-acid content, improved storage stability, and good aroma coupled with good yield potential. (A. Haunold)

f. Objective: Develop an improved Cluster hop.

Progress: USDA 21094 and 21095 were found to be susceptible to DM in replicated greenhouse tests, contrary to previous field observations. The two lines were dropped from further field testing in the Yakima Valley. (A. Haunold)

g. Objective: Maximize alpha-acid content in new progenies from 1976 crosses.

Progress: Lupulin samples of males and 5-cone samples of females were obtained from the 1978 crop. Analyses have not yet been completed. Downy mildew was a problem in 1978, particularly in the progeny related to the susceptible cultivar Comet. Cone yields in general were below expectations. (A. Haunold)

h. Objective: Evaluate foreign, aroma-type hop varieties for production in the U.S.

Progress: About 1 acre Styrian and 1/4 acre Hersbrucker were planted in a commercial location in the fall of 1978. (A. Haunold)

i. Objective: Improve techniques for long term hop pollen storage.

Progress: Pollen collected from the field had moisture content of 10 to 40%, too high for liquid N storage. All but 1 sample had badly clumped pollen and could not be used for pollination in 1978. Test will be repeated in 1979 using sealed glass ampules. (A. Haunold)

j. Objective: Determine feasibility of breeding for low proportion of cohumulone in the alpha-acids of hops.

Progress: The cohumulone contents of alpha-acids in random samples from crosses 7504, 7505, 7506 and 7507 (four males onto Cascade) were estimated to establish whether this quality trait can be influenced by male parents. Results ranged from 7% to 64%. Both extremes were judged unreasonable and efforts are being made to assure analytical control of the estimating procedure. (S. T. Likens)

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

Progress: Of 1162 samples evaluated, 88 exceeded 10% alpha-acids. Of these, 10 experimental lines had good storage stability (more than 70% of alpha-acids left after 6 months storage at 20°C). Of these, the following 4 lines also had low cohumulone in their alpha-acids: 7005-194, 7006-311, 7504-123 and 7504-057. (S. T. Likens)

l. Objective: Determine the relationships between the essential oil content and other quality traits of hops.

Progress: The oil content of 163 samples representing approximately 150 genotypes was weakly correlated with alpha-acids ($r = 0.62$) but was unrelated to storage stability ($r = 0.47$). The storage stability of 174 samples was unrelated to their lupulin content ($r = 0.16$). The relationship between the cohumulone content of the alpha-acids in 13 samples and the myrcene content of the essential oils of the same genotypes was not significant ($r = -0.41$), and in the opposite direction to popular belief. These results indicate that any of the quality traits examined can probably be bred for independently. (S. T. Likens)

Unplanned Objective: Develop a step-wise gradient elution procedure for separation of hop constituents.

Progress: A step-wise procedure was developed which separates alpha-acids, beta-acids, iso alpha-acids and hulapones from a QAE sephadex-A-25 ion exchange column by incremental adjustment of acetic acid concentration of the eluant. The procedure has been adopted as "official" by the American Society of Brewing Chemists. (S. T. Likens)

Progress Report continued - 5809-20010-007: Improved mint varieties and production practices.

a. Objective: Evaluate wilt-resistant mutants of Scotch spearmint in regional field tests.

Progress: Regional tests of 20 strains of Scotch spearmint were conducted in Washington, Oregon and Michigan for the second

year and in Indiana the first year. Some strains performed well at all locations but extreme variability was evident and no single strain was superior. (C. E. Horner)

b. Objective: Initiate a breeding program for genetic improvement of mints.

Progress: A geneticist was hired in April, 1978. The mint germplasm collection was relocated and preliminary selection of parental material was made. Dr. M. J. Murray, world mint genetics authority was hired for 6 weeks to help plan and advise the program. An experimental distillery was constructed and gas chromatographic equipment was obtained for assays. (C. E. Horner, D. D. Roberts)

Progress Report continued - 5090-20013-009-A: Evaluation of mint strains for resistance to Verticillium wilt. Extramural Agreement, Purdue University.

Objective: Determine level of resistance to Verticillium wilt disease in irradiation-induced mutant clones of spearmint and peppermint.

Progress: Irradiation-induced mutant clones of Scotch spearmint have been assembled and propagated. No research results to report yet. (R. J. Green, C. E. Horner)

Progress Report continued - 5090-20014-0010-A: Screening and evaluation of mint clones for resistance to Verticillium wilt. Extramural Agreement, Washington State University.

Objective: Identify strains of mints resistant to Verticillium wilt, powdery mildew and rust diseases.

Progress: Of 52 irradiation-induced mutants of Scotch spearmint field tested for wilt resistance, only a few were superior to the control varieties. The most resistant strain (336-10-74) had 60% healthy plants at harvest compared to 20% or less in the controls. Of 101 strains tested for powdery mildew resistance, 11 were selected for further evaluation. These 11 strains had vigor comparable to Scotch spearmint, and even though infected with mildew, did not drop their leaves prior to harvest. (C. B. Skotland, C. E. Horner)

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: Virus tested clones were increased by vegetative propagation. One commercial test location using virus tested plants was established at Grants Pass, Oregon. (A. Haunold, C. E. Horner)

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

Progress: Styrian was vegetatively increased from 20 to 600 plants and will be increased further. Hersbrucker was increased from 20 to 200. Huller Bitterer was found to be infected with a severe virus and planting stock was sent to Prosser, WA for virus indexing and heat-treatment cleanup. (A. Haunold)

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

Progress: A 50-fold increase in detection sensitivity was obtained by modification of existing techniques for assay of soils for the level of V. dahliae. The sensitivity of the technique is such that soils with a crop-damaging level of Verticillium can now be identified. (C. E. Horner)

2. Progress Report:

a. Tangible achievements:

1. Haunold, A. 1978. Agronomic and quality data of female and male hop genotypes grown at Corvallis, Oregon, USA. In: Gene Pools of Hop Countries. T. Wagner, editor. Zalec, Yugoslavia. pp. 60-66.

2. Haunold, A., S. T. Likens, G. B. Nickerson, C. E. Horner, and C. E. Zimmermann. 1978. Registration of USDA-21055 hop germplasm (Reg. No. GP 5) Crop Science 18:919.

3. Horner, C. E., and H. A. Melouk. 1978. Mint breeding and disease control research. Proceedings, Oregon Essential Oil Growers 28th Annual meeting, 1978. pp. 29-36.

4. Likens, S. T., G. B. Nickerson, A. Haunold, and C. E. Zimmermann. 1978. Relationship between alpha-acids, beta-acids, and lupulin content of hops. Crop Science 18:380-386.

5. Nickerson, G. B., and S. T. Likens. 1978. Stepwise elution of hop constituents from QAE-Sephadex A-25 ion exchange resin. Journal Amer. Soc. of Brewing Chemists 36:23-27.

