1990

USDA - ARS

HCP RESEARCH

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HOP GROWERS OF AMERICA, INC.

1989-1990 ANNUAL STATISTICAL REPORT

35TH ANNUAL HGA CONVENTION - SCOTTSDALE , ARIZONA - JANUARY 11, 1991

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Prepared by: Hop Growers of America, Inc., P.O. Box 9218, Yakima, Wa. 98909

U.S. HOP PRODUCTION BY STATE AND VARIETY 1988-1990

STATE & VARIETY	PRODUCTION - LBS			% Change
	1988	1989	1990	'90 vs. '89
CALIFORNIA 1/				
IDAHO				
Aquila	0	182,600	164,800	-9.75%
Banner	0	234,300	224,700	-4.10%
Chinook	338,800	389,400	321,200	-17.51%
Cluster	896,700	984,900	1,120,000	13.72%
Eroica	692,300	574,000	507,200	-11.64%
Galena	951,600	853,200	792,000	-7.17%
Willamette	62,400	0	0	-
Other Varieties	978,200	872,200	920,100	5.49%
Total	3,920,000	4,090,600	4,050,000	**-0.99%**
OREGON				
Fuggle	926,500	961,200	857,300	-10.81%
Galena	282,000	265,200	192,100	-27.56%
Nugget	2,998,800	2,594,300	2,744,200	5.78%
Perle	369,600	436,100	211,700	-51.46%
Tettnang	517,000	573,500	797,200	39.01%
Willamette	4,958,000	6,029,300	5,479,700	-9.12%
Other Varieties	973,100	999,400	580,800	-41.89%
Total	11,025,000	11,859,000	10,863,000	**-8.40%**
WASHINGTON				
Aquila	487,000	825,900	741,200	-10.26%
Banner	561,000	847,300	732,800	-13.51%
Cascade	1,831,000	2,568,000	2,070,100	-19.39%
Chinook	1,990,000	2,385,700	2,777,100	16.41%
Cluster	16,100,000	13,003,000	11,442,100	-12.00%
Eroica	1,242,000	939,300	799,000	-14.94%
Galena	9,252,000	11,011,200	11,089,800	0.71%
Nugget	2,916,000	4,347,500	4,777,600	9.89%
Olympic	545,000	493,800	476,000	-3.60%
Perle	603,000	919,200	798,000	-13.19%
Tettnang	1,958,000	2,506,400	2,314,800	-7.64%
Willamette	2,091,000	3,284,200	3,333,100	1.49%
Other Varieties	175,000	245,300	590,200	140.60%
Total	39,751,000	43,376,800	41,941,800	**-3.31%**
UNITED STATES	**54,696,000**	**59,326,400**	**56,854,800**	**-4.17%**

1/ Combined with Washington to avoid disclosure of individual operations.

SOURCE: USDA. Prepared by Hop Growers of America

U.S. HOP ACREAGE & YIELDS BY STATE & VARIETY 1988-90

STATE & VARIETY	ACRES HARVESTED			YIELD - LBS.		
	1988	1989	1990	1988	1989	1990
CALIFORNIA 1/						
IDAHO						
Aquila	0	110	103	0	1,660	1,600
Banner	0	110	107	0	2,130	2,100
Chinook	220	220	292	1,540	1,770	1,100
Cluster	490	490	560	1,830	2,010	2,000
Eroica	430	350	317	1,610	1,640	1,600
Galena	520	540	528	1,830	1,580	1,500
Willamette	130	0	0	480	0	0
Other Varieties	1,010	980	793	970	890	1,160
Total	2,800	2,800	2,700	1,400	1,461	1,500
OREGON						
Fuggle	850	801	608	1,090	1,200	1,410
Galena	150	149	99	1,880	1,780	1,940
Nugget	1,470	1,278	1,393	2,040	2,030	1,970
Perle	330	285	134	1,120	1,530	1,580
Tettnang	470	531	618	1,100	1,080	1,290
Willamette	3,700	3,792	3,859	1,340	1,590	1,420
Other Varieties	530	576	389	1,840	1,740	1,493
Total	7,500	7,412	7,100	1,470	1,600	1,530
WASHINGTON						
Aquila	320	356	348	1,520	2,320	2,130
Banner	340	356	361	1,650	2,380	2,030
Cascade	920	1,297	1,270	1,990	1,980	1,630
Chinook	1,000	1,269	1,454	1,990	1,880	1,910
Cluster	7,950	6,374	6,054	2,030	2,040	1,890
Eroica	640	472	439	1,940	1,990	1,820
Galena	4,900	5,735	6,161	1,890	1,920	1,800
Nugget	1,800	2,241	2,827	1,620	1,940	1,690
Olympic	270	279	280	2,020	1,770	1,700
Perle	580	779	798	1,040	1,180	1,000
Tettnang	2,200	2,410	2,362	890	1,040	980
Willamette	2,050	2,507	2,604	1,020	1,310	1,280
Other Varieties	130	261	705	1,350	940	837
Total	23,100	24,336	25,663	1,721	1,782	1,634
UNITED STATES	**33,400**	**34,548**	**35,463**	**1,638**	**1,717**	**1,603**

1/ Combined with Washington to avoid disclosure of individual operations.

SOURCE: U.S.D.A. Prepared by Hop Growers of America

1990 U.S. Hop Production by Variety

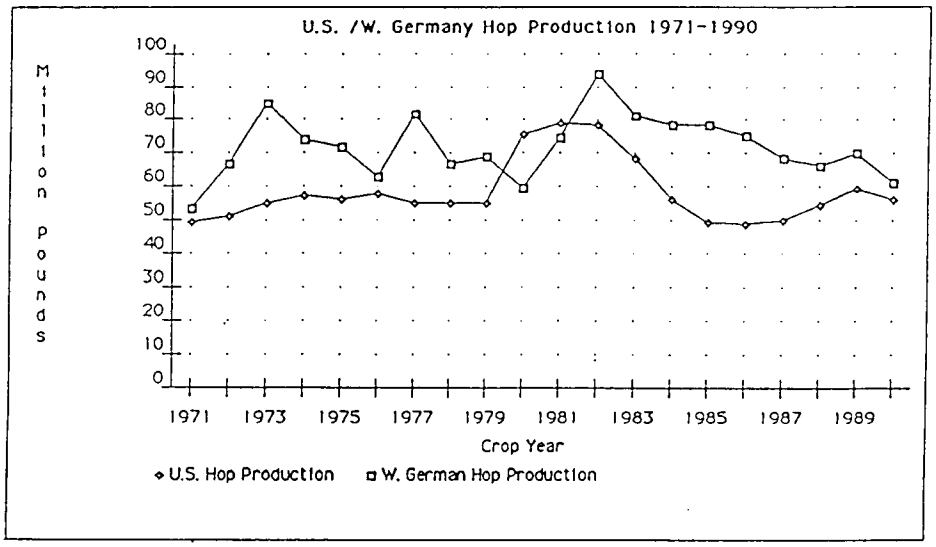
Variety	State			Total acres harvested	Yield	Total Production
	ID	OR	WA			
		acres			lb/A	lbs
Aquila	103	-	348	451	2009	906 000
Banner	107	-	361	468	2046	957 500
Cascade	-	-	1270	1270	1630	2,070 100
Chinook	292	-	1454	1746	1775	3,098 300
Cluster	560	-	6054	6614	1899	12,562 100
Eroica	317	-	439	756	1728	1,306 200
Fuggle	-	608	-	608	1410	857 300
Galena	528	99	6161	6788	1779	12,073 900
Nugget	-	1393	2827	4220	1782	7,521 800
Olympic	-	-	280	280	1700	476 000
Perle	-	134	798	932	1083	1,009 700
Tettnanger	-	618	2362	2980	1044	3,112 000
Willamette	-	3859	2604	6463	1364	8,812 800
Other[1]	793	389	705	1887	1108	2,091 100
Totals	2700	7100	25663	35463	1603	56,854 800

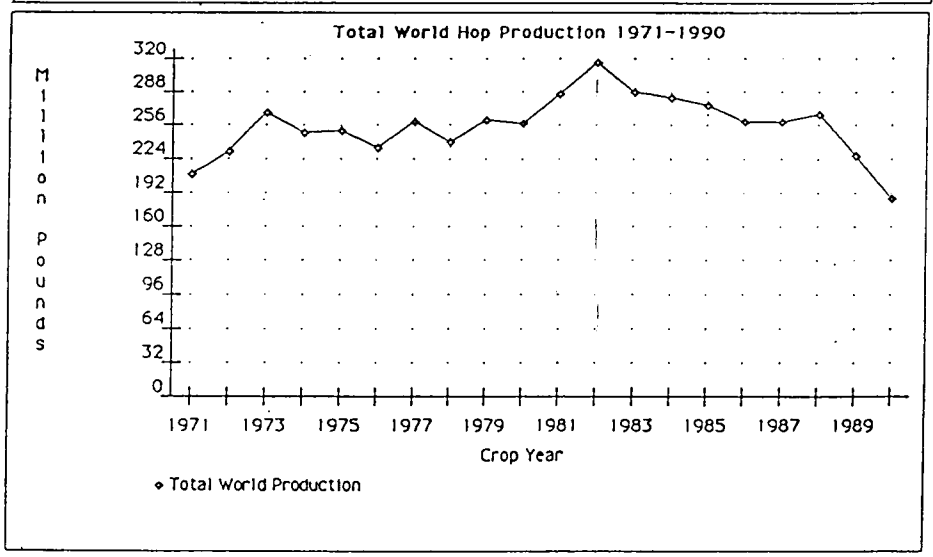
[1]Saazer (No.Idaho), Mt. Hood, Liberty, and various experimental hops

U.S./ WORLD PRODUCTION - 1971 TO DATE

	U.S. PRODUCTION	W. GERMANY PRODUCTION	OTHER WORLD PRODUCTION	TOTAL WORLD PRODUCTION
		(Million Pounds)		
1971	49.7 (25%)	53.4 (25%)	107.0 (51%)	210.1 (100%)
1972	51.3 (22%)	66.9 (28%)	112.4 (50%)	230.6 (100%)
1973	54.8 (20%)	84.9 (32%)	128.8 (48%)	268.5 (100%)
1974	57.0 (23%)	73.9 (30%)	118.4 (47%)	249.3 (100%)
1975	55.9 (22%)	71.5 (29%)	122.9 (49%)	250.2 (100%)
1976	57.8 (25%)	62.6 (26%)	115.0 (49%)	238.1 (100%)
1977	54.8 (21%)	81.6 (32%)	123.5 (47%)	259.5 (100%)
1978	55.1 (23%)	66.9 (28%)	117.4 (49%)	239.4 (100%)
1979	54.9 (21%)	68.8 (27%)	137.2 (53%)	260.9 (100%)
1980	75.6 (29%)	59.3 (23%)	123.0 (48%)	257.9 (100%)
1981	79.1 (28%)	74.3 (26%)	132.7 (46%)	286.1 (100%)
1982	78.6 (25%)	93.7 (29%)	144.9 (46%)	317.2 (100%)
1983	68.1 (24%)	81.2 (28%)	137.9 (48%)	287.2 (100%)
1984	56.2 (20%)	78.3 (28%)	148.2 (52%)	282.7 (100%)
1985	49.7 (18%)	78.5 (28%)	147.4 (54%)	275.5 (100%)
1986	49.0 (19%)	75.2 (29%)	134.7 (52%)	258.9 (100%)
1987	50.0 (19%)	68.2 (27%)	141.4 (54%)	259.6 (100%)
1988	54.7 (21%)	66.2 (25%)	145.5 (55%)	266.4 (100%)
1989	59.3 (22%)	70.1 (26%)	137.5 (52%)	266.9 (100%)
1990 *	56.9 (23%)	61.1 (25%)	125.2 (52%)	242.5 (100%)

* Figures for 1990 are estimates. Totals may not add due to rounding.





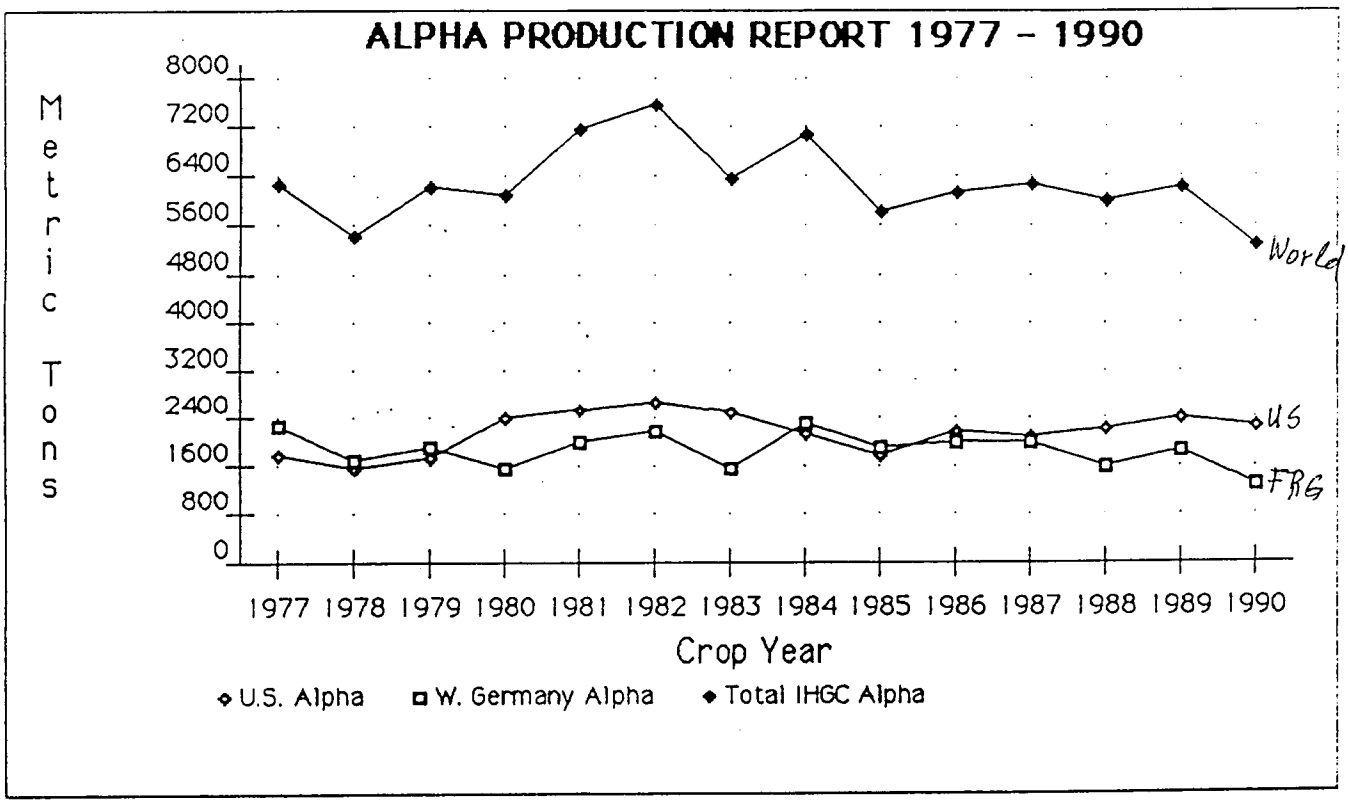
ALPHA PRODUCTION REPORT - metric tons

Year	U.S.	W. Germany	Other IHGC Countries 1/	Total
1977	1,789	2,253	2,207	6,249
1978	1,550	1,705	2,186	5,441
1979	1,746	1,902	2,569	6,217
1980	2,405	1,541	2,135	6,081
1981	2,520	2,019	2,600	7,139
1982	2,673	2,188	2,702	7,563
1983	2,503	1,541	2,332	6,376
1984	2,140	2,299	2,647	7,086
1985	1,781	1,895	2,163	5,839
1986	2,157	1,999	1,987	6,143
1987	2,100	1,997	2,163	6,260
1988	2,200	1,621	2,175	5,996
1989	2,386	1,866	1,981	6,233
1990*	2,249	1,292	1,766	5,307

1/Total Alpha production for the other IHGC members: Australia, Belgium, Bulgaria, Czechoslovakia, E. Germany, U.K., Spain, France, Hungary, Yugoslavia, and Poland.

*1990 Figures are estimates

SOURCE: IHGC reports, U.S. Hop Administrative Committee reports



SUMMARY: 1990 HOP PRODUCTION REPORTS

U.S. Hop Production by State and Variety

State	%Change '90 vs. '89	%Change '90 vs. '88	%Change '90 vs. '80
Washington	-3.31%	+5.5%	-25%
Oregon	-8.40%	-3.6%	-10.6%
Idaho	-0.99%	+3.3%	-26.2%
USA	-5.46%	+2.5%	-24.7%

* Two hop varieties had significant decreases in their 1990 production, as compared to 1989:

Washington's Cluster,	-1,560,900 lbs	(-12.00%).
Oregon's Willamette,	-549,600 lbs	(- 9.12%).

U.S. vs. World Production

* Preliminary figures show that 1990 World Hop production is down 9.1% as compared to last year.

* Overall World Hop production is down 23.5% from 1982, when production levels reached a peak of 317.2 million pounds.

* Since 1971, the U.S. and W. Germany have supplied approximately 50% of the world hops.

1990 HOP INSPECTION REPORT

Prepared by

USDA, Federal Grain Inspection Service
Portland, Oregon

Table 1 - Total Number of Bales Inspected - Weighted Average of Leaf & Stem in Parenthesis

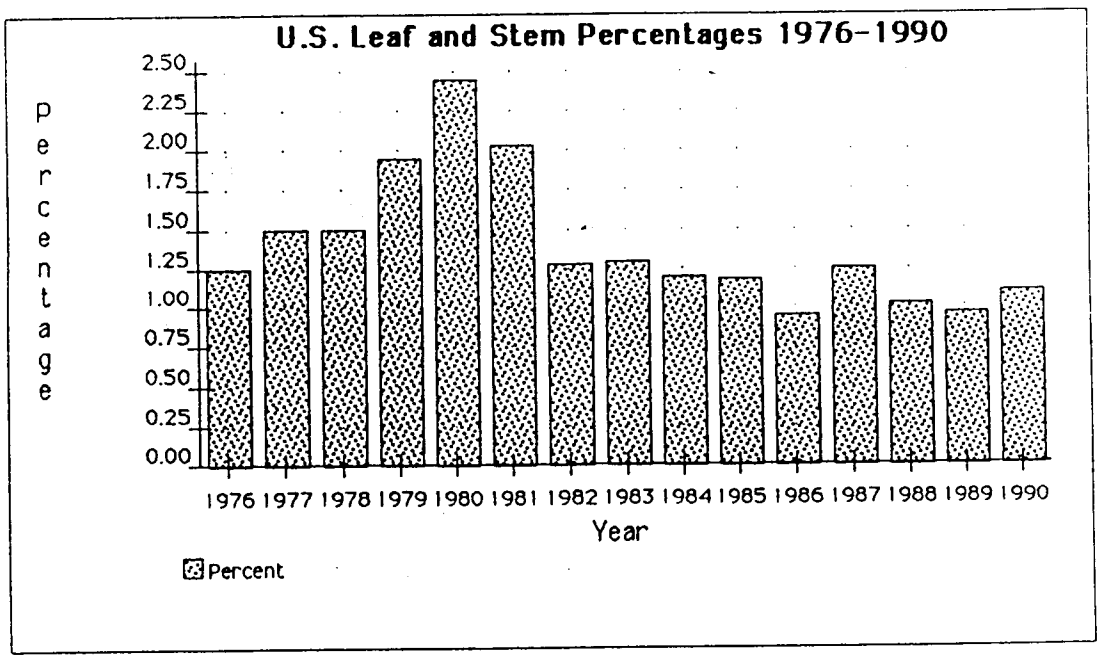
	Wash. (%)	Oregon (%)	Idaho (%)	Calif. (%)	Total (%)
1985	184,134 (1.25)	42,289 (1.56)	25,595 (1.16)	330 (0.06)	252,348 (1.16)
1986	179,603 (0.95)	43,672 (0.92)	25,301 (0.73)	26 (0.46)	248,602 (0.93)
1987	186,248 (1.14)	43,705 (1.55)	18,880 (1.28)	31 (0.45)	248,864 (1.23)
1988	200,584 (0.92)	55,716 (1.28)	18,992 (1.01)	35 (0.00)	275,327 (1.00)
1989	216,188 (0.96)	63,000 (0.83)	19,881 (1.20)	None	299,069 (0.95)
1990	212,271 (1.01)	56,859 (1.35)	19,033 (1.11)	None	288,163 (1.09)

Table 2 - Number of Bales in Each Leaf & Stem Category - Percent of Total in Parenthesis

	0%	1%	2%	3%	4%	5%	6%	> 6%	Total
WA	55,720(26)	118,268(56)	23,643(11)	10,104(5)	3,857(2)	542(0)	137(0)	0	212,271(100)
OR	14,370(25)	21,860(38)	11,147(20)	5,972(11)	2,734(5)	546(1)	230(0)	0	56,859(100)
ID	2,785(15)	12,646(66)	2,215(12)	1,387(7)	0	0	0	0	19,033(100)
Total	72,875	152,774	37,005	17,463	6,591	1,088	367	0	288,163
% of Total	25.3%	53.0%	12.8%	6.1%	2.3%	0.4%	0.1%	0%	100.0%

Table 3 - Number of Bales in Each Seed Category - Percent of Total in Parenthesis

	0%	1%	2%	3%	4%	5%	6%	> 6%	Total
WA	165,679(78)	33,571(16)	7,511(4)	2,287(1)	1,573(1)	802(0)	879	29(0)	212,271(100)
OR	11,685(21)	16,418(29)	8,093(14)	3,190(6)	1,813(3)	1,392(2)	1,462(3)	12,806(22)	56,859(100)
ID	19,033(100)	0	0	0	0	0	0	0	19,033(100)
Total	196,397	49,989	15,604	5,477	3,326	2,194	2,341	12,835	288,163
% of Total	68.1%	17.3%	5.4%	1.9%	1.2%	0.8%	0.8%	4.5%	100.0%



U. S. HOP STATISTICS
LEAF & STEM CONTENT (%)

Crop Year	WA.	OR.	ID.	CA.	U. S. Average
1974	1.95	1.57	1.02	.56	1.72
1975	1.75	1.24	.97	.65	1.53
1976	1.23	1.43	1.16	.88	1.24
1977	1.46	1.91	1.15	.90	1.49
1978	1.38	2.19	1.34	1.07	1.48
1979	1.92	2.32	1.38	1.83	1.93
1980	2.57	2.19	1.84	1.66	2.43
1981	1.93	2.49	1.60	2.73	2.01
1982	1.13	1.80	1.24	1.24	1.26
1983	1.25	1.44	1.20	1.20	1.28
1984	1.07	1.77	1.27	1.26	1.18
1985	1.25	1.56	1.16	0.06	1.16
1986	0.95	0.92	0.73	0.46	0.93
1987	1.14	1.55	1.28	0.45	1.23
1988	0.92	1.28	1.01	0.00	1.00
1989	0.96	0.83	1.20	-	0.95
1990	1.01	1.35	1.11	-	1.09

Source: Federal-State Inspection Service
Prepared by Hop Growers of America

SUMMARY: U.S. HOP INSPECTION REPORT

* The weighted average of leaf and stem content found in 1990 U.S. bale inspections increased .14%, compared to 1989.
* Leaf and Stem content comparisons ('90 vs. '89):

Idaho	-.09%
Oregon	+.52%
Washington	+.05%

* In 1990, the U.S.D.A. inspected 288,163 bales, a 10,906 bale decrease from the number inspected last year.

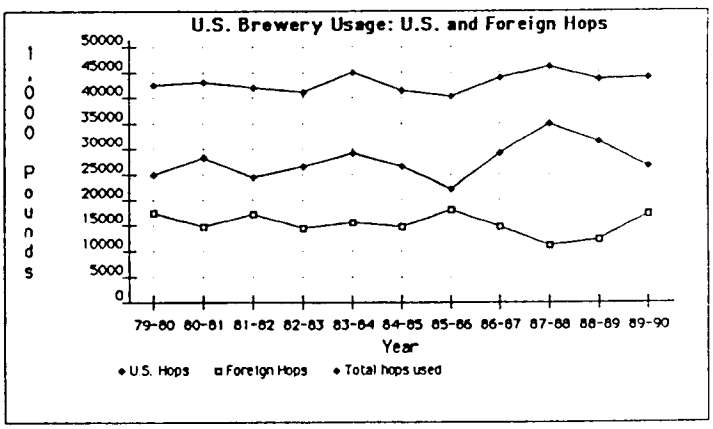
DISPOSITION OF PRODUCTION
SALABLE HOP PRODUCTS

	Exports (+)	Net Domestic Usage of [2] U.S. Hops (+)	Plus or (Minus) Unaccountable Difference (+)	Increase or (Decrease) in Domestic Stocks (=)	Salable [1] Product
		(1,000 lbs.)			
1979-80	36,373[3]	24,870	(2,380)	(4,470)	54,757 (100%)
1980-81	41,965	28,346	2,580	1,520	74,411 (100%)
1981-82	43,725	24,493	(1,892)	12,600	78,926 (100%)
1982-83	34,742	26,689	2,673	14,050	78,154 (100%)
1983-84	32,181	25,700	3,098	7,016	67,995 (100%)
1984-85	31,352	26,691	(4,354)	2,364	56,053 (100%)
1985-86	26,091	22,168	866	490	49,615 (100%)
1986-87	28,362	29,159	(8,239)	(320)	48,962 (100%)
1987-88	35,427	34,965	(8,798)	(10,630)	50,964 (100%)
1988-89	47,494	31,322	(15,820)	(8,300)	54,696 (100%)
1989-90	49,105 all time high	26,599	(16,566)	190	59,326 (100%)

1 Total production less fire loss & reserves not yet sold in normal outlets.
2 Total usage less imports adjusted for year-end inventory changes.
3 5 million pounds minus adjustment to reflect more accurate export figure.

U.S. BREWERY USAGE

	Net Usage U.S. Hops	Net Usage Foreign Hops
	(1,000 lbs.)	
1979-80	24,870 (59%)	17,595 (41%)
1980-81	28,346 (66%)	14,601 (34%)
1981-82	24,493 (59%)	17,346 (41%)
1982-83	26,689 (65%)	14,349 (35%)
1983-84	29,195 (65%)	15,677 (35%)
1984-85	26,691 (64%)	14,774 (36%)
1985-86	22,168 (55%)	18,039 (45%)
1986-87	29,159 (67%)	14,626 (33%)
1987-88	34,965 (76%)	11,138 (24%)
1988-89	31,322 (72%)	12,302 (28%)
1989-90	26,599 (61%)	17,243 (39%)



Source: U.S.D.A. Prepared by Hop Growers of America

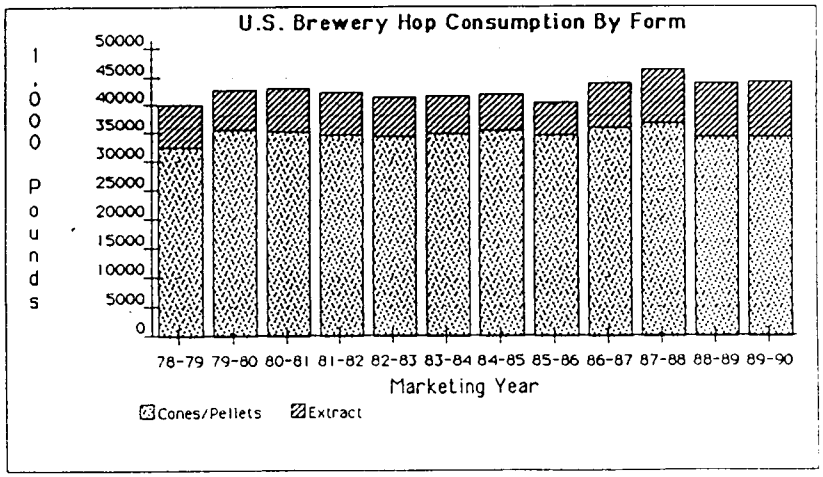
BREAKDOWN OF BREWERY CONSUMPTION AND EXPORTS - (In 1,000 lbs.)