6. Diffor, D. W., S. T. Likens, A. J. Rehberger, and R. J. Burkhardt. 1978. The effect of isohumulone/isocohumulone ratio on beer head retention. Journal Amer. Soc. of Brewing Chemists 36:63-65.

b. Other achievements:

1. Haunold, A., S. T. Likens, and C. E. Horner. Annual Progress Report of Hop Research 1978. A report to the Hop Research Committee, U.S. Brewers Association, January 20, 1978. Portland, OR. 31 pp.

2. Haunold, A. Invitational speaker. Hop variety development and problems. 17th Annual Technical Brewing Conference, Jos. Schlitz Brewing Co., Milwaukee, WI. November 1, 1978.

3. Haunold, A. Hops: Botany, Breeding and Production. U.S. Brewers Assn. Shortcourse on Brewing and Malting Technology. University of Wisconsin, Madison. November 2, 1978.

4. Horner, C. E. Annual research report to the Mint Industry Research Council, September, 1978.

5. Horner, C. E. Invited technical presentation on mint disease control. Oregon Essential Oil Growers League Annual meeting, Eugene, OR. January 1978.

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

5809-20010-006
5809-20010-007
5090-20013-009-A
5090-20014-010-A
8004-20010-032
8004-20010-250

C. Principal Accomplishments and Significance.

Hop Germplasm with High Flavor Value for Beer Developed and Released.

A germplasm line of hops with about double the alpha-acids value of the average of U.S. hop varieties was developed and released. Alpha-acids provide most of the bitterness and some of the flavor in beer. While not important as a new commercial variety because of low yield potential, the new line, USDA-21055, will provide plant breeders with an excellent genetic source of high alpha-acids.

RESEARCH WORK UNIT/PROJECT DESCRIPTION - PROGRESS REPORT

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

ACCESSION NO.	AGENCY IDENTIFICATION NO. 2.	3.	4.	5. WORK UNIT/PROJECT NO.	6. STATUS TERMINATED	30. ESTIMATED TERM. DATE
0044254	ARS	5809	2500000000	5809-20010-006	E ☐	17 JAN 19

TITLE

IMPROVED HOP VARIETIES AND PRODUCTION PRACTICES

PERFORMING ORGANIZATION

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

12. INVESTIGATOR NAME(S)

1. HORNER C E
2. HAUNOLD A
3. LIKENS S T
4.
5.
6.

84. PERIOD COVERED BY THIS REPORT (Month & year)

From: 0178 To: 0978

PROGRESS REPORT

An early-maturing, triploid, Fuggle-type variety (USDA-21091) was grown on 1.3 ha plots commercially harvested, and the hops were shipped to cooperating brewers for plant scal beer production. The yield of 21091 was about 1,300 kg per ha, only slightly better th Fuggle. However, its earliness, plus the fact that it is naturally seedless because of its triploid genetic state, make it attractive to growers. /A high alpha-acids selectio USDA-21193, was advanced to expanded commercial-scale tests in Oregon and Washington. /Eight male triploid genotypes were developed and recommended as "pollinators" for Oreg hop varieties. These nearly sterile males stimulate increased yields of cones and alph resins in female varieties without actual seed set. All are resistant to downy mildew, vigorous, and heavy producers of pollen. /About 1200 genotypes were evaluated for the c bined characteristics of high alpha, low cohumulone and good storage stability. Of 116 cone samples processed, 88% exceeded 10% alpha-acids. Of those, 10 lines had excellent storage stability, and 4 of the 10 had also low cohumulone content. These selections w be advanced for extensive agronomic tests. /Forty-four introduced varieties and advance selections were evaluated in a 20-plant replicated greenhouse test for resistance to downy mildew. Seventeen resistant males were identified that could be useful in the breeding program.

PUBLICATIONS

1. HAUNOLD, A., LIKENS, S. T., NICKERSON, G. B., HORNER, C. E. and ZIMMERMANN, C. E. 1978 Registration of USDA-21055 hop germplasm (Reg. No. GP 5). Crop Science 18:919.

2. LIKENS, S. T., NICKERSON, G. B., HAUNOLD, A. and ZIMMERMANN, C. E. 1978. Relationship between alpha-acids, beta-acids, and lupulin content of hops. Crop Science 18:380-386.

3. NICKERSON, G. B. and LIKENS, S. T. 1978. Stepwise elution of hop constituents from QAE-Sephadex A-25 ion exchange resin. Journal Amer. Soc. of Brewing Chemists 36:23-27.

4. DIFFOR, D. W., LIKENS, S. T., REHBERGER, A. J. and BURKHARDT, R. J. 1978. The effect of isohumulone/isocohumulone ratio on beer head retention. Journal Amer. Soc. of Brewing Chemists 36:63-65.

APPROVED (Signature) | TITLE *Research Leader* | DATE *3-7-7*

U.S. DEPARTMENT OF AGRICULTURE

RESEARCH WORK UNIT/PROJECT DESCRIPTION - PROGRESS REPORT

OF THE AGRICULTURAL STATE AGRICULTURAL EXPERIMENT STATIONS AND OTHER INSTITUTIONS

DATE (Mo., Yr.) 202

1.	2. AGENCY IDENTIFICATION NO.	3.	4.	5. WORK UNIT/PROJECT NO.	6. STATUS TERMINATED	50. ESTIMATED TERMI DATE
11330	AR	5309	1067	8004-20010-250	E [X]	07 OCT 1977

TOCHTHONOUS HOP IN YUGOSLAVIA AND ITS USABILITY FOR BREEDING NEW VARIETIES

7. PERFORMING ORGANIZATION	12. INVESTIGATOR NAME(S)	
ST OF HOP RESEARCH EC OSLAVIA	1 WAGNER T 2 HAENOLD A 3	4 5 6
	24. PERIOD COVERED BY THIS REPORT (Month & year)	
	From: 0178	To: 0978

PROGRESS REPORT

FINAL REPORT. Actual Termination Date: 07 OCT 1977.

Indigenous hops in the wild state were found in most provinces of Yugoslavia, mostly in humid and alpine regions up to 1,000 meters elevation. An extensive collection was made and maintained in an isolated area. Of an original 485 clones collected, 250 entries remained alive in 1977. Of these 140 were females, 95 were males and the othe did not flower. Wild clones were characterized morphologically, and, in some cases, cytologically. In general wild hops were susceptible to downy mildew, aphids and spid mites. However, 10 female and 16 male clones were highly resistant to downy mildew. Maturity was mostly late to medium late. Yield potential was mostly low, but 13% of t females had average to good yields. Aroma was rated poor to fair. Alpha-acids conten of females was generally low; only 5% of the genotypes had more than 5% alpha-acids in their cones. Many wild clones had good storage stability; nearly 8% were rated very good. Twenty-five female plants with downy mildew resistance were selected and plante in replicated plots. Most were late maturing, low yielding, and low in alpha-acids. Selections 20P14, 21P01, 24P07, 26P03, 27P04, 32P02, 33P13, 33P34, 40P19, and 41P36 had high yield potential and good downy mildew resistance.

PUBLICATIONS

1. WAGNER, T. 1976. Wild hops as sources of breeding material and maintaining gene pools. In: Breeding and Development of New Hop Varieties, Proceedings of the Scientific Commission, Inter. Hop Growers Conv., Wye College, England, pp. 61-72.