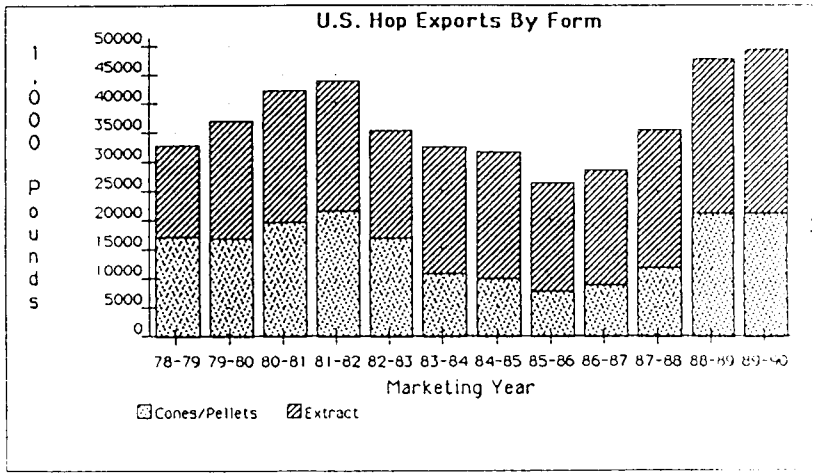
Marketing Year:	EXTRACT CONVERSION FACTOR 1/ Domestic	Export	BREWERY CONSUMPTION As Hops	As Extract (Hop Equivalent)	Total	EXPORTS As Hops	As Extract (Hop Equivalent)	Total
1978-79	4.4-1	4.0-1	32,632	7,321	39,953	17,336	15,207	32,543
1979-80	4.4-1	4.0-1	35,582	6,883	42,465	17,045	19,692 2/	36,737 2/
1980-81	3.5-1	4.0-1	35,331	7,616	42,947	19,605	22,360	41,965
1081-82	4.4-1	4.0-1	34,644	7,195	41,839	21,713	22,012	43,725
1982-83	5.0-1	4.0-1	34,476	6,562	41,038	16,817	17,925	34,742
1983-84	5.1-1	4.0-1	35,078	6,294 3/	41,372 3/	10,740	21,441	32,181
1984-85	4.7-1	4.0-1	35,451	6,014	41,465	10,068	21,284	31,352
1985-86	5.6-1	4.0-1	34,617	5,590	40,207	7,803	18,288	26,091
1986-87	6.6-1	4.0-1	36,220	7,567	43,787	8,960	19,400	28,360
1987-88	5.4-1	4.0-1	36,894	9,209	46,103	11,998	23,432	35,427
1988-89	5.3-1	4.0-1	34,341	9,283	43,624	21,254	26,240	47,494
1989-90	5.5-1	4.0-1	34,485	9,357	43,842	21,437	27,666	49,103

1/ Domestic Conversion Factor is based on actual pounds of hops used in production of extract as reported by Treasury Department. Export Conversion Factor is based on USDA Hop Market News Service.

2/ 5 million pounds minus adjustment to reflect more accurate export extract figure.

3/ Includes 3.5 million pounds minus adjustment to reflect more accurate domestic extract consumption figure.



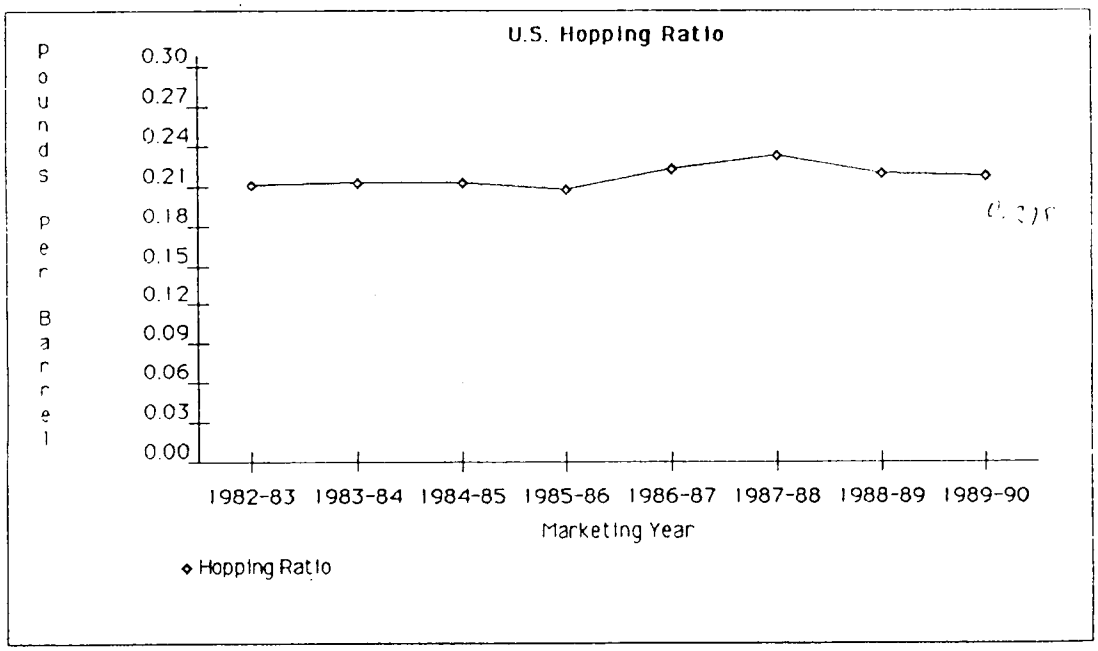


Source: U.S.D.A. Prepared by Hop Growers of America

SUPPLY AND DISPOSITION 1982-83 TO DATE (in 1,000 lbs.)

SUPPLY	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
Carryin Stock [1]	47,030	61,080	68,096	70,460	70,950	70,630	60,000	51,700
Salable Prod. [2]	78,154	67,995	56,053	49,615	48,962	50,964	54,696	59,326
Imports	14,349	15,672	14,774	18,039	14,626	11,138	12,302	17,243
TOTAL	**139,533**	**144,748**	**138,923**	**138,114**	**134,538**	**132,732**	**126,998**	**128,269**
DISPOSITION								
Brewery Usage	41,038	[3]41,372	41,465	40,207	43,787	46,103	43,624	43,842
Exported	34,742	32,181	31,352	26,091	28,360	35,427	47,494	49,103
Carryout Stocks [1]	61,080	68,096	70,460	70,950	70,630	60,000	51,700	51,890
Balancing Item	2,673	[3]3,098	(4,354)	866	(8,239)	(8,798)	(15,820)	(16,566)
TOTAL	**139,533**	**144,748**	**138,923**	**138,114**	**134,538**	**132,732**	**126,998**	**128,269**
HOPPING RATE:	.211	.213[3]	.214	.208	.224	.233	.220	.218

[1] Brewer, dealer and grower stocks as of Sept. 1.
[2] Production less fire loss and reserve hops not sold in normal outlets.
[3] Includes 3.5 million pounds minus adjustment to reflect more accurate domestic extract consumption figure.

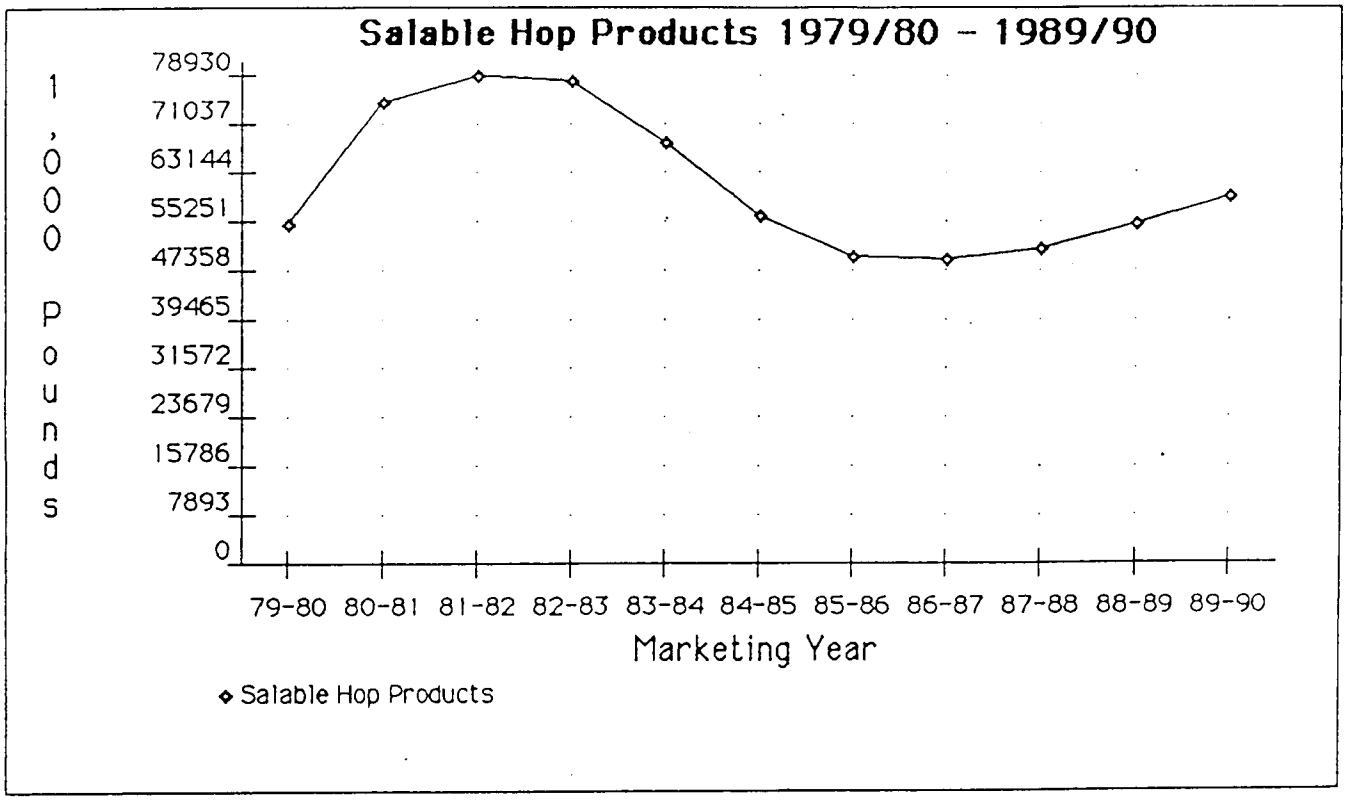


Source: U.S.D.A. ATF, Dept. of Commerce
Prepared by Hop Growers of America

SUMMARY: DISPOSITION OF PRODUCTION

Salable Hop Products.

* 1990 Salable hop products reached the level of 59,326,000 pounds, its highest point since the 1983-84 year.



U.S. Brewery Consumption

	%Change 1989/90 vs. 1979/80
Imported hops used	-2.0%
Domestic hops used	+6.9%

*Total U.S. Brewery consumption(domestic and foreign hops) increased .49% in 1990.

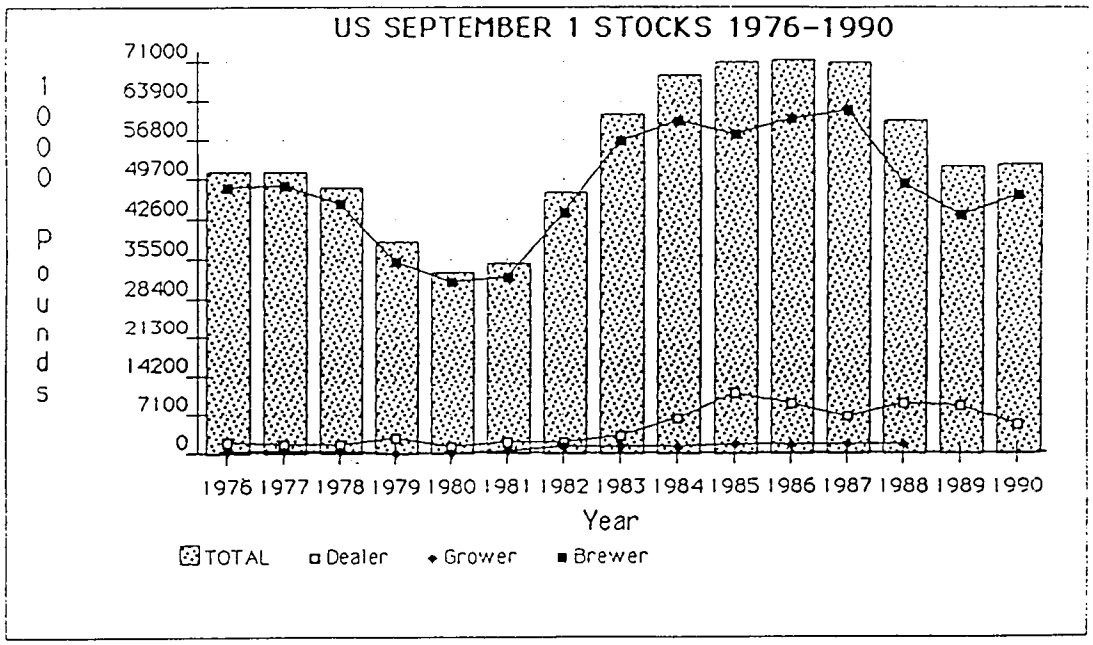
*Exports of U.S. Hop Extract reached a new high of 27,666,000 pounds in 1990, an 81.9% increase over the 1978-79 crop year.

1990 HOP STOCKS

September 1 U.S. Hop Stocks - 1,000 lbs.

Year	Brewer	Dealer	Grower	TOTAL
1976	48,050	1,960	390	50,400
1977	48,520	1,580	380	50,480
1978	45,430	1,730	380	47,540
1979	35,270	2,930	0	38,200
1980	31,420	1,380	0	32,800
1981	32,240	1,950	240	34,430
1982	43,740	2,090	1,200	47,030
1983	56,700	3,000	1,380	61,080
1984	60,480	6,256	1,360	68,096
1985	58,130	10,930	1,400	70,460
1986	60,630	8,930	1,390	70,950
1987	62,430	6,580	1,620	70,630
1988	49,090	9,160	1,750	60,000
1989	43,200	8,500	3/	51,700
1990	46,810	5,080	3/	51,890

3/ Included in dealer stocks to avoid disclosure of individual operations.



SUMMARY: SEPTEMBER 1 U.S. HOP STOCKS

*U.S. hop stocks on September 1, 1990 were at 51,890,000. Compared to 1980, September 1 hop stocks have increased 2.9%.

*Dealers and growers held 5.08 million pounds in 1990, compared with 8.5 million pounds on hand last year.