2. WAGNER, T. 1978. Gene pools of Hop Countries. Institute for Hop Research, Zalec, Yugoslavia, 83 pages.

[ ]

TITLE Research Leader

DATE 7 0 7

U.S. DEPARTMENT OF AGRICULTURE

DATE

RESEARCH WORK UNIT/PROJECT DESCRIPTION - PROGRESS REPORT

203

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

...ION NO.	AGENCY IDENTIFICATION NO. 2.	3.	4.	5. WORK UNIT/PROJECT NO.	6. STATUS TERMINATED	10. ESTIMATED TERMIN. DATE
2290	ARS	5809	2067000000	6004-20010-032	E ☐	31 OCT 197

BREEDING NEW HOP VARIETIES WITH HIGH ALPHA RESINS AND RESISTANCE TO DOWNY ...E...

...RMING ORGANIZATION

...IV OF NOVI SAD
...M, SAD
YUGOSLAVIA

12. INVESTIGATOR NAME(S)

1 ACIMOVIC M
2 HERNER C E
3
4
5
6

14. PERIOD COVERED BY THIS REPORT (Month & year)

From: 0178 To: 0978

...GRESS REPORT

This project terminated October 31, 1977. A report for the period November 1, 1976 to October 31, 1977 was received in April, 1978. A final report covering the entire life of the project is due. There is no new progress to report at this time.

...LICATIONS

None.

...ED (Signature)

TITLE Research Leader

DATE 3-7-7

Faculty of Agriculture
Institute of Field and Vegetable Crops
M. Gorkog 30
21000 Novi Sad, Yugoslavia

Dr. Milivoje Aćimović, Scientific Advisor,
Phytopathologist

BREEDING NEW HOP VARIETIES WITH HIGH ALPHA RESIN CONTENTS AND RESISTANCE TO DOWNY MILDEW (Pseudoperonospora humuli Miy. et Tak.) Wils.

YO - ARS - 32 - JB - 25; P - ZF - 32

November 1, 1976 - October 31, 1977

SUMMARY

The program of development of highly bitter varieties resistant to Pseudoperonospora humuli started in 1974.

In 1977, large-scale laboratory tests were performed on varieties and male plants to determine their resistance to Ps. humuli. Besides the variety Challenger and the domestic Husar's tolerant clone 1/22 which had been tested earlier, the clone Ch 87/74/1/IV, originating from the varieties Challenger, Star, and Cascade 56013, was found to be highly resistant; the male plants At 4/71/3a and Ap 6/71/1a were field resistant; the clone At 4/71/1a-13 was highly tolerant to Ps. humuli.

On the basis of inoculations in greenhouse and in field, it was found that the best combining ability possessed the varieties Styrian Gold (type of Fuggle), Husar's tolerant clone 8/27, Challenger, and Ahil, the male clones At 4/71/1a-13, Vo 22/74/3-m, Nb 2/72/3a-24, and Nb 2/65/1 which gave the most resistant populations, and the male plants Nb 1/61/4, Wcl 3/3, and M 64032, the populations of which had the largest number of resistant and highly tolerant plants.

Among the clones crossed in 1975, three of them deserve closer attantion: resistant clone Gb 29/75/1, and highly tolerant clones Bu 11/75/11 and Ne 38/75/2.

Among the clones crossed in 1974, neither resistant clone showed sufficient yielding ability and bitterness; among the highly tolerant clones, Htcl 57/74/5/VI and Ne 42/74/1/V showed a high yielding ability and satisfactory technological quality. With these clones, Ps. humuli occurred as a slight secondary infection of leaves while the other parts, particularly the cones, were resistant. These clones showed also a high resistance to Sph. humuli and Cladosporium in field conditions.

DETAILED REPORT

The research within the project was conducted on the following accepted theme:

BREEDING NEW HOP VARIETIES WITH HIGH ALPHA RESIN CONTENTS AND RESISTANCE TO DOWNY MILDEW (Pseudoperonospora humuli Miy. et Tak.) Wils.

INTRODUCTION

The problem of downy mildew occurrence in hop gardens started in Vojvodina after 1920. According to Vŕbovsky (1928), downy mildew had been registered before 1925 when it caused larger damages in the production of hops. Starting from 1926, which was a humid year, downy mildew kept causing large damages in hop gardens of Vojvodina. The variety Bačka, which was expanding its acreage in Vojvodina at that time, was classified by Vŕbovsky as more susceptible than the varieties Saas Red, Elzaser, and Golding (Styrian Gold, type of Fuggle). During this period, Bačka was grown without chemical protection in dry years; it required 2-3 sprayings in humid years. Later on, the attacks by Ps. humuli became more frequent. After the World War II, there were several epiphytotics of Ps. humuli. A particularly strong epiphytotics occurred in 1955 (Aćimović, 1963), when Ps. humuli entirely destroyed the hop in Vojvodina. Although the production region of Vojvodina may be considered as semi-arid, downy mildew is still the major hop disease. Nowadays, 12 - 18 sprayings are necessary for a successful protection of the variety Bačka. Similar increases in susceptibility to downy mildew have been observed in other regions and with other varieties, even those which had had rather high resistance to this disease (Royale, 1976).

The selection for clones resistant to Ps. humuli was started in Vojvodina by Husar (1962, 1963) after the epiphytotics in 1955. He selected 11 tolerant clones

(Husar's tolerant clones, i.e., HTCL) from 380 plants resistant to Ps. humuli. Some of them still retain field resistance, after 20 years of growing (Aćimović, Mijavec, 1977), but other inherent shortcomings prevented them from being introduced into commercial production. Our new varieties with high contents of alpha resins approved by the Federal Varietal Commission in 1972, particularly Neoplanta and Vojvodina, possess a considerable resistance to Ps. humuli and may be successfully grown with 3 - 6 sprayings (Mijavec, Spevak, 1973). Their resistance originates from the male plant Sx 502 which was obtained from the crossing of a form of wild hop and Styrian Gold.

A new peogram of development of bitter varieties resistant to Ps. humuli started at the Department of Hop and Broomcorn in 1974. The program was sponsored by the Foundation for Scientific Work in SAP Vojvodina and the Counterpart Foundation of the United States.

LIST OF SCIENTISTS

Name	Scientific discipline	% of time
Milivoje Aćimović	Phytopathologist	20
Andrej Mijavec	Breeder	30
Pavel Spevak	Chemist	40
Jan Kišgeci	Physiologist	20
Katarina Oros	Agr. technician	50
Jan Kudron	Agr. technician	50
Marija Maleš	Chem. technician	40

METHODOLOGY

The following operations were performed in 1977:

- testing, selection, and crossing of parental pairs.

- Testing the seedlings from 1976 crossings for susceptibility to Ps. humuli in greenhouse and in field.

- Vegetative multiplication of resistant and highly tolerant clones selected from 1974 and 1975 crossings and testing for important biological characteristics.

- Testing for yielding ability and technological characteristics of resistant and highly tolerant clones selected from 1974 and 1975 crossings.

In 1977, the material for crossings was comprised of resistant and highly tolerant varieties and clones (Challenger, Cascade 56013, Shinshyiu Wasse, HTCL 4/6, HTCL 6/16, HTCL 7/18, HTCL 7/23) and varieties with other desirable characteristics (Ahil, Atlas, Bačka, Bullion, Brewer's Gold, College Cluster, Neoplanta).

Among the male plants, we used previously tested male plants from Oregon, USA (M 64032 and M 64033), wild hop from Slovenia (Wcl 3/3), and resistant and highly tolerant male plants from our nursery (Nb 2/ /59/6, Nb 13/66/1, Nb 13/66/2 originating from the male plant Sx 502; Ne 48/74/40-25 with two sources of resistance (Sx 502 x Wcl 3/3); Htcl 59/74/14-25 with three sources of resistance (Sx 50 2 x Wcl 3/3 x Htcl). The crossings also included four resistant male plants originating from the variety Challenger: Ch 87/74/12, Ch 87/74/13, Ch 87/74/18, and Ch 87/74/19. The basis for the combining were earlier progeny tests, phenotype, and particularly the degree of field resistance to Ps. humuli.

We also carried out a laboratory test for susceptibility to Ps. humuli, the method of discs. This was an additional test to our field and progeny tests. It covered only those plants which were crossed but not laboratory tested earlier as well as those male and female plants which had field resistance. The method of discs had been descrived earlier (Aćimović, Mijavec, 1973).

The tests for populations' susceptibility were performed by inoculating the plants grown in greenhouse and in field with a suspension of zoo-spores. The method had been described in the reports for the previous two years. The tests covered the population of 3414 seedlings originating from 15 varieties and 19 male plants.

The tests for basic biological characteristics, yielding ability, and technological characteristics were performed on the clones selected from 1974 and 1975 crossings. The resistance in field conditions was evaluated by the standard method, in the course of the development of the plants, and on all plant parts: lignified part of the stem, annual stem and shoots, leaves, and cones. The rating ranged from (-) for plants uninfected by Ps. humuli and (+) to (++++) for plants attacked by Ps. humuli to varying degrees.

The rankness and yielding ability of annual plants (the clones from 1975 crossings) were rated on the scale from (1) = low rankness, i.e., yielding ability to (5) = intensive rankness, i.e., yielding ability. With the two-year clones from 1974 crossings, we evaluated separately the rankness or underground and above-ground parts. The rankness was rated on the scale from 1 to 5. The yielding ability was evaluated on the basis of kilograms of fresh hops per plant. The contents of bitter substances in resistant and highly tolerant clones with satisfactory yielding ability were analysed by Wöllmer's method. The tables give the values for total and alpha resins.

RESEARCH RESULTS

In 1977, 26 combinations of test crosses and 16 combinations of so-called commercial crosses were planted in order to establish a population for the selection of plants resistant to Ps. humuli.

Tab.1 - Laboratory tests of susceptibility to Ps. humuli of varieties and clones

No.	Variety - clone	Field * resistance	Infection index by McKinney**	Rating***
1	Ahil	T	(59,38)	-
2	Atlas	T	(31,25)	-
3	Bačka	O	(84,38)	-
4	Brewers Gold	T	(38,54)	-
5	Bullion	T	(63,54)	-
6	Challenger	R	(13,54)	-
7	Dunav	T	(37,50)	-
8	HTCL 8/27	VT	31,13	7
9	HTCL 12/4	VT	28,30	6
10	Neoplanta	VT	(26,04)	-
11	Northern Brewers	T	(40,63)	-
12	Savinjski Golding (Styrian)	VT	(25,00)	-
13	Shinshyiu Wasse	VT	(35,83)	-
14	Vojvodina	VT	(26,04)	-
15	Žatečki červenjak (Saaz red line)	O	(80,83)	-
16	HTCL 1/22	R	(18,33)	-
17	HTCL 1/23	R	(30,00)	-
18	HTCL 4/6	R	(35,83)	-
19	HTCL 7/18	R	(28,33)	-
20	HTCL 7/23	R	(36,66)	-
21	Cascade: 56013	R	22,64	3-4
22	Star	R	20,74	2
23	Ch 87/74/1/XIII	R	16,98	1
24	Ne 20/74/1/IV	R	23,58	5
25	Ap 35/74/10/III	R	22,64	3-4

* Evaluation ofter three-year field test without chemical protection

** Laboratory results from 1975 and 1976 given in parentheses

*** Varieties tested in 1977 rated only

Tab.2 - Laboratory tests of susceptibility to Ps.humuli of male plants

No.	Designation	Gen.of crossing origin	Source of resistance	Field* resistance	Infection index by McKinney**	Rating***
1	M 64032	-	-	VT	(21,66)	-
2	M 64033	-	-	R	(17,50)	-
3	Nb 2/59/1	F_1(nb)	Sx 502	VT	(21,66)	-
4	Nb 2/59/6	F_1(nb)	"	R	(24,17)	-
5	Nb 1/61/4	F_1(nb)	"	VT	(23,33)	-
6	Nb 1/61/5	F_1(nb)	"	R	15,09	4
7	Nb 3/62)1	F_2(nb^2)	"	O	(36,66)	-
8	Nb 2/65/1	F_3(nb^3)	"	VT	(38,33)	-
9	Nb 13/66/2	F_4(nb^4)	"	O	(25,83)	-
10	S 32/71/1	F_x(sx nb^{2}bnb)	"	VT	(70,83)	-
11	Nb 2/72/3a-24	F_4(nb^4)	"	VT	30,19	11
12	El 52/73/1-20	F_4(inb^{2}snb^2)	"	T	(49,16)	-
13	Ne 42/74/1-25	F_6(nb^{5}ne)	"	T	(31,67)	-
14	Wcl 3/3	F_o wild hop	(Divlji hmelj)	VT	(16,67)	-
15	Vo 22/74/3-n	F_6(nb^{4}atvo)	Sx 502 x Wcl 3/3	DT	32,07	12
16	At 4/71/1a-13	F_5(nb^{4}at)	"	DT	14,15	3
17	Ah 5/71/5	F_4(nb^{3}ah)	"	DT	(27,08)	-
18	HTcl 59/74/1-25	F_5(nb^{3}ahhtcl)	Sx 502 x Wcl 3/3 x Htcl	T	(25,00)	-
19	Sg 16/69/1	F_3(ya^2 sg)	(Yasg)	O	(30,29)	-
20	Nb 1/65/5	F_3(nb^3)	Sx 502	R	26,41	9
21	Ne 4/72/1	F_2(nbne)	"	R	19,81	6-7
22	Ne 7/72/4	F_3(nbžane)	"	R	23,58	8
23	♀ Vo 22/72	F_3(nbdvo)	"	R	19,81	6-7
24	At 4/71/3a	F_6(nb^{4}bat)	Sx 502 x Wcl x 3/3	R	12,26	1
25	At 4/71/3b	F_6(nb^{4}bat)	"	R	17,92	5
26	Ap 6/71/1a	F_4(nb^{3}ap)	"	R	13,21	2
27	OC 40/71/1-24	F_x(oc)	(OC)	R	28,30	10

* Evaluation after three-year field test without chemical protection

** Laboratory results from 1975 and 1976 given in parentheses

*** Male plants tested in 1977 rated only

The results of the laboratory test for varietal resistance are given in Table 1. The method of discs was used. The results show that seven varieties and clones were tested in 1977 for the first time. The results given in parentheses are those from previous test years and are given for comparison. The values in the table indicate that the clone Ch 87/74/1/XII, originating from the varieties Challenger and Star, was more resistant than the other varieties. This clone equals the resistance of the variety Challenger and Husar's tolerant clone 1/22. The other varieties and clones were more susceptible to inoculation with zoo-spores in laboratory.