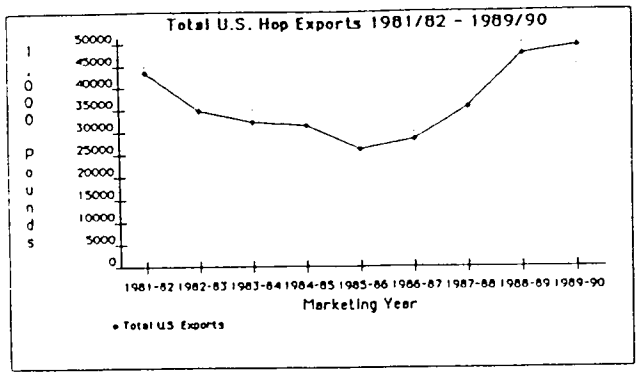
1990 U.S. EXPORTS OF HOPS, PELLETS & HOP EXTRACT

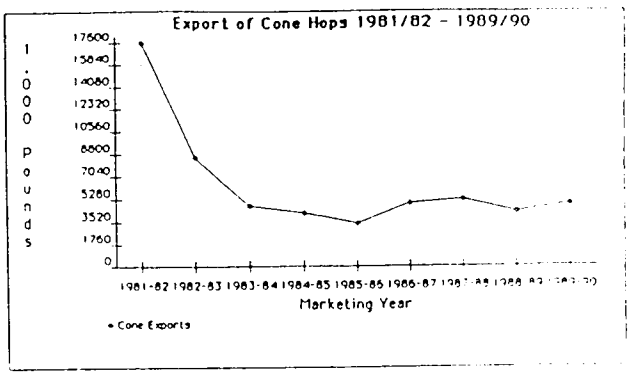
CUMULATIVE 1989-1990 CROP YEAR - EXPORTS IN POUNDS

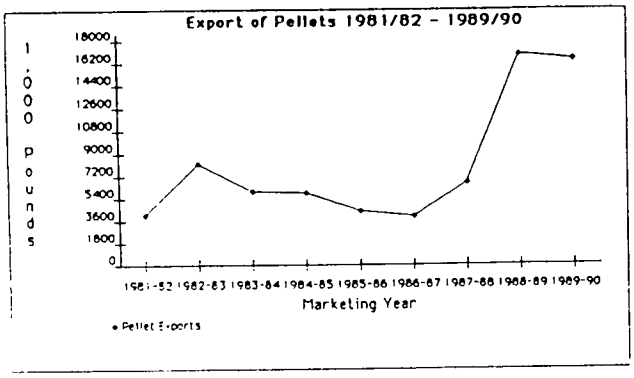
	CONES	PELLETS	EXTRACT	TOTAL
ARGENTINA	0	0	59525	59525
AUSTRALIA	0	24251	1349	25600
BAHAMA'S	0	0	7717	7717
BARBADOS	0	0	2006	2006
BELGIUM	323898	8818	203478	536194
BOLIVIA	0	0	13228	13228
BRAZIL	550980	8231523	306439	9088942
CAMEROON	44092	0	41886	85978
CANADA	700963	2717780	248767	3667510
CHILE	0	0	175407	175407
COLOMBIA	0	1052609	916161	1968770
CZECHOSLOVAKIA	0	0	39682	39682
DOMINICAN REPUBLIC	55115	371639	35275	462029
ECUADOR	0	48501	72752	121253
FINLAND	0	0	2205	2205
FRANCE	2205	0	0	2205
FRENCH PACIFIC ISLAND	0	0	2205	2205
GERMANY, FED. REP.	1838643	2124207	359390	4322240
GHANA	0	0	5106	5106
GUATEMALA	0	121253	0	121253
GUYANA	0	0	769	769
HAITI	0	0	8819	8819
HONDURAS	0	0	15999	15999
HONG KONG	0	0	16272	16272
INDIA	0	0	11023	11023
INDONESIA	6614	0	4410	11024
IRAQ	0	26455	0	26455
IRELAND	0	26455	372924 *	399379
JAMAICA	39683	15432	19841 *	74956
JAPAN	109679	254272	0	363951
KOREA	15432	19841	0	35273
LEEWARD-WINDWARD ISL	3087	0	8370	11457
LESOTHO	0	28660	0	28660
MALAWI	0	0	14228	14228
MALAYSIA	30864	0	0	30864
MEXICO	112434	388010	2025245	2525689
NETHERLAND ANTILLES	0	0	13227	13227
NETHERLANDS	56874	45745	424144	526763
NICARAGUA	0	39683	2205	41888
NIGERIA	42372	551	51148	94071
NORWAY	0	2414	0	2414
PAKISTAN	7500	15432	0	22932
PANAMA	0	0	18740	18740
PAPUA NEW GUINEA	0	0	41447	41447
PARAGUAY	0	0	33071	33071
PERU	0	66138	222304	288442
PHILIPPINES	30864	158731	692830	882425
PORTUGAL	0	0	66138	66138
SINGAPORE	9123	0	55103	64226
SOUTH AFRICA	0	50706	0	50706
SOVIET UNION	714290	551150	0	1265440
SPAIN	0	0	44092	44092
SRI LANKA	0	6614	0	6614
SURINAME	0	0	8820	8820
TOGO	0	0	11023	11023
TRINIDAD & TOBAGO	4409	0	21219	25628
UNITED KINGDOM	189856	91050	52872	333778
URUGUAY	13228	5512	12125	30865
VENEZUELA	0	41887	147708	189595
ZIMBABWE	0	0	7716	7716
TOTAL EXPORTS	4902205	16535319	6916410	28353934
EXTRACT HOP EQUIVALENT (4.0-1)			27665640	
GRAND TOTAL EXPORTS				49103164

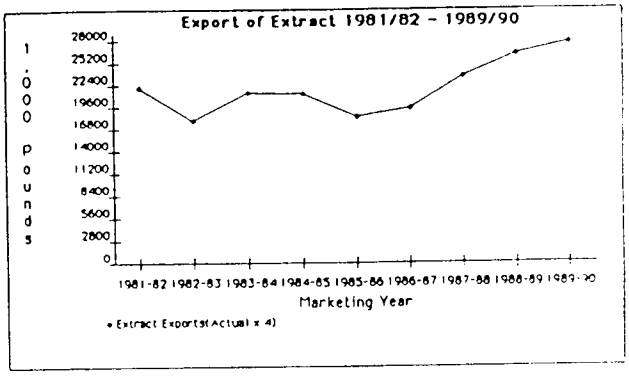
Source: U.S.D.A. Prepared by Hop Growers of America

SUMMARY: U.S. EXPORTS OF HOPS, PELLETS & EXTRACT









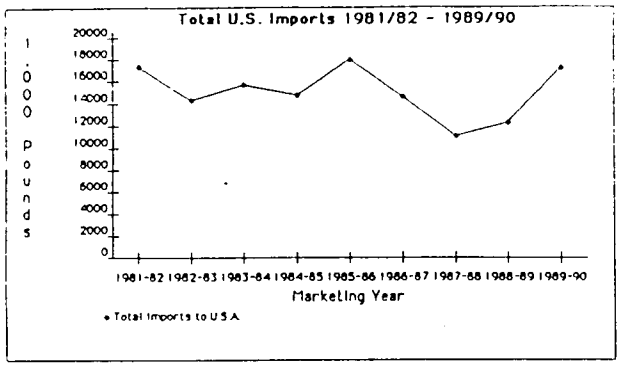
- Total U.S. hop exports hit a all time high of 49,103,000 pounds in 1990.
- The exports of U.S. cone hops fell 72.7% between 1981-82 and 1983-84. Since that time, U.S. cone exports have leveled off at an average of 4.55 million pounds exported per year.
- U.S. exports of pellets and extract have dramatically increased since the 1986-87 crop year - Pellets (+ 315%)
  Extract (+ 42.5%)

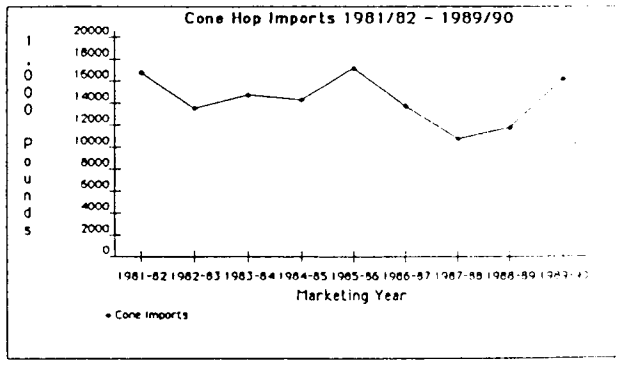
1990 U.S. IMPORTS OF HOPS, PELLETS & HOP EXTRACT

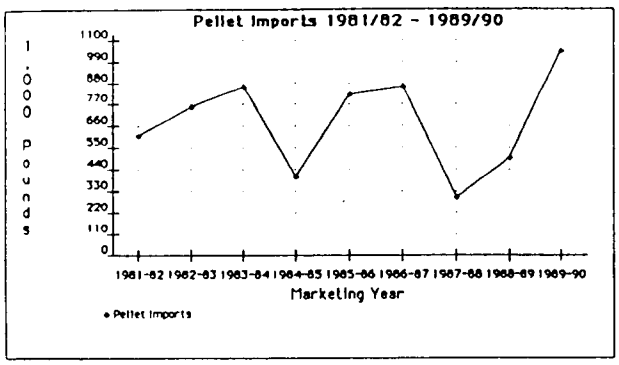
CUMULATIVE 1989-1990 CROP YEAR - IMPORTS IN POUNDS

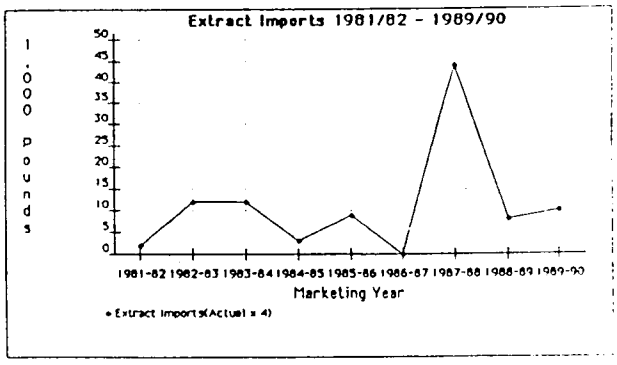
	CONES	PELLETS	EXTRACT	TOTAL	88-89 Crop
Australia	0	306,440	0	306,440	7,000
Belgium	88,184	0	0	88,184	24,000
Canada	903,620	0	0	903,620	359,000
China	61,729	0	0	61,729	N/A*
Czechoslovakia	2,560,546	0	0	2,560,546	761,000
France	560,183	0	0	560,183	591,000
Germany, FDR	11,311,150	252,115	2,524	11,565,789	9,074,333
Japan	60,316	0	0	60,316	N/A*
New Zealand	0	114,638	0	114,638	60,000
Poland	599,651	0	0	599,651	1,041,000
United Kingdom	0	2,205	0	2,205	6,000
Yugoslavia	39,683	372,797	0	412,480	349,000
TOTAL IMPORTS	16,185,062	1,048,195	2,524	17,235,781	
EXTRACT HOP EQUIVALENT (40-1)			10,096		
GRAND TOTAL IMPORTS				17,243,353	

*1989 USDA report grouped these countries together in "other" category









Source: U.S.D.A. Prepared by Hop Growers of America

1990 SOLD AHEAD PROJECTIONS

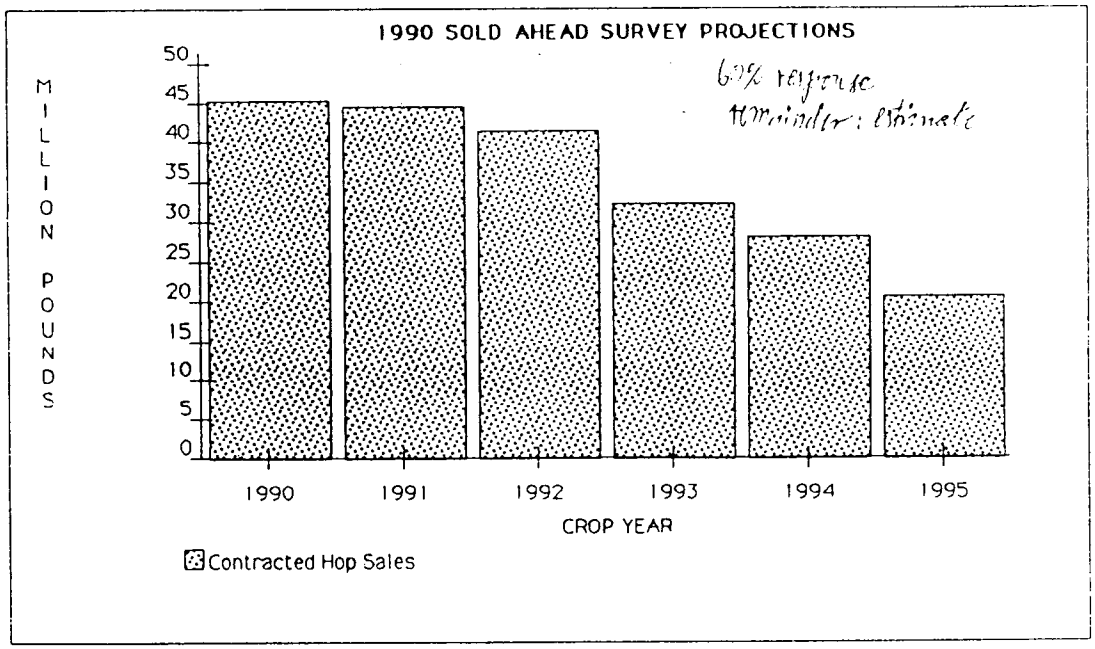
The 1990 Sold Ahead Survey conducted by Hop Growers of America received responses from 60% of the growers representing 48% of the 1990 acreage total. An additional 7 responses did not indicated their 1990 acreage and were unuseable for calculation purposes.

YEAR	POUNDS CONTRACTED	% OF 1989 CROP
1990	45,100,076	76%
1991	44,217,060	75
1992	41,227,310	69
1993	32,085,188	54
1994	27,671,500	47
1995	20,221,900	34

1989 SOLD AHEAD SURVEY PROJECTIONS

YEAR	POUNDS CONTRACTED	% OF 1988 CROP
1989	49,707,999	91%
1990	44,503,791	82
1991	35,489,434	65
1992	25,063,911	46
1993	4,672,857	9
1994	1,154,285	2

Source: Hop Growers of America.



Source: Hop Growers of America

WORLD STATISTICS

Most of the statistical reports provided in this section were derived from annual reports published by S.S. Steiner, Inc. and Joh. Barth and Sohn.

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-INTERNATIONAL CONVERSION TABLE-

1 Zentner (Ztr.)	= 50 kg	= 110,23 lbs.
100 lbs.	= 45,359 kg	= ca. 0,907 Zentner (Ztr.)
1 Hektar (ha)	= 2,471 acres	
1 acre	= 0,405 Hektar (ha)	
1 Hektoliter (hl)	= 100 Liter (Ltr.)	= 0,8523 bbl. [USA] = 0,6114 bbl. [Brit.]
1 bbl. [USA]	= 117,34 Liter (Ltr.)	= 1,1734 Hektoliter (hl)
1 bbl. [Brit.]	= 163,65 Liter (Ltr.)	= 1,6365 Hektoliter (hl)

INTERNATIONAL HOP GROWERS CONGRESS - ECONOMIC COMMITTEE REPORT
DECEMBER 6, 1990

	1990 HOP ACRES			1990 HOP PRODUCTION-LBS.			ALPHA	1991 ACRE ESTIMATES		
Country	**Aroma**	**Alpha**	**Total**	**Aroma**	**Alpha**	**Total**	**Tons**	**Aroma**	**Alpha**	**Total**
Australia	124	2,557	2,681	165,347	4,458,844	• 4,624,190	238.8	124	2,557	2,681
Belgium	341	578	919	490,969	950,632	• 1,441,601	37.8	341	665	1,006
Bulgaria	897	1,408	2,305	n/a	n/a	2,102,546	46.5	897	1,408	2,305
W. Germany	32,350	17,346	49,697	38,742,338	21,884,712	61,178,205	1,292.4	32,659	17,186	49,845
Czechoslovakia	29,281	0	29,281	23,368,972	0	23,368,972	339.2	29,281	0	29,281
E. Germany	86	5,562	5,649	52,911	5,761,774	5,814,685	157.5	49	5,387	5,436
United Kingdom	3,469	5,216	8,686	3,713,352	5,693,652	9,407,003	334.5	3,410	5,473	8,908
Spain	7	3,583	3,590	11,023	4,649,103	4,660,126	169.1	7	3,583	3,590
France	1,085	227	1,312	1,427,822	307,434	1,735,256	18.5	1,216	193	1,409
Hungary	128	734	862	70,107	859,581	929,688	24.4	99	717	816
Yugoslavia	6,590	1,240	7,845	7,484,685	1,543,234	9,027,919	262.1	6,598	1,310	7,908
Poland	5,231	346	5,577	4,982,441	462,970	5,445,411	137.1	5,436	395	5,831
USA	15,073	20,961	36,035	n/a	n/a	• 57,000,000	2,326	15,073	23,475	38,548
IHGC Total	94,664	59,529	154,440			186,394,228	5,383.9	95,190	62,348	157,563
IHGC 1989	94,143	59,751	153,894	110,053,749	95,041,168	205,094,917	6,232.7	94,664	59,529	154,440
Diff. '90 vs. '89	521	-222	521	———	———	-18,700,689	-848.8	526	2,820	3,123
% Change '90 vs. '89	0.55%	-0.37%	0.35%	———	———	-9.02%	-13.61%	0.56%	4.70%	2.02%

• Due to incomplete data, the IHGC used 1989 hop production figures for the U.S., Australia, and Bulgaria. A final report with updated U.S. and world totals will be presented at the annual HGA convention in Scottsdale.

Columns may not add due to rounding.

SOURCE: IHGC. Prepared by Hop Growers of America.

WEST GERMANY HOP PRODUCTION DOWN 12.7%

A preliminary production report from the December 6, 1990 I.H.G.C. meeting in Munich, Germany, shows West Germany's total hop production at a level of 61, 178,205 pounds. This represents a decrease of 12.7%, or 8.92 million pounds as compared to 1989. Other report highlights include:

- Only 2 countries realized increases in their 1990 hop production: France (+ 4.2%) and Poland (+ .8%).
- Besides West Germany, seven other countries had a decrease in their total hop production as compared to 1989: Hungary (-29.6%), East Germany (-16.4%), Czechoslovakia (-13%), Belgium (-9.1%), United Kingdom (-2.6%), Spain (-1.8%) and Yugoslavia (-1.3%).
- 1990 world hop acreage increased .35% over 1989, and estimates for 1991 acreage indicate another increase of 2.02%.

Concise Review

World Beer Production
1988: 1086 million hl 1989*: 1120 million hl +3,1 %
1990*: 1150 million hl +2,7 %

World Hop Acreage
1987: 86434 ha 1988: 90723 ha +5,0 %
1989: 91182 ha +0,5 %

World Hop Crop
1987: 2355206 Ztr. 1988: 2416624 Ztr. +2,6 %
1989*: 2421140 Ztr. (Estimate: 9.1.1989) +0,2 %

World Alpha Acids Supply
1987: 8130000 kg 1988: 7310000 kg +10,1 %
1989*: 7263000 kg - 0,6 %

World Alpha Acids Consumption
1988: 7602000 kg 1989*: 7840000 kg + 3,1 %
1990*: 8050000 kg + 2,7 %

Cumulated World Alpha Acids Balance
1987: 6280000 kg 1988*: 5750000 kg - 8,4 %
1989*: 4963000 kg -13,7 %

Worldwide Use of Hop Products
1987: 1350000 Ztr. 1988: 1411000 Ztr. + 4,5 %

WORLDWIDE USE OF HOP PRODUCTS

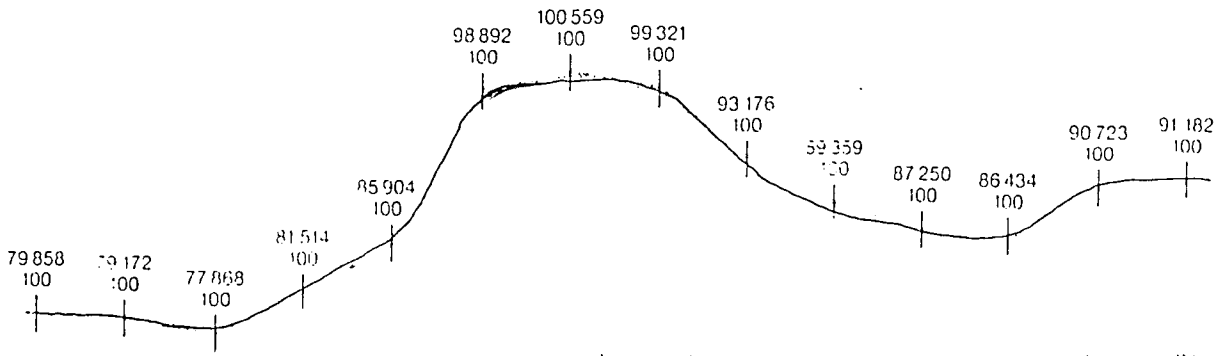
The efficient use of bittering substances in the brewing process and the excellent storage stability of hop extract and pellets have led to a further increase in the demand for these hop products.

Based on estimates almost 60% of the world hop crop of approx. 2.4 million zn. has been processed into hop products. In the Federal Republic of Germany alone about 440000 zn. hops have been transformed into pellets and 230000 zn. into extract, 100000 zn. of that as ethanol extract. With regard to pellets a distinct trend to pellets 45 (mecanically enriched) has been observed.

	Hopfen/Hops Houblon Total Production	Pellets Production			Extrakt/Extract/Extrait Production		
	Ztr.	Ztr.	% Total	± %	Ztr.	% Total	± %
1981	2617553	790000	30,2	+25,4	630000	24,1	+14,5
1982	2844500	930000	32,7	+17,7	720000	25,3	+14,3
1983	2685055	910000	33,9	- 2,2	715000	26,6	- 0,7
1984	2553104	950000	37,2	+ 4,4	735000	28,8	+ 2,8
1985	2536490	830000	32,7	-12,6	595000	23,5	-19,0
1986	2343802	830000	35,4	+ 8,3	600000	25,6	+ 8,9
1987	2355206	830000	35,2	± 0,0	520000	22,1	-13,3
1988	2416624	916000	37,9	+10,4	495000	20,5	- 4,8

Source: S.S. Steiner

WORLD HOP ACREAGE 1976-1989 (Hectares and % share)



	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	
Total	79 858	79 172	77 868	81 514	85 904	98 892	100 559	99 321	93 176	89 359	87 250	86 434	90 723	91 182	
Germany (BRD)	19 686 24,7	19 250 24,3	17 622 22,6	17 273 21,2	17 929 20,9	19 171 19,4	19 988 19,9	19 759 19,9	19 604 21,0	19 597 21,9	19 648 22,5	19 309 22,3	19 782 21,8	19 938 21,9	
England	5 920 7,4	5 888 7,4	5 897 7,6	5 825 7,1	5 760 6,7	5 692 5,7	5 903 5,9	5 888 5,9	5 446 5,9	4 747 5,3	4 284 4,9	4 025 4,7	3 990 4,4	3 920 4,3	
CSSR	9 700 12,1	10 200 12,9	10 400 13,4	10 400 12,8	11 100 12,9	11 800 11,9	11 857 11,8	11 850 11,9	11 950 12,8	11 657 13,0	11 950 13,7	11 950 13,8	11 950 13,2	11 950 13,1	
Europe Rest	27 988 35,1	27 422 34,6	27 358 35,1	30 687 37,6	26 718 31,1	31 597 32,0	32 331 32,1	32 574 32,8	31 753 34,1	30 986 34,7	30 694 35,2	30 009 34,7	29 860 32,9	29 914 32,8	
USA	12 545 15,7	12 393 15,7	12 546 16,1	12 950 15,9	15 034 17,5	17 483 17,7	16 875 16,8	15 136 15,3	12 643 13,6	11 483 12,9	10 117 11,6	11 533 13,4	13 724 15,1	14 060 15,4	
Rest	4 019 5,0	4 019 5,1	4 045 5,2	4 379 5,4	9 363 10,9	13 149 13,3	13 607 13,5	14 134 14,2	11 740 12,6	10 879 12,2	10 556 12,1	9 608 11,1	11 417 12,6	11 400 12,5	

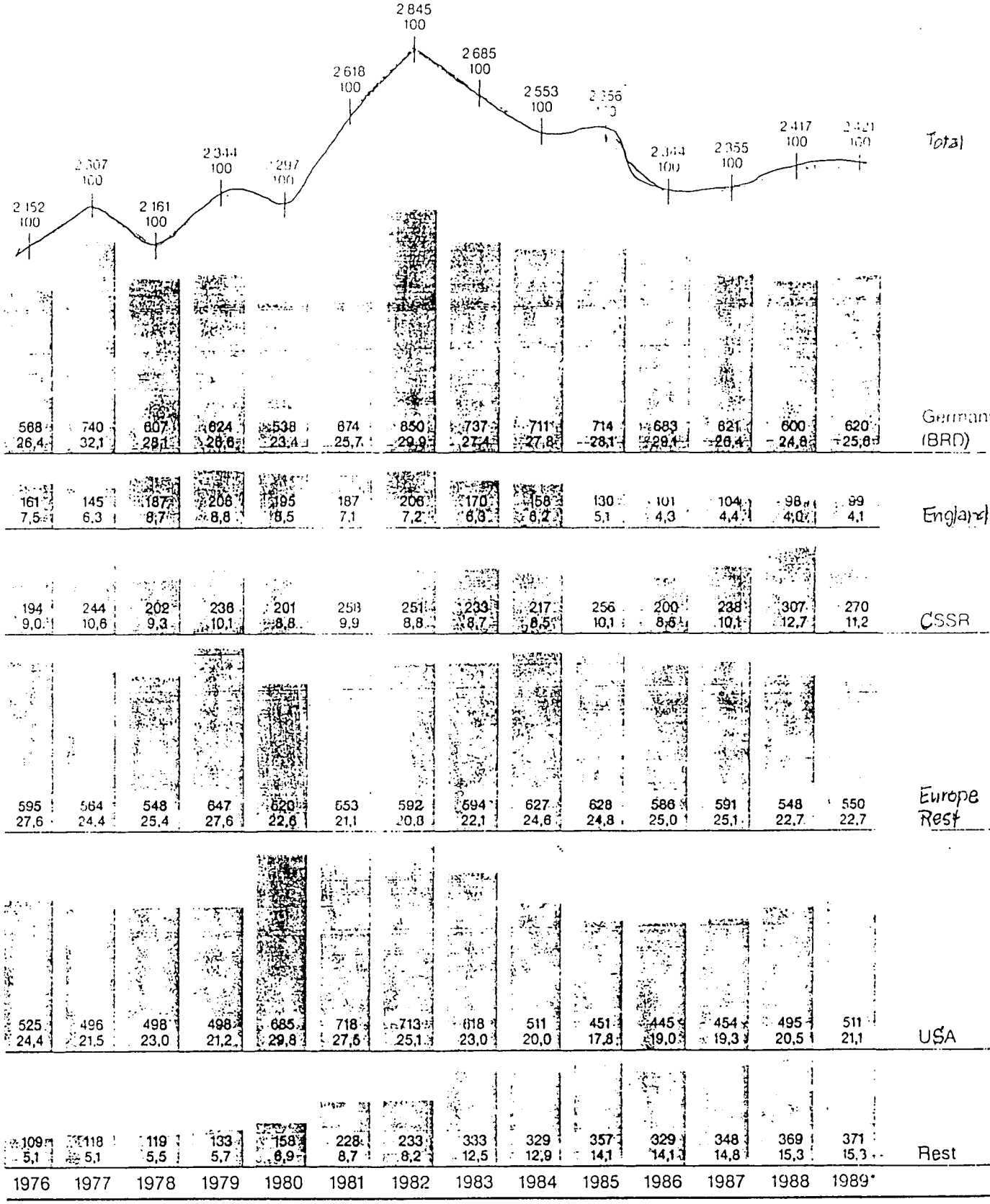
Source: S.S. Steiner

WORLD HOP CROP AND AVERAGE YIELDS 1987 - 1989

	Ztr.			+/- %		Ø Ztr./Hectare		
	1987	1988	1989*	87/88	88/89*	1987	1988	1989*
Perle	*64506*	*61791*	*81000*	*- 4,2*	*+31,1*	*37,8*	*30,1*	*35,1*
Hüller	*17176*	*19750*	*16000*	*+15,0*	*-19,0*	*21,3*	*28,9*	*27,4*
Hersbrucker	*143545*	*174404*	*196000*	*+21,5*	*+12,4*	*27,1*	*29,3*	*30,6*
Hallertauer	*16390*	*13038*	*11800*	*-20,5*	*- 9,5*	*23,1*	*21,2*	*23,3*
Northern Brewer	*202623*	*152699*	*146300*	*-24,6*	*- 4,2*	*37,0*	*28,5*	*28,8*
Brewers Gold	*84865*	*86821*	*71600*	*+ 2,3*	*-17,5*	*41,3*	*47,1*	*41,5*
Record	*7934*	*7165*	*7300*	*- 9,7*	*+ 1,9*	*29,1*	*29,4*	*30,2*
Hallertau Total	537039	515668	530000	- 4,0	+ 2,8	32,9	30,8	31,4
Tettnang	34934	37164	39500	+ 6,4	+ 6,3	26,9	27,8	28,6
Spalt	21185	20961	20700	- 1,1	- 1,2	25,8	25,8	25,2
Hersbruck	2354	2938	3200	+24,8	+ 8,9	17,6	22,6	25,8
Jura	24790	23110	26300	- 6,8	+13,8	35,0	31,8	35,8
Rest	474	466	480	- 1,7	+ 3,0	24,9	24,5	24,0
Germany (BRD) Total	620776	600307	620180	- 3,3	+3,3	32,1	30,3	31,1
England	103800	98309	99000	- 5,3	+ 0,7	25,8	24,6	25,3
CSSR	238340	307420	270000	+29,0	-12,2	19,9	25,7	22,6
USSR	220000	200000	200000	- 9,1	± 0,0	14,4	13,1	13,1
Slovenia	*87080*	*74020*	*75600*	*-15,0*	*+ 2,1*	*34,9*	*30,1*	*30,0*
Backa	*21220*	*21180*	*19980*	*- 0,2*	*- 5,7*	*26,5*	*30,0*	*29,2*
Yugoslavia Total	108300	95200	95580	-12,1	+ 0,4	32,9	30,1	29,8
Poland	52058	56800	52000	+ 9,1	- 8,5	21,3	23,7	21,9
Germany (DDR)	71510	63139	63000	-11,7	- 0,2	30,3	27,1	27,9
Spain	36978	32486	40000	-12,1	+23,1	22,7	20,3	25,3
France	14130	15675	15000	+10,9	- 4,3	25,5	31,9	28,5
Belgium	14328	12036	12000	-16,0	- 0,3	33,3	25,1	26,8
Bulgaria	14020	15710	16000	+12,1	+ 1,8	14,5	16,5	19,2
Romania	34000	33000	33000	- 2,9	± 0,0	17,0	15,0	13,2
Hungary	13312	12756	13000	- 4,2	+ 1,9	25,4	25,8	29,5
Europe Rest	12000	11000	10000	- 8,3	- 9,1	24,0	24,4	22,2
Europe Total	1553552	1553838	1538760	± 0,0	- 1,0	23,8	23,7	23,4
USA Aroma	*79811*	*124279*	*142100*	*+55,7*	*+14,3*	*30,9*	*25,9*	*27,0*
USA Bitter	*203953*	*176400*	*147500*	*-13,5*	*-16,4*	*41,5*	*41,1*	*42,1*
USA Highalpha	*170263*	*194321*	*221800*	*+14,1*	*+14,1*	*42,2*	*42,0*	*41,8*
USA Total	454027	495000	511400	+ 9,0	+ 3,3	39,4	36,1	36,4
Canada	8820	8910	9000	+ 1,0	+ 1,0	37,9	31,7	32,0
Argentina	4900	5000	5000	+ 2,0	± 0,0	19,1	18,9	18,9
Japan	37017	37888	37000	+ 2,4	- 2,3	36,7	38,7	39,6
Australia	37980	47160	49460	+24,2	+ 4,9	50,3	43,5	44,4
New-Zealand	7150	7800	8000	+ 9,1	+ 2,6	45,3	45,9	47,1
China PR	190000	200000	200000	+ 5,3	± 0,0	36,5	38,5	38,5
Turkey	2700	2800	2800	+ 3,7	± 0,0	19,3	35,0	35,0
South Africa	11760	10500	11720	-10,7	+11,6	25,8	23,0	25,7
Rest	47300	47728	48000	+ 0,9	+ 0,6	33,8	16,5	16,6
Total	2355206	2416624	2421140	+ 2,6	+ 0,2	27,2	26,6	26,6