The results of the laboratory test for the resistance of male plants are given in Table 2. The results show that there was a number of male plants with a lower index of susceptibility to Ps. humuli than the indices of the varieties Challenger and Star as well as previously tested American male plants M 64032 and M 64033. A particularly high resistance during the laboratory test was found in the male plants At 4/71/3a, At 6/71/1a, and At 4/71/1a-13. These male plants were used in 1977 for crossing.

The results of the degree of resistance of the population of crossings in 1976 are given in Table 3.

Tab. 3 -- Number and relative percentage of seedlings per categories of susceptibility to Ps.humuli

Degree of resistance	Category of susceptibility	No. of plants	Relative percentage
I	R = resistant	22	0.64
II	VT = highly tolerant	59	1.73
III	T = tolerant	169	4.95
IV	DT = sufficiently tolerant	983	28.79
V	O = susceptible	2181	63.89
TOTAL		3414	100.00

The results in Table 3 show that the population of crossings in 1976 included 3414 seedlings. After the inoculations in greenhouse and in field, 22 seedlings (0.64%) were found to be resistant (R), 59 seedlings (1.73%) were highly tolerant, 169 seedlings (4.95%) were tolerant (T), 983 seedlings (28.79%) were sufficiently tolerant (DT), and even 2181 seedlings (63.89%) were susceptible (O).

Distribution of susceptibility of the populations in relation to the female parent, susceptibility index by McKinney, and rating list are given in Table 4. The data show that the varieties and clones Styrian Gold, HTCL 8/27, Challenger, Ahil, Neoplanta, and HTCL 12/4 had the best transfer of resistance to Ps. humuli when used as female parents. With the exception of the variety Ahil, these varieties and clones have high degrees of resistance to Ps. humuli in natural conditions.

Distribution of susceptibility of the populations in relation to the male parent is given in Table 5. The data show that 19 male plants with expressed resistance to Ps. humuli were used to develop population in 1976. The male plants which had the best populations were those originating from the male plant Sx 502 (in turn originating from a form of wild hop and Styrian Gold), the male plant Wcl 3/3 from Slovenia, approved American resistant male plant M 64032, male plants with two sources of resistance (Sx 502 x Wcl 3/3) and three sources of resistance (Htcl x Sx 502 x Wcl 3/3).

It may be concluded on the basis of the obtained results that neither of the 19 tested male plants generated an outstandingly resistant progeny. The male plants At 4/71/1a-13 originating from Atlas, Vo 22/74/3-m originating from Vojvodina (both of these having a combination of the sources of resistance -

Tab.4 - Susceptibility of progeny (progeny test) to Ps.humuli

Variety	Field resis-tance*	No of tested seed-lings	Category of susceptibility					Infec-tion index by McHinney	Rating** Rank
			R	UT	T	DT	O		
Ahil	T	112	-	1	5	48	58	86,38	4
Atlas	T	199	-	1	9	46	143	91,58	10
Bačka	O	19	-	1	2	9	7	78,94	-
Brewers Gold	T	490	4	4	9	114	359	91,83	11
Bullion	T	218	-	2	9	69	138	89,33	8
Challenger	R	270	4	6	29	82	149	83,88	3
Dunav	T	75	-	2	4	22	47	88,00	7
HTCL 8/27	VT	119	2	5	10	38	64	82,98	2
HTCL 12/4	VT	32	-	2	3	5	22	86,72	6
Neoplanta	VT	1.168	11	28	66	372	691	86,47	5
Northern Brewers	T	90	-	3	5	23	59	88,35	9
Savinjski Golding	VT	46	-	1	8	16	21	80,97	1
Shinshyiu Wasse	VT	485	1	3	6	119	356	92,57	12
Vojvodina	VT	67	-	-	1	17	49	92,91	13
Žatečki crvenjak	S	84	-	-	3	3	18	90,62	-

* Evaluation after three-year field test without chemical protection

** Populations exceeding 25 plants rated only

Tab.5 - Susveptibility of progeny of male plants crossed in 1976

No.	Male clone	No.of tested seed-lings	Category of susceptibility					Infecti-on index by McKinney	Rating* Ranking
			R	UT	T	DT	O		
1	M 64032	277	2	8	19	78	170	86,64	7
2	M 64033)**	-	-	-	-	-	-	-	-
3	Nb 2/59/1	488	1	5	13	123	346	91,39	13
4	Nb 2/59/6	88	1	-	4	30	53	88,87	9
5	Nb 1/61/4	598	7	10	36	150	395	88,27	10
6	Nb 1/61/5	159	-	5	7	63	84	85,53	5
7	Nb 3/62/1	19	-	-	1	7	11	88,15	-
8	Nb 2/65/1	101	1	1	6	41	52	85,15	4
9	Nb 13/66/2	3	-	-	-	2	1	83,33	-
10	S 32/71/1	12	-	1	1	4	6	81,25	-
11	Nb 2/72/3a-24	144	1	7	11	48	77	83,50	3
12	El 52/73/1-20	136	-	4	6	54	72	85,66	6
13	Ne 42/74/1-25	126	1	2	2	50	71	87,30	8
14	Wcl 3/3	578	5	9	34	122	408	89,74	12
15	Vo 22/74/3-[illegible]	50	1	3	3	15	28	83,00	2
16	At 4/71/1a-13	108	1	3	12	38	54	82,63	1
17	Ah 4/71/5	17	-	-	-	12	5	82,35	-
18	Htcl 59/74/1-25	162	-	-	2	32	128	94,44	14
19	Sg 16/69/1	348	1	1	12	114	220	89,58	11

* Populations exceeding 25 plants rated only

** Crossed in 1977. Progeny test will be done in 1978.

.. Sx 502 x Wcl 3/3), and Nb 2/72/3a-24 originating from Northern Brewers (with Sx 502 as the source of resistance) were a shade better than the others. They may be counted among those previously tested male plants which transfer an increased resistance to Ps. humuli to their progenies.

The basic biological characteristics: susceptibility to Ps. humuli, Sph. humuli, and Cladosporium, rankness, yielding ability, and technological quality of vegetatively multiplied plants from the populations of crossings in 1975 are given in Table 6. This table gives the above characteristics for six resistant and 13 highly tolerant clones in which Ps. humuli did not occur in field conditions on the lignified part of the stem, annual stem, shoots, and cones. With these clones, Ps. humuli occurred as a low-intensity (+) secondary infection of leaves. Two of the clones had high yielding ability (5) and five of them satisfactory yielding ability (4). The cones of these clones were also tested for technological characteristics. On the basis of the results from Table 6, we decided to multiply the clones Gb 29/75/1 originating from the variety Groene Bell and Ne 50/75/5 originating from the variety Neoplanta. The former clone is resistant to Ps. humuli, the latter highly tolerant. Both of them have a high yielding ability and a very good bitterness. The clones Bu 11/71/11 originating from the variety Bullion and Ne 38/75/2 originating from the variety Neoplanta are also interesting for multiplication because of their resistance to Ps. humuli and high contents of bitter substances, particularly of alpha resins. In addition, the clones Gb 29/75/1 and Ne 38/75/2 did not have the cones infected by Sph. humuli and Cladosporium.

Clonicly multiplied resistant and highly tolerant plants from the population of crossings in 1974 and

Tab.6 - Susceptibility to Ps.humuli, Sph.humuli, and Cladosporium sp., yielding ability, and technological values of selected tolerant and highly tolerant clones crossed in 1975.

No	Clone	Susc.to Ps.humuli					Suc.to Sph.humuli		Susc.to Cladosporium	Rankness	Yielding ability	Technological quality	
		Lignified stem	Annual stem shoots	Leaves	Cones	Total	Stem	Leaves	Cones			Total resins	Alpha resins
1	Bu 1/75/1	-	-	-	-	R	-	+	-	1	-	-	-
2	Bu 11/75/11	-	-	-	-	R	-	-	+	4	4	20,22	9,55
3	Gb 29/75/1	-	-	-	-	R	-	-	-	5	5	18,64	6,74
4	Ne 38/75/2	-	-	-	-	R	-	-	-	3	4	20,23	8,99
5	Ne 38/75/9	-	-	-	-	R	-	-	-	3	4	17,15	6,07
6	Ne 78/75/2	-	-	-	-	R	-	+	-	1	1	-	-
7	Bu 48/75/10	-	-	+	-	VT	-	+	-	2	2	-	-
8	Ne 18/75/7	-	-	+	-	VT	-	+	-	2	2	-	-
9	Ne 18/75/18	-	-	+	-	VT	-	+	+	1	-	-	-
10	Ne 27/75/34	-	-	+	-	VT	-	+	-	1	1	-	-
11	Ne 27/75/35	-	-	+	-	VT	-	-	-	3	4	16,72	4,07
12	Ne 38/75/5	-	-	+	-	VT	-	-	-	1	1	-	-
13	Ne 38/75/6	-	-	+	-	VT	-	-	+	3	4	13,31	4,24
14	Ne 50/75/5	-	-	+	-	VT	-	-	+	5	5	17,48	6,78
15	Ne 50/75/14	-	-	+	-	VT	-	-	-	1	-	-	-
16	Ne 55/75/16	-	-	+	-	VT	-	-	-	1	1	-	-
17	SV 63/75/6	-	-	+	-	VT	-	-	+	1	-	-	-
18	Vo 49/75/18	-	-	+	-	VT	-	-	+	1	1	-	-
19	Vo 83/74/5	-	-	+	-	VT	-	-	-	1	1	-	-

Tab.7 - Susceptibility to Ps.humuli, Sph.humuli, and Cladosporium sp., rankness, yielding ability, and technological quality of selected resistant, tolerant, and highly tolerant clones crossed in 1974)*

No.	Clone	Suc.to Ps. humuli					Suc.to Sph.humuli			Susc. to Cladosporium	Rankness		Yielding ability	Rankness	
		Lignified stem	Annual stem shoots	Leaves	Cones	Total	Stem Leaves	Comes			Under ground part	Above ground part		Total resins	Alpha resins
1	Ap 35/74/10/III	-	-	-	-	T	-	-		+	4	1	1,28	12,99	5,73
2	Ap 35/74/10/IV	-	-	-	-	R	-	-		+	4	2	0.90	16,72	4,27
3	Ch 87/74/1/XIII	-	-	-	-	R	+	-		-	2	2	0.95	11,39	3,61
4	Ne 20/74/1/IV	-	-	-	-	R	-	-		-	4	1	0,45	9,78	4,18
5	Ap 35/74/1/III	-	-	+	-	VT	-	-		+	4	4	1,85	12,92	6,37
6	Ap 36/74/9/III	-	-	+	-	VT	+	+		+	5	5	2,12	18,27	6,59
7	Ap 36/74/9/III NO	-	-	+	-	VT	+	++		+	5	4	1,88	19,77	6,33
8	Ap 69/74/1/III	-	-	+	-	VT	-	-		+	5	4	1,95	16,72	7,57
9	Ap 71/74/3/III	-	-	+	-	VT	+	++		+	4	2	0.85	16,40	7,39
10	Au 40/74/1/II	-	-	+	-	VT	-	+		-	5	2	0.75	15,36	5,07
11	Au 40/74/1/IV	-	-	+	-	VT	-	+		-	4	1	0,45	14,92	5,27
12	Au 65/74/5/IV	-	-	+	-	VT	-	-		+	5	4	1,92	15,07	4,91
13	Au 65/74/11/II	-	-	+	-	VT	-	-		++	5	3	1,35	15,16	4,93
14	Pu 11/74/5/VI	-	-	+	-	VT	-	-		++	2	4	1,80	20,98	9,98
15	Ch 87/74/1/IV	-	-	+	-	VT	+	-		-	2	4	1,82	14,74	4,07
16	Ch 87/74/19/II	-	-	+	-	VT	+	-		+	5	5	2,08	18,85	6,28
17	Ch 87/74/27/II	-	-	+	-	VT	-	-		-	5	4	1,70	16,70	6,64

(Tab.7)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
18	Htcl 57/74/5/VI	-	-	+	-	VT	-	-	-	5	5	2,30	15,97	7,28
19	Htcl 57/74/11/II	-	-	+	-	VT	-	-	-	5	5	1,80	12,41	4,27
20	Htcl 59/74/1/V	-	-	+	-	VT	-	-	-	5	5	2,40	12,48	5,69
21	Ne 28/74/1/II	-	-	+	-	VT	+	-	+	5	4	1,80	17,89	7,40
22	Ne 28/74/1/IV	-	-	+	-	VT	+	-	+	5	4	1,95	16,02	6,64
23	Ne 42/74/1/V	-	-	+	-	VT	-	-	-	5	5	2,25	16,72	5,11
24	AT 60/74/1/V NO	-	+	++	-	T	-	-	+	5	5	2,20	16,53	7,29
25	Ne 48/74/34/V	-	+	++	-	T	+	-	+	5	5	2,40	15,74	7,79
26	CO 10/74/1/V NO	-	++	+	-	T	+	+	+	5	5	2,05	15,59	5,73
27	CCl 13/74/3/4	-	+	+	-	T	-	-	-	5	4	1,95	18,35	8,02

* Average of three two-year-old plants

those tolerant (T) plants with the cones uninfected by Ps. humuli are listed in Table 7. The data in the table show that out of 27 tested clones, four of them had all plant parts free from Ps. humuli which were thus rated R. It may be seen, however, that neither of these clones had a sufficient yielding ability and the contents of total and alpha resins. Besides the resistance to Ps. humuli, the clone Ne 20/74/1/IV had the cones uninfected by Sph. humuli and Cladosporium throughout the two-year research period.