Source: S.S. Steiner

WORLD HOP CROP 1976 - 1989 (1000 Zentner and % share)



*Estimate
Source: S.S. Steiner

ALPHA ACIDS LEVELS by HOPSTEINER - LABORATORIES

	conducto. (lftr./as is/t.q.) 1986 %	1987 %	1988 %
1. Aroma-Varieties			
Hersbrucker	3,1	5,2	3,0
Perle	6,4	7,4	6,6
Tettnang	5,1	5,5	4,1
Spalt	4,9	5,1	4,2
Saaz	4,0	3,3	3,6
Styrian	5,7	5,0	5,0
Backa	3,0	3,0	3,0
Willamette	5,9	5,0	4,5
US-Perle	10,0	8,3	7,8

	conducto. (lftr./as is/t.q.) 1986 %	1987 %	1988 %
2. Alpha-Varieties			
Hallertau Northern Brewer	8,7	8,9	8,0
Hallertau Brewers Gold	6,4	7,0	6,5
Super Styrians	8,2	7,8	7,9
Target	10,2	12,0	10,9
US-Galena	12,8	12,1	10,8
US-Nugget	14,0	13,4	12,9
US-Cluster	8,0	7,7	7,0
Pride of Ringwood	9,4	9,0	9,9
3. Rest	5,3	5,9	5,9

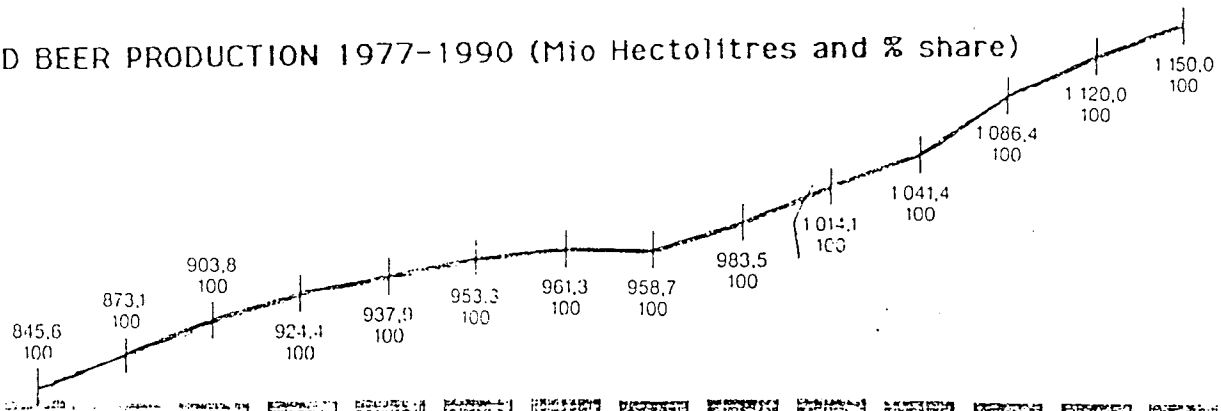
WORLD ALPHA ACIDS SUPPLY 1986-1988

	Hopfen/Hops/Houblon Zentner Total			Hopfen/Hops/Houblon % Total		
	1986	1987	1988	1986	1987	1988
Aroma-Varieties	761936	782444	920661	32,5	33,2	38,1
Alpha-Varieties	970393	868063	841300	41,4	36,9	34,8
Rest	611473	704699	654663	26,1	29,9	27,1
Total	2343802	2355206	2416624	100	100	100

	Ø Alpha %			Ø Alpha kg		
	1986	1987	1988	1986	1987	1988
Aroma-Varieties	4,23	5,14	3,83	1614000	2010000	1765000
Alpha-Varieties	8,80	9,31	8,62	4274000	4041000	3625000
Rest	5,27	5,90	5,87	1612000	2078000	1920000
Total	6,40	6,90	6,05	7500000	8129000	7310000

Source: S.S. Steiner

WORLD BEER PRODUCTION 1977-1990 (Mio Hectolitres and % share)



Total

1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989*	1190*	
94,3 11,2	91,7 10,5	91,6 10,1	92,3 10,0	93,7 10,0	94,6 10,0	95,0 9,9	92,6 9,7	93,3 9,4	94,1 9,3	92,7 8,9	92,6 8,5	92,6 8,2	92,6 8,1	Germany (BRD)
333,5 39,4	338,5 38,8	348,4 38,6	338,7 36,7	340,2 36,3	345,1 36,2	352,5 36,7	342,4 35,7	347,0 35,3	341,4 33,7	341,0 32,7	351,0 32,3	356,2 31,8	360,8 31,4	Europe Rest
200,1 23,7	210,1 24,1	215,8 23,9	227,7 24,6	227,3 24,2	228,1 23,9	230,3 23,9	226,5 23,6	226,8 23,1	230,7 22,7	229,3 22,0	232,3 21,4	238,0 21,3	240,0 20,9	USA
102,0 12,1	109,9 12,6	118,3 12,9	123,3 13,3	127,3 13,6	126,2 13,2	118,4 12,3	123,8 12,9	131,5 13,4	154,6 15,2	161,9 15,5	167,7 15,4	173,7 15,5	180,7 15,7	America Rest
62,0 7,3	67,3 7,7	72,5 8,0	79,2 8,6	82,3 8,8	89,7 9,4	94,5 9,8	102,6 10,7	112,8 11,5	122,3 12,0	140,4 13,5	163,8 15,1	178,4 15,9	193,1 16,8	Asia
30,0 3,6	31,3 3,6	35,5 3,9	39,0 4,2	42,6 4,5	45,0 4,7	46,9 4,9	47,2 4,9	48,8 4,9	48,3 4,8	52,3 5,0	54,5 5,0	56,1 5,0	57,3 5,0	Africa
23,7	23,8	23,7	24,2	24,5	24,4	23,7	23,6	23,3	23,0	23,8	24,5	25,0	25,5	Australia

*Estimate

BALANCE OF HOP SUPPLY

4.1 Hop Supply Balance of the World Market

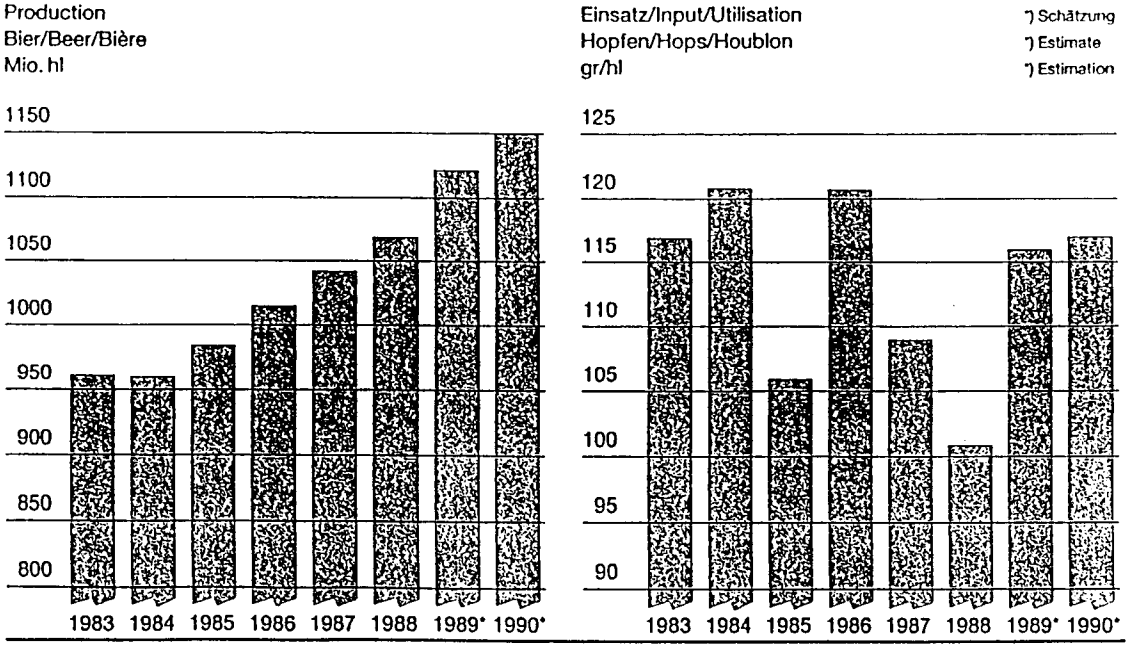
The 1988 crop of 2 416 624 zn. has yielded an alpha acids supply of 7.31 million kg. Compared with an estimated world-wide demand of 7.84 million kg for the world beer production in 1989 a calculated shortage of approx. 530 000 kg which is slightly more than 180 000 zn. of hops, is the result. A hopping rate of 7 g alpha acids per hectolitre of beer has been here assumed.

Based on the 1989 crop estimate and an anticipated beer output in 1990 of 1 150 million hectolitres the calculated result would again show a shortage which will be 787 000 kg of alpha acids or 270 000 zn. of hops.

Because of the lower alpha acids production in 1988 and the estimated hop crop in 1989 it is expected that a further increase in beer production will result in a further decline world-wide in hop inventories. The existing world hop inventory would then amount to approx. 60% of a yearly requirement or a supply for approx. 7 months.

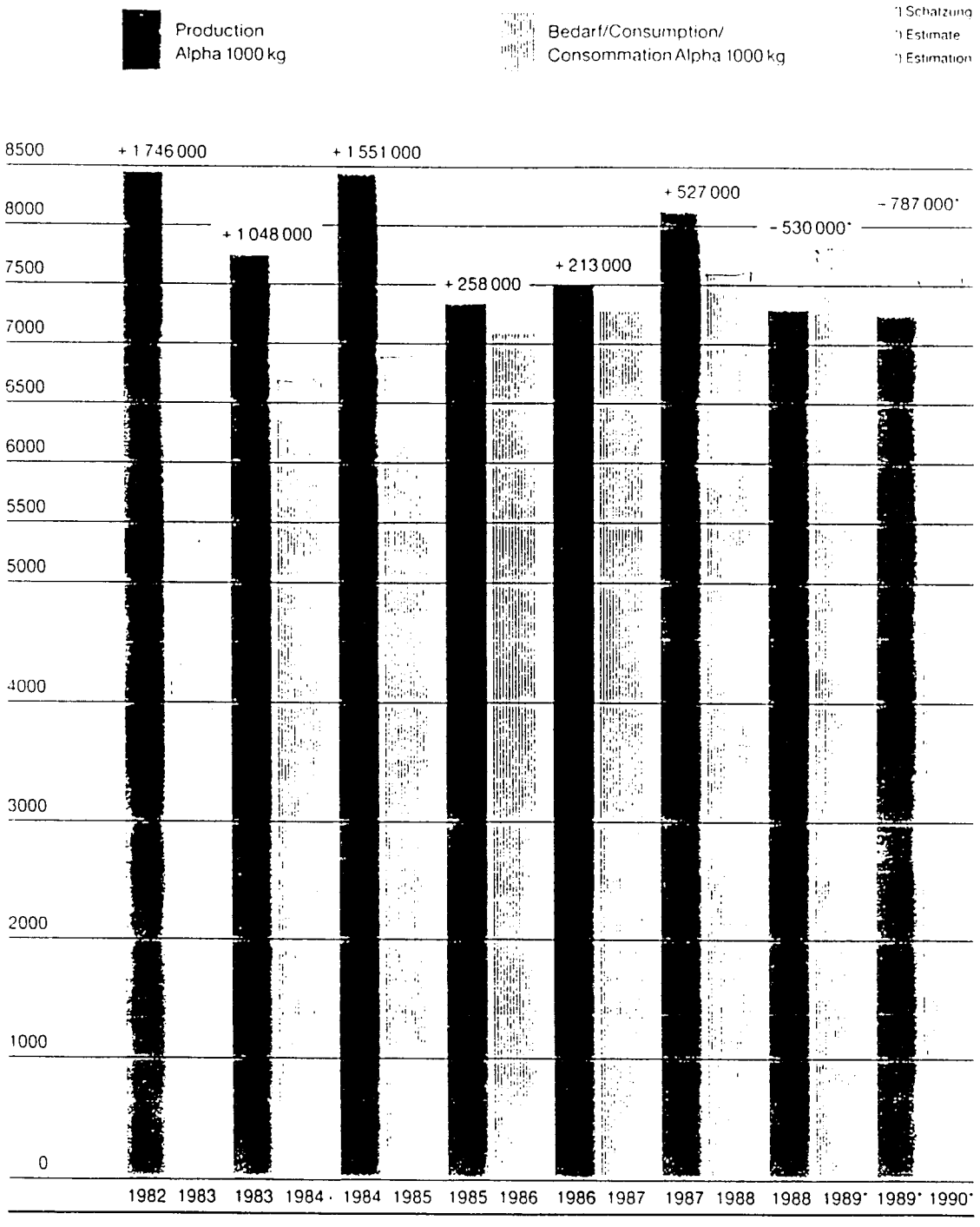
WORLD-ALPHA ACIDS BALANCE 1982-1989

Production		Production Bier/Beer/Bière		Einsatz/Inpunt/ Utilisation	Bedarf Consumption Consommation	Bilanz/Balance/ Bilan	Kumulierte Bilanz Cumulated Bal. Bilan Cumulé	
	Alpha kg		Mio. hl	Alpha gr/hl	Alpha kg	Alpha kg		Alpha kg
1982	8 473 000	1983	961	7,00	6 727 000	+1 746 000	1982	+2 683 000
1983	7 761 000	1984	959	7,00	6 713 000	+1 048 000	1983	+3 731 000
1984	8 439 000	1985	984	7,00	6 888 000	+1 551 000	1984	+5 282 000
1985	7 356 000	1986	1014	7,00	7 098 000	+ 258 000	1985	+5 540 000
1986	7 500 000	1987	1041	7,00	7 287 000	+ 213 000	1986	+5 753 000
1987	8 129 000	1988	1086	7,00	7 602 000	+ 527 000	1987	+6 280 000
1988	7 310 000	1989	1120*	7,00	7 840 000*	– 530 000*	1988	+5 750 000*
1989	7 263 000	1990	1150*	7,00	8 050 000*	– 787 000*	1989	+4 963 000*