Out of 23 clones rated for the resistance to Ps. humuli as highly tolerant (VT) and tolerant (T), five of them were free from Sph. humuli and Cladosporium throughout the test period. The following clones had a particularly high yielding ability: Htcl 59/74/1/V, Htcl 57/74/5/VI, originating from Husar's tolerant clones, Ne 42/74/1/V, originating from Neoplanta; the clone Bu 11/74/5/VI, originating from Bullion, had a high value for bitterness. These clones will be further multiplied.

DISCUSSION

It may be concluded on the basis of the research performed so far that neither of the tested male plants possessed a complete resistance to Ps. humuli. This conclusion was drawn from the inoculations in laboratory conditions. On the other hand, field resistance was found in the American male plant M 64033 and another ten male plants which originate either from the male plant Sx 502 or from the plants combining two sources of resistance, Sx 502 and Wcl 3/3. There was one male plant of unknown origin, the seed of which was obtained from a commercial sample of the hop variety Oregon Cluster. Until this year, we believed the male clones M 64032 and Wcl 3/3 to be resistant. However, a small-scale secondary infection with full fructification and

vital zoo-spores was observed with these clones in June 1977, which forced us to reclassify them into the group of highly resistant male plants.

Among the materials grown for three years without protection, the following varieties showed the field resistance: Challenger, Cascade 56013, Star, and five Husar's tolerant clones: HTCL 1/22, HTCL 1/23, HTCL 4/6, HTCL 7/18, and HTCL 7/23. After the two-year tests in the conditions without protection, another three clones possessing the highest degree of resistance (R) were developed within the program: Ch 87/74/1/XIII originating from Challenger, Ne 20/74/1/V originating from Neoplanta, and Ap 35/ /74/10/III originating from Apollo. It may be seen in Table 1 that the infection was also induced on leaf discs of these clones by inoculating them with zoo-spores in laboratory conditions. The clone originating from the variety Challenger was more resistant then the others.

The progeny tests performed so far show that the sources of the transfer of the resistance may be found in the tested varieties which are resistant but low-yielding in the conditions of Vojvodina. It was proved by the progenies of the variety Challenger and some Husar's tolerant clones. However, the results from the previous two years as well as those in Tables 4 and 5 show that the resistance of the varieties is not transferred to the progenies to the extent the other useful characteristics (yielding ability) are transferred. It is, therefore, difficult to determine reliable correlations in such a short period of time. After the three-year tests and the determinations of combining ability of the varieties and male plants, we still do not have sufficiently attractive combinations of parental pairs to be used for the establishment of populations for the selection of resistant

plants. At the moment, we have only the outlines which should enable us to achieve some success in a few years. The results from this and the previous years show that a higher frequency of plants resistant or highly tolerant to Ps. humuli was found in large populations. This was taken into account during the crossings in 1977 - we tried to obtain larger populations of parental pairs.

CONCLUSION

The following conclusions may be drawn on the basis of the tests for resistance to Ps. humuli in male and female plants and their progenies:

seven varieties and clones showed a high degree of resistance to Ps. humuli after inoculation in laboratory. The varieties and clones Ch 87/74/1/IV, originating from Challenger (susceptibility index 16.98%), Belgian variety Star (index 20.74%), American variety Cascade 56013 (index 22.64%), and the clone Ap 35/74/10/III, originating from Apollo (index 12.64%) should be included into the group of prospective varieties and clones from the previous years.

Out of 12 tested male plants, four showed higher resistance to Ps. humuli than those plants tested earlier (including the clones M 64033 and Wcl 3/3). Those were the male plants obtained by crossing two resistance sources, Sx 502 and Wcl 3/3, in 1971: At 4/71/3a, Ap 6/71/1a, At 4/71/1a-13, and the male plant with one source of resistance, Sx 502, obtained from the crossings in 1961 - Nb 1/61/5. The first, second, and fourth plant were resistant to Ps. humuli in field conditions; the third was highly tolerant.

The population of seedlings tested in 1976 included 3414 plants. Out of this number, 22 plants were resistant (R), 59 were highly tolerant (VT),

while the others had lower degrees of tolerance or were susceptible. These 81 plants will be clonicly multiplied and tested in the future.

Testing the resistance of the populations in relation to the female parent, we found that the varieties Styrian Gold, Husar's tolerant clone 8/27, Challenger, and Ahil had the most resistant progenies.

Among the male plants tested in 1976, At 4/71/ /1a-13, Vo 22/74/3-m, Nb 2/72/3a-24, and Nb 2/65/1 had relatively the best progenies; the progenies of the male plants Nb 1/61/4, Wcl 3/3, and M 64032 had the largest number of resistant and highly tolerant plants.

Among the clones crossed in 1975, six clones were resistant to Ps. humuli, but only Gb 29/75/1 had a high yielding ability and good technological characteristics. Two highly tolerant clones, Bu 11/ /75/11 and Ne 38/75/2, had high yielding abilities and bitterness. Only their leaves were attacked by Ps. humuli.

Among the clones crossed in 1974, four were resistant but neither of them had satisfactory yielding ability and technological characteristics. Among the highly tolerant clones from these crossings, the best were Htcl 57/74/5/VI and Ne 72/74/1/V. These clones suffered a low-intensity attack of Ps. humuli on the leaves, while the cones remained uninfected throughout the three-year test period. In field conditions, these clones were uniinfested by Sph. humuli and Cladosporium.

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PLAN OF WORK

Arrangement and classification of three-year results to prepare the materials for the final report.

PUBLICATIONS:

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GRADUATE DEGREES

There were no promotions in 1977.

PROGRESS REPORT

Solar - Assisted Drying of Hops

REPORT TO: Dr. J. L. Butler, Principal Investigator,
Solar Drying of Crops Other than Grain
USDA, SEA - AR
Coastal Plain Experiment Station
Tifton, GA 31794

PERIOD: June 19 - Sept. 30, 1978

PROJECT NO: 12-14-7001-1242

PROJECT TITLE: Solar - Assisted Drying of Hops

PROJECT MANAGER: Glenn Kranzler
Washington State University
Agricultural Engineering Department
Pullman, WA 99164

PROJECT ABSTRACT:

Hop drying is a significant agricultural consumer of fuel oil in the Northwest. Solar radiation offers potential as an auxiliary energy supply to reduce this fossil fuel consumption. This proposed research seeks to evaluate the feasibility of applying solar energy to hop drying. Specifically, the objective is to:

> Investigate by field study the technical and economic feasibility of utilizing solar energy as a supplementary thermal source for the drying of hops by means of, (a) preheating ambient system intake air, and (b) conditioning kiln exhaust air for system recirculation.