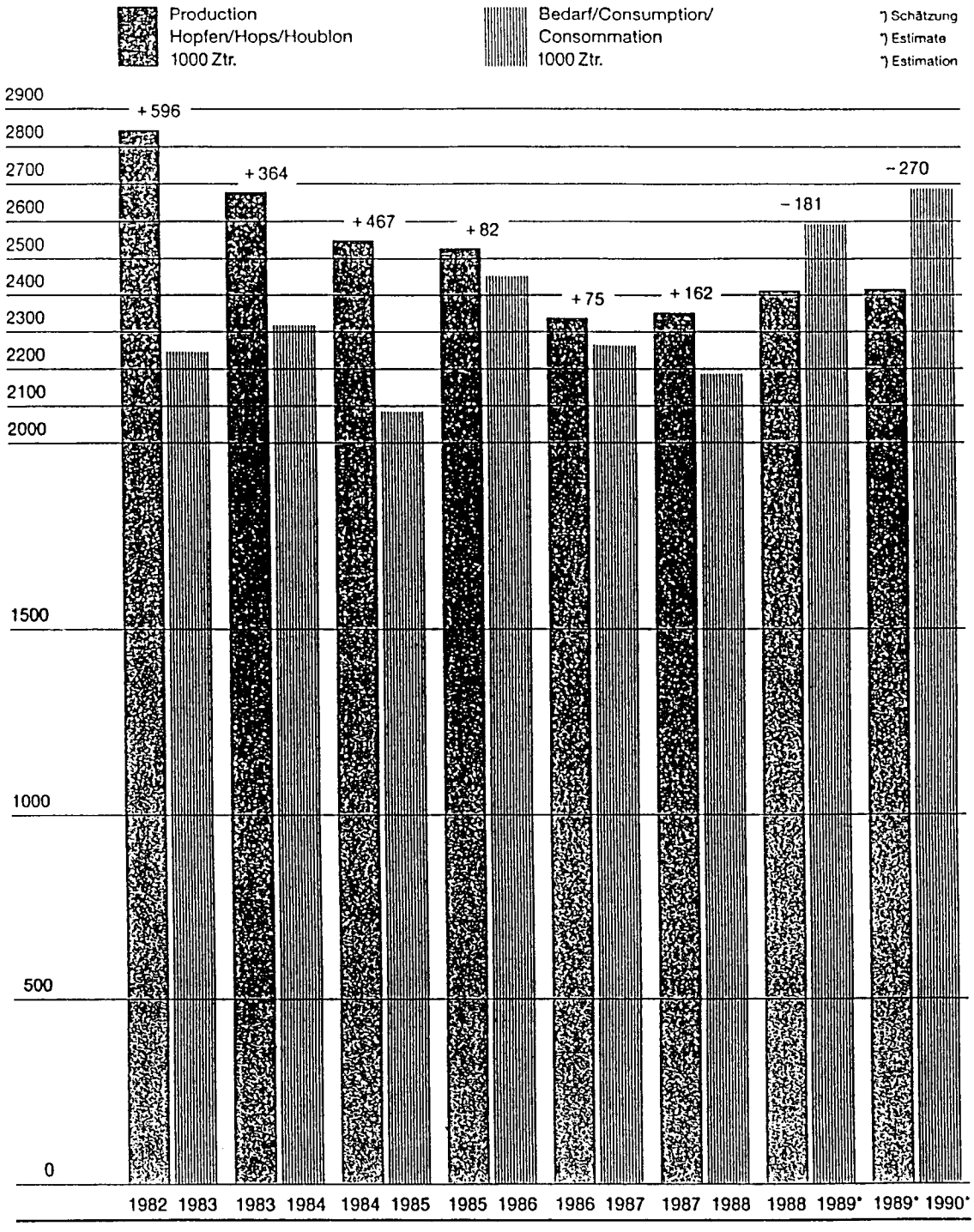
Source: S.S. Steiner

WORLD-ALPHA ACIDS BALANCE 1982-1989



Source: S.S. Steiner

WORLD HOP BALANCE 1982 - 1989



Source: S.S. Steiner

World Beer Production 1988/89

Specification in 1,000 hl

EUROPE

Country	1989	1988
Fed. Rep. of Germany	93.200	92.639
Great Britain	60.140	60.280
USSR	56.000*	54.000
Spain	27.200	26.579
German Dem. Rep.	24.800	24.400
Czechoslovakia	22.684	22.670
France	20.900	19.959
Netherlands	18.813	17.526
Rumania	14.000	13.000[2]
Belgium	13.166	13.792
Poland	12.380	12.257
Yugoslavia	11.107	11.000*
Italy	10.383	11.191
Hungary	9.388	9.480
Austria	9.200	9.015
Denmark	8.600	8.600
Bulgaria	7.000*	7.000*
Portugal	6.810	5.325
Ireland	5.401	5.401
Sweden	4.586	4.350
Switzerland	4.133[3]	4.100[3]
Finland	3.914	3.645
Greece	3.700*	3.700*
Norway	2.205	2.080[1]
Luxemburg	611	635
Malta	163	165
Albania*	100*	100*
Iceland	66	51
TOTAL	450.650	442.940

[1] later correction to 2,217
[2] Please see country report
[3] Production year from 1. 10. to 30. 9. 1988: 4,075

AMERICA

Country	1989	1988
USA	233.619	231.500
Brazil	55.000	47.800
Mexico	38.677	34.131
Canada	22.710	23.837
Colombia	18.000	18.000
Venezuela	11.000	13.000
Argentina	6.100	5.950
Peru	5.400	6.700
Cuba	3.333	3.320
Chile	2.765	2.657
Ecuador	1.700	1.200
Dominican Rep.	1.467	1.139
Bolivia	1.000	1.280
Jamaica	1.000	1.100
Paraguay	1.000	800
Panama	980	980
Guatemala	900	900
Costa Rica	809	746
Honduras	738	680
El Salvador	680	690
Uruguay	650	640
Puerto Rico	592	526
Trinidad	450	450
Nicaragua	300	300
Netherl. Antilles	165	157
Guyana	120	164
Barbados	120	110
Surinam	117	99
San Lucia	85	69
Bahamas	84	61
Haiti	70	60
Martinique	63	66
Belize	51	40
St. Vincent	38	23
Guadeloupe	30*	32
Grenada	30	25
St. Kitts	18	25
TOTAL	409.861	399.257

AFRICA

Country	1989	1988
South Africa	21.000	19.200
Nigeria	7.000	7.300
Cameroon	4.738	5.059
Kenya	3.900	3.600
Zaire	3.173	4.014*[2]
Zimbabwe	1.800	1.700
Ivory Coast	1.360	1.400
Zambia	945	900
Burundi	916	953
Gabon	800	1.000
Ruanda	710	700
Ethiopia	706	930
P. Rep. Congo	700*	725
Angola	700	600
Ghana	614[3]	585
Tansania	538	530
Burkina Faso	500*	500*
Marocco	500	498
Namibia	498	455
Egypt	460	480
Togo	438	450
Botswana	415	342
Tunesia	400	390
Algeria	366	430*
Central African Rep.	325	285
Lesotho	313	200*
Moçambique	300	296
Madagascar	250	203
Swaziland	213	210
Benin	206	250
Mauritius	180	290
Senegal	153	150
Malawi	150*	160
Liberia	143	145[1]
Reunion	135	132
Uganda	130	155
Chad	113	105
Niger	100*	100
Mali	80*	80*
People's Dem.Rep.Yemen	60	53
Seychelles	53	53
Sierra Leone	43	30
Guinea Bissau	20	15
Gambia	16	17
TOTAL	56.160	55.670

[1] later correction to 139
[2] later confirmed with 4,050
[3] other sources: 567

NEAR EAST

Country	1989	1988
Turkey	2.500	2.650
Israel	700	425
Iraq	400*	400*
Cyprus	314	291
Lebanon	130*	130
Syria	90*	90*
Jordan	37	36
TOTAL	4.171	4.022

FAR EAST

Country	1989	1988
Japan	61.005	57.498
People's Rep. China	60.000[2]	55.000*
Philippines	13.650	12.480
Rep. of Korea	10.500	10.420
Taiwan	4.000*	3.987
Vietnam	2.000*	2.000*
Thailand	1.900	1.300
Hong Kong	1.686	1.618
India	1.723*	1.487[1]
D. P. Rep. Korea	1.000*	1.000
Indonesia	992	910
Malaysia	709	650
Singapore	441	414
Iran	100**	100**
Mongolia	100*	100*
Sri Lanka	71	75
Burma	50*	50*
Nepal	50	50
Laos	10	10
Pakistan	9	9
Bangla-Desh	5*	5*
Cambodia	5*	5*
TOTAL	160.006	149.168

[1] from 1. 4. 1988 to 31. 3. 1989
[2] Please see country report

AUSTRALIA/ OCEANIA

Country	1989	1988
Australia	18.700	19.500
New Zealand	3.890	4.100
New Guinea	494	502
Fiji Islands	170*	170*
Tahiti	121	125
New Caledonia	59	64
Samoa	54	55
Vanuatu ***		
Salomonen ***		
TOTAL	23.488	24.516

*estimated
**non-alcoholic
***from 1990 onwards

	1989	1988
WORLD	1.104.336	1.075.573

Source: Joh. Barth and Sohn

Alpha Acid Production

Alpha acid production on the world market was determined on the basis of the following groups of varieties:

Group A: finest aroma hops such as Saaz, Tettnang, Spalt

Group B: aroma hops such as Hallertau, Hersbruck, Hüll, Perle, Golding, Fuggle, Cascade and others

Group C: hop varieties without significance for the world market

Group D: bitter hops such as Northern Brewer, Brewers Gold, Cluster, Bullion, Pride of Ringwood, high-alpha hops from the USA and the UK

When grouping world hop production in this way the following alpha production results for 1989 which compares to the previous year's as follows:

	1989				1988			
Group	share %	crop tons	α % ø	α tons	share %	crop tons	α % ø	α tons
A	7	17,283	3.1	530	10	18,733	3.7	694
B	19	29,980	4.5	1,360	15	25,788	4.2	1,091
C	22	29,820	5.4	1,600	24	31,477	5.6	1,771
D	52	41,468	9.2	3,800	51	41,365	9.0	3,720
Total	100	118,551	6.2	7,290	100	117,363	6.2	7,276

Alpha Acid Balance

After a year of surplus in 1987 and a year of shortage following the 1988 crop, the 1989 hop production resulted in another deficit, even though the hopping rate was still further reduced worldwide.

One factor is the further rise of world beer production – which we estimated to be + 1% in 1990 –, another the extension of acreage for aroma varieties in the US which now affects the world market supply with bitter substances.

In our last report we estimated that the international brewing industry had stocks for 6-8 months, we may now safely assume that the overstocks have been almost used up.

1987 demand (hopping rate 7.1 g alpha/hl)	7,413.6 tons alpha
1986 production	7,199.0 tons alpha
Deficit	214.6 tons alpha
1988 demand (hopping rate 7.0 g alpha/hl)	7,529.0 tons alpha
1987 production	8,080.0 tons alpha
Surplus	551.0 tons alpha
1989 demand (hopping rate 7.0 g alpha/hl)	7,730.0 tons alpha
1988 production	7,276.0 tons alpha
Deficit	454.0 tons alpha
1990 demand (estimated hopping rate 6.9 g alpha/hl)	7,690.0 tons alpha
1989 production	7,290.0 tons alpha
Deficit	400.0 tons alpha