An existing multi-kiln hop drier plant of conventional design will be utilized. A portion of the roof will be modified to function as a solar collector. Solar heated air will be ducted to the kiln fan intake to supplement furnace output. The collector design will permit preheating of outside air or optional conditioning and recirculation of kiln exhaust air.

Both direct and recirculation modes of operation will be studied. Energy consumed by the solar-assisted kiln and by a second kiln in the plant

will be monitored throughout the drying season and compared to assess energy savings.

Selection of Cooperator

Selection of a hop grower - cooperator for the project was begun in January, 1978. Prerequisites included a conventional multi-floor hop drying kiln with south-sloping roof, south-side fans and furnaces, and at least two drying floors with identical drying systems. Each hop producer in the Yakima Valley was apprised of the prospective project through the U.S. Hop Administrative Committee newsletter. Five expressions of interest were received.

Visits were made to the hop ranches of the respondents. Each grower was interviewed and his drying facilities examined to determine compatibility with the project objectives. A progressive, family-owned hop ranch with about 400 acres of yards was selected. The site is located about 25 miles from Yakima, Washington:

Wesley Morford
Green Acre Farms
Rt. 1. Box 196 J
Wapato, WA 98951

Collector Design

The solar collector design concept involved modification of the existing kiln roof. Goals included relatively low cost, use of standard materials, and simple construction suitable for installation by the grower or small building contractor. Constraints were imposed by the configuration of the roof and drying system and by the requirement to permit operation with either ambient air or recirculated exhaust air.

Design solar radiation levels were based on theoretical considerations and on long-term insolation data for Prosser, Washington, about 50 miles southeast of the project site. Design criteria and specifications are summarized

below:

1. Collector type: air, covered flat-plate
2. Orientation: south-facing, 20° from horizontal
3. Design radiation level(max.): 280 Btu/ft^2 - hr
4. Design temperature rise (max.): 40° F
5. Design airflow: 4200 cfm
6. Design efficiency (max.): 50%
7. Collector area: 1350 ft^2
8. Flow configuration: series, 4-channel
9. Flow modes: ambient air or recirculated air, remotely selectable
10. Circulation fan: 3 HP, tubeaxial

Working drawings and specifications were preapred for contractor bidding purposes. Specifications included flat black paint to be applied to existing sheet metal roofing, kiln-dried 2" x 6" framing members, and Tedlar-coated corrugated fiberglass glazing.

Sub-Contractor, Materials

The two-month delay in project funding caused considerable difficulty in identifying a sub-contractor to install the collector and in securing the necessary construction materials. A lead time of well over two months is normally required to complete WSU bidding procedures for outside contractors. Less than two months remained before the seasonal onset of the hop harvest. Some compromises in materials and installation were necessitated by the abbreviated schedule.

Installation

Installation of the collector was performed by sub-contractor during the second and third weeks of August. Departmental personnel installed the ducting and circulation fan. Wiring was done by a local electrician.

Ducting was designed to route the collector output to the intake of the existing drying system serving one drying floor. At the system intake, solar preheated air mixed with ambient air to supplement the 40,000 cfm

furnace-heated flow. Thermostatic regulation of fuel to the furnace maintained a uniform dyring air temperature of approximately 150° F.

Instrumentation

A total of 37 thermocouples was installed to monitor ambient, collector, and drying system air temperatures. Solar radiation levels were recorded with two pyranometers; one mounted horizontally, the other at the collector angle. Flow meters were fitted to measure fuel oil consumption on both the solar-supplemented drying system and on the adjacent "control" system. Air humidity determinations were made with a portable electronic relative humidity meter.

Recording equipment included a multi-point temperature recorder and a digital data acquisition system with temperature, integration, and magnetic tape storage capabilities.

The revised schedule delayed completion of instrumentation installation until the fourth week in August.

Operation

Hop drying at Green Acre Farms began on August 21 and was completed September 24. The weather proved to be a major disappointment. Long-term weather data for Prosser show the average number of cloudy days in August and September to be only 2 and 4, respectively. By contrast only 5 sunny days occurred during the entire drying period! The dearth of sunshine severely curtailed opportunities for obtaining useful data. Further, the cloudy and rainy conditions upset normal harvesting routines and made the scheduling of planned experiments very difficult.

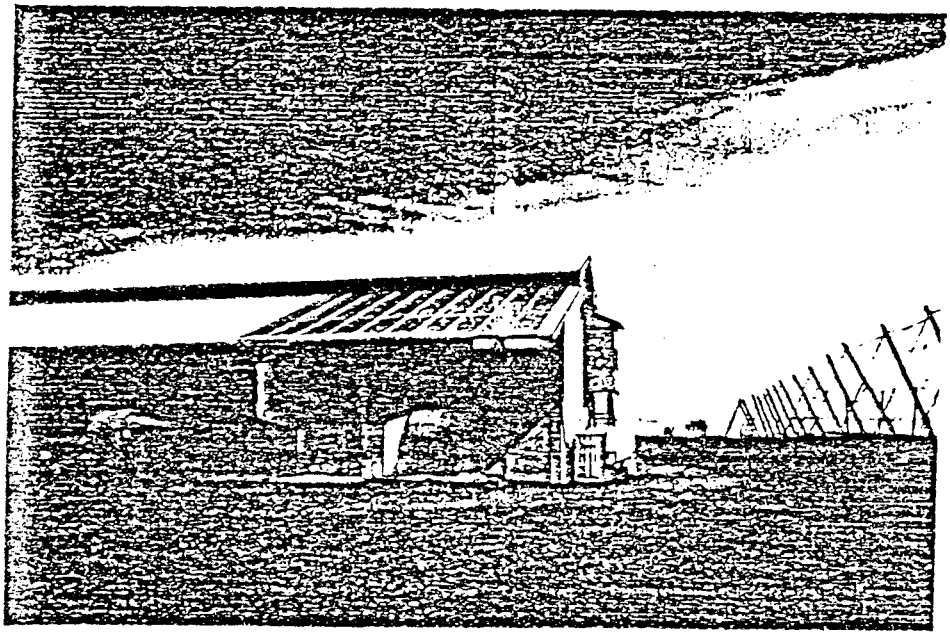
Nevertheless, some experiments in both the direct and recirculation modes were conducted and data recorded. Dried hop samples from the solar - supplemented floor and the control floor were gathered for analysis of quality

and moisture content. Collector performance appeared to approximate design specifications. The system proved to be fully compatible with the operation of the existing dyring fan and furnace.

We anticipate that sufficient data were obtained to permit "normal-year" performance projections. Analysis of these data has just gotten under way. Results will be detailed in subsequent progress reports.

Personnel

Greg Cuillier, Agricultural Engineering senior was employed on the project part-time during spring semester and full-time over the summer. Department technician, Virgil Ewell assisted full-time for one month during equipment installation. Jim Ebeling, research assistant will devote half-time during fall semester to data analysis.



Solar hop drying project showing solar collector on kiln roof and existing drying systems for solar-supplemented floor and control floor.