Source: Joh. Barth and Sohn

Acreage and Hop Production

area	1989 acreage in ha	1989 ⌀ tons per ha	1989 crop in tons = 1000 kg	1988 acreage in ha	1988 ⌀ tons per ha	1988 crop in tons = 1000 kg
Hallertau	16.859	1,63	27.397,2	16.756	1,54	25.845,8
Spalt	821	1,21	989,7	814	1,29	1.048,1
Hersbruck	124	1,29	168,7	130	1,13	146,9
Jura	734	1,92	1.408,0	727	1,59	1.155,5
Tettnang	1.380	1,42	1.956,9	1.336	1,39	1.858,2
others	20	1,23	24,6	19	1,23	23,3
Fed. Rep. of Germany	**19.938**	**1,60**	**31.945,0**	**19.782**	**1,52**	**30.077,8**
England	**3.742**	**1,26**	**4.719,5**	**3.878**	**1,27**	**4.915,4**
Aalst	80	1,46	137,3	84	1,67	140,4
Poperinge	322	1,72	468,9	332	1,39	461,4
Belgium	**402**	**1,51**	**606,2**	**416**	**1,45**	**601,8**
Alsace	455	1,51	688,8	425	1,68	715,0
Nord	69	0,96	66,2	56	1,00	56,0
Burgundy	2	2,50	5,0	8	1,63	13,0
France	**526**	**1,44**	**760,0**	**489**	**1,60**	**784,0**
Ireland	**22**	**1,16**	**25,6**	**22**	**1,27**	**28,0**
Spain	**1.560**	**1,46**	**2.269,6**	**1.600**	**1,02**	**1.624,3**
Portugal	**118**	**2,11**	**248,4**	**134**	**1,15**	**154,3**
EEC	**26.308**	**1,54**	**40.574,3**	**26.321**	**1,45**	**38.185,6**
Saaz	7.690	0,97	7.481,0	7.678	1,34	10.259,0
Auscha	1.602	1,18	1.897,0	1.657	1,27	2.105,0
Tirschitz	1.144	1,24	1.414,0	1.015	1,52	1.542,0
Slovakia	1.505	0,98	1.481,0	1.600	0,92	1.465,0
Czechoslovakia	**11.941**	**1,03**	**12.273,0**	**11.950**	**1,29**	**15.371,0**
USSR*	**15.000**	**0,63**	**9.500,0**	**15.000**	**0,63**	**9.500,0**
Slovenia	2.518	1,29	3.247,0	2.460	1,50	3.702,0
Bačka and Ilok	685	1,35	926,0	706	1,50	1.059,0
Yugoslavia	**3.203**	**1,30**	**4.173,0**	**3.166**	**1,50**	**4.761,0**
Germ. Dem. Rep.	**2.239**	**1,37**	**3.074,8**	**2.320**	**1,36**	**3.156,9**
Poland	**2.372**	**1,03**	**2.450,0**	**2.399**	**1,19**	**2.840,0**
Bulgaria	**833**	**0,94**	**780,0**	**950**	**0,83**	**785,5**
Rumania	**2.300**	**1,10**	**2.500,0**	**2.200**	**0,75**	**1.650,0**
Hungary	**441**	**1,36**	**599,7**	**495**	**1,28**	**637,8**
Mühlviertel	96	1,57	150,3	91	1,71	155,7
Leutschach	85	1,32	112,0	86	1,14	98,0
Waldviertel	5	0,60	3,0	3	0,23	0,7
Austria	**186**	**1,43**	**265,3**	**180**	**1,41**	**254,4**
Switzerland	**21**	**2,17**	**45,7**	**23**	**1,81**	**41,7**
Albania*	**70**	**1,00**	**70,0**	**70**	**1,00**	**70,0**
EUROPE	**64.914**	**1,18**	**76.305,8**	**65.074**	**1,19**	**77.253,9**
Washington	9.849	2,00	19.716,0	9.424	1,92	18.131,0
Oregon	2.999	1,80	5.390,0	3.010	1,63	4.914,0
Idaho	1.133	1,64	1.860,0	1.186	1,43	1.699,0
USA	**13.981**	**1,93**	**26.966,0**	**13.620**	**1,80**	**24.744,0**
Canada	**290**	**1,45**	**419,2**	**281**	**1,59**	**445,9**
Japan	**935**	**2,07**	**1.939,3**	**980**	**1,90**	**1.862,2**
Australia	**1.113**	**2,22**	**2.473,0**	**1.085**	**2,14**	**2.325,0**
New Zealand	**199**	**2,21**	**439,3**	**162**	**2,47**	**400,0**
People's Rep. of China	**5.000**	**1,40**	**7.000,0**	**5.000**	**1,40**	**7.000,0**
Dem. People's Rep. of North Korea¹	**2.000**	**0,60**	**1.200,0**	**2.000**	**0,80**	**1.600,0**
Republic of South Korea	**410***	**1,33**	**545,0**	**412**	**1,30**	**536,4**
South Africa	**515**	**1,18**	**605,0**	**481**	**1,16**	**556,0**
India*,	**450**	**0,56**	**250,0**	**450**	**0,56**	**250,0**
Turkey	**120**	**1,08**	**130,0**	**80**	**1,75**	**140,0**
Argentina*	**250**	**1,11**	**278,0**	**250**	**1,00**	**250,0**
WORLD	**90.177**	**1,32**	**118.550,6**	**89.875**	**1,31**	**117.363,4**

* estimated

¹ see corresponding country report.

Source: Joh. Barth and Sohn

IHGC COUNTRIES - ESTIMATED [illegible]RD SALES 1990-1994

Country	Estimated [illegible] sales (zentners)				
	1990	[illegible]	1992	1993	1994
F.R.G.	530 000	[illegible]0 000	350 000	250 000	150 000
France	14 570	13 350	13 850	13 275	-
Belgium	2 800	1 800	-	-	-
United Kingdom	87 000	63 000	42 000	15 000	3 000
Spain	42 100	43 100	40 000	40 000	-
Ireland	250	100	100	-	-
EEC	676 720	541 350	445 950	318 275	153 000
U.S.A.	403 700	322 000	227 400	42 400	-
Australia	40 000	34 600	29 700	24 700	-
Yugoslavia	45 400	20 500	19 000	14 700	8 900
Czechoslovakia	225 000	200 000	75 000	50 000	50 000
G.D.R.	60 000	50 000	-	-	-
Poland	47 500	47 500	45 000	43 500	41 000
Hungary	12 000	12 000	-	-	-
TOTAL IHGC	1 510 320	1 227 950	842 050	493 575	252 900

Source : IHGC March 1990

WORLD HOP PRODUCTION 1971 - 1989

YEAR	AREA HA	PRODUCTION ZTR	= PROD TONNES	YIELD T/HA	ALPHA TONNES	% ALPHA	ALPHA KG/HA	BEER PROD. million hl	CONTRACT PRICE FRG DM/Ztr	SPOT PRICE FRG DM/Ztr	AVE. PRICE USA $/Lb
1971	75 042	1 921 000	96 050	1,28	5 377	5,60	71,65	658	353	622	0,66
1972	78 015	2 103 440	105 172	1,35	6 174	5,87	79,14	689	332	372	0,71
1973	81 247	2 366 020	118 301	1,46	7 468	6,31	91,92	731	331	207	0,76
1974	82 083	2 223 520	111 176	1,35	6 627	5,96	80,74	771	331	235	0,80
1975	80 527	2 270 040	113 502	1,41	7 230	6,37	89,78	802	331	221	0,83
1976	78 206	2 135 200	106 760	1,37	6 137	5,75	78,47	826	327	264	0,85
1977	79 262	2 355 920	117 796	1,49	7 066	6,00	89,15	848	319	128	0,90
1978	80 230	2 200 173	110 009	1,37	6 374	5,79	79,45	875	297	290	0,90
1979	81 224	2 350 848	117 992	1,45	7 348	6,23	90,47	911	324	533	0,98
1980	86 348	2 378 772	118 939	1,38	7 046	5,92	81,60	936	341	1 400	1,51
1981	92 434	2 652 833	132 642	1,43	7 997	6,03	86,52	954	377	606	1,51
1982	95 532	2 966 785	148 339	1,55	8 805	5,94	92,17	970	390	167	1,74
1983	92 688	2 651 851	132 593	1,43	7 543	5,69	81,38	970	405	210	1,93
1984	88 701	2 472 791	123 640	1,39	8 165	6,60	92,05	970	409	191	2,15
1985	86 700	2 419 725	120 986	1,40	6 990	5,78	80,62	982	401	245	1,98
1986	85 699	2 372 455	118 622	1,38	7 528	6,35	86,04	990	410	151	1,74
1987	87 274	2 366 497	118 324	1,36	8 414	7,11	96,45	1 044	405	301	1,56
1988	90 044	2 407 032	120 352	1,34	7 382	6,10	81,98	1 050	398	378	1,51
1989	90 504	2 365 239	118 262	1,30	7 436	6,29	82,16	1 090	387	326	1,60
AVERAGE	84 829	2 367 849	118 392	1,39	7 216	6,09	84,81	898	361	360	1,32
INDEX '89 (1971 = 100)	120	123	123	101	138	112	114	165	109	52	307
INDEX '89 (1979 = 100)	104	100	100	96	98	97	93	98	111	67	134

AREA UNDER HOPS, PRODUCTION OF HOPS, ALPHA ACID AND BEER BY PRODUCER COUNTRIES 1989

I Country	II Area ha 1989	IIa Area ha (+/-) 1989-88	IIb Area ha (+/-) 1989-80	III Production Ztr 1989	IV Yield t/ha 1989	V Product. Alpha T 1989	VI Percent Alpha 1989	VII Yield alpha kg/ha 1989	VIII Beer prod. m/hl (Barth) 1989	IX Forecast Area ha 1990	X Area Change ha 1990-89
F.R.G.	19 938	156	1 984	638 782	1,60	1 812	5,7	90,9	93,2	19 950	12
France	529	40	- 228	15 260	1,44	28	3,7	54,0	20,9	550	21
Belgium	402	- 16	- 421	12 456	1,55	36	5,7	88,7	14,0	420	18
United Kingdom	3 743	- 135	- 1 975	94 388	1,26	385	8,2	103,0	60,1	3 715	- 28
Spain	1 443	- 56	- 409	45 392	1,57	175	7,7	121,3	27,2	1 440	- 3
Portugal	142	- 8	- 50	4 949	1,74	17	6,9	120,3	6,8	150	8
Ireland	21	± 0	- 54	512	1,19	2	8,8	105,2	5,4	18	- 3
EEC-12	26 218	- 19	- 1 153	811 739	1,55	2 455	6,0	92,6	269,8	26 243	25
U.S.A	13 981	257	-1 021	538 200	1,93	2 386	8,9	170,7	231,5	14 250	269
Australia	1 113	- 2	- 42	49 460	2,22	247	10,0	222,3	18,7	1 113	0
Yugoslavia	1 204	16	49	83 000	1,30	280	6,7	87,4	12,0	3 204	0
Czechoslovakia	11 950	0	850	245 460	1,03	442	3,6	37,0	23,0	11 950	0
G.D.R	2 240	- 80	84	60 000	1,34	200	6,7	89,3	24,8	2 100	- 140
Poland	2 372	- 13	- 102	49 000	1,03	129	5,3	54,4	12,4	2 410	38
Hungary	441	- 54	- 115	12 000	1,36	36	6,0	82,1	9,4	410	- 31
Bulgaria	950	0	- 650	15 600	0,82	46	6,0	48,9	7,0	950	0
Total IHGC(-EEC)	36 251	124	- 947	1 052 720	1,45	3 766	7,2	103,9	338,8	36 387	136
Total IHGC(+EEC)	62 469	-105	- 2 100	1 864 459	1,49	6 221	6,7	99,6	608,6	62 630	161
Japan	935	- 45	- 226	38 780	2,07	100	5,2	107,0	61,0	950	15
USSR	15 000	0	1 000	200 000	0,67	300	3,0	20,0	56,0	15 000	0
Romania	2 600	400	1 600	32 000	0,57	70	4,4	25,0	13,0	2 600	0
China	5 000	0	2 000	140 000	1,40	420	6,0	84,0	60,0	5 000	0
North Korea	2 000	0	1 500	24 000	0,60	70	5,8	35,0	1,0	2 000	0
Others	2 500	0	331	66 000	1,32	255	7,7	102,0	302,4	2 500	0
World total	90 504	460	4 105	2 365 239	1,30	7 436	6,3	82,2	1 102,0	90 680	176

Source: European Communities Report 4/23/90

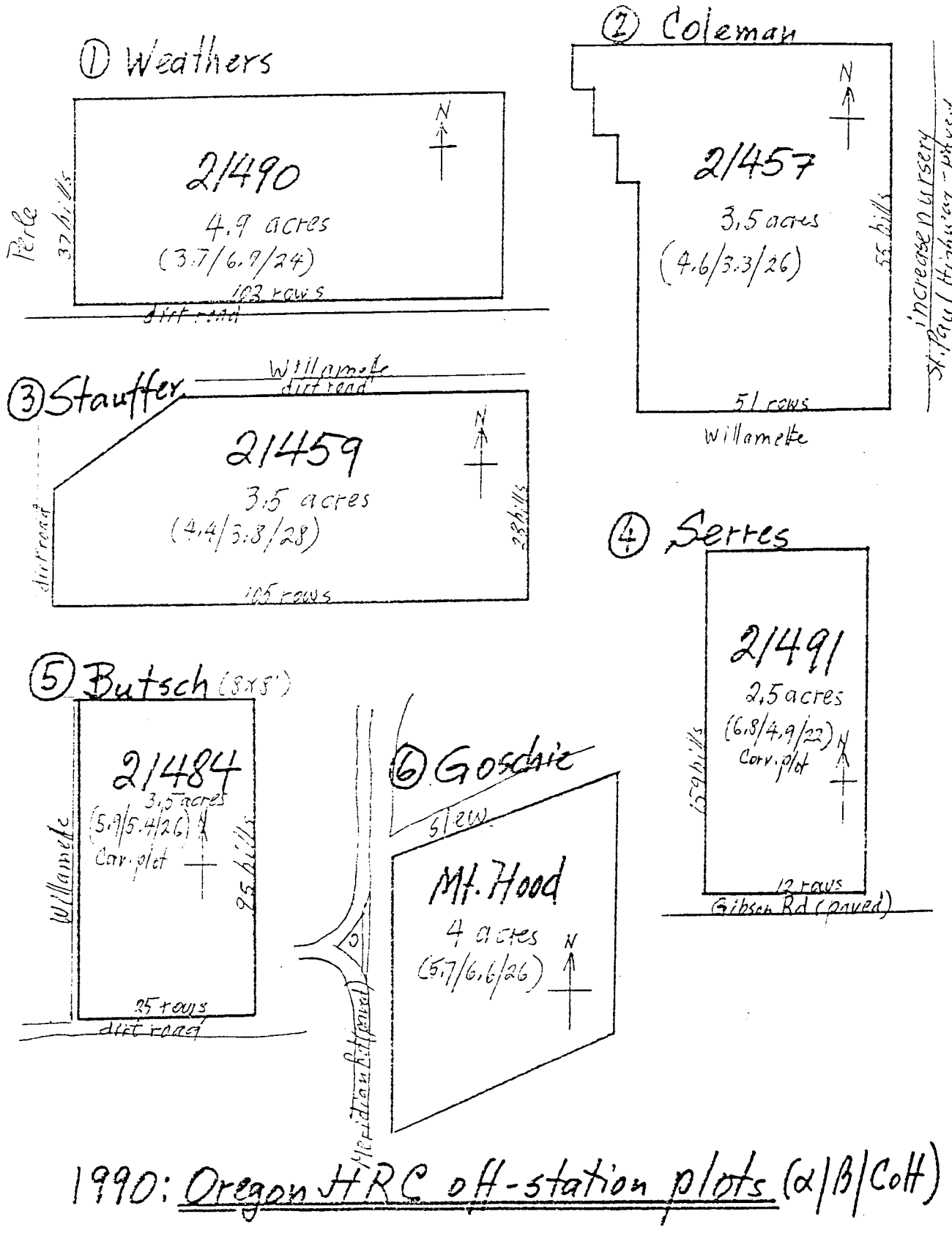
E. E. C. COUNTRIES

Seven Member States currently produce hops. 6,871 growers farm a total area of 64,785 acres, with each grower having on average 9.4 acres under hops(see Table 1). Production structures vary considerably from Member State to Member State. In the United Kingdom, 252 hop producers farm more than 9,200 acres(37 acres/grower), whereas each Spanish producer farms an average of only 2 acres.

TABLE 1:

	# of growers	Total hop acres	Acres/Growers
W. Germany	4,298	49,267	11.5
France	183	1,307	7
Belgium	124	993	8
United Kingdom	252	9,249	37
Ireland	2	52	26
Spain	1,972	3,566	2
Portugal	40	351	9
E.E.C.	6,871	64,785	9.4

Source: European Communities Report, 4/23/90



1990: Oregon HRC off-station plots (α/β/CoH)

1990: USDA - OSU Main Hop Yard.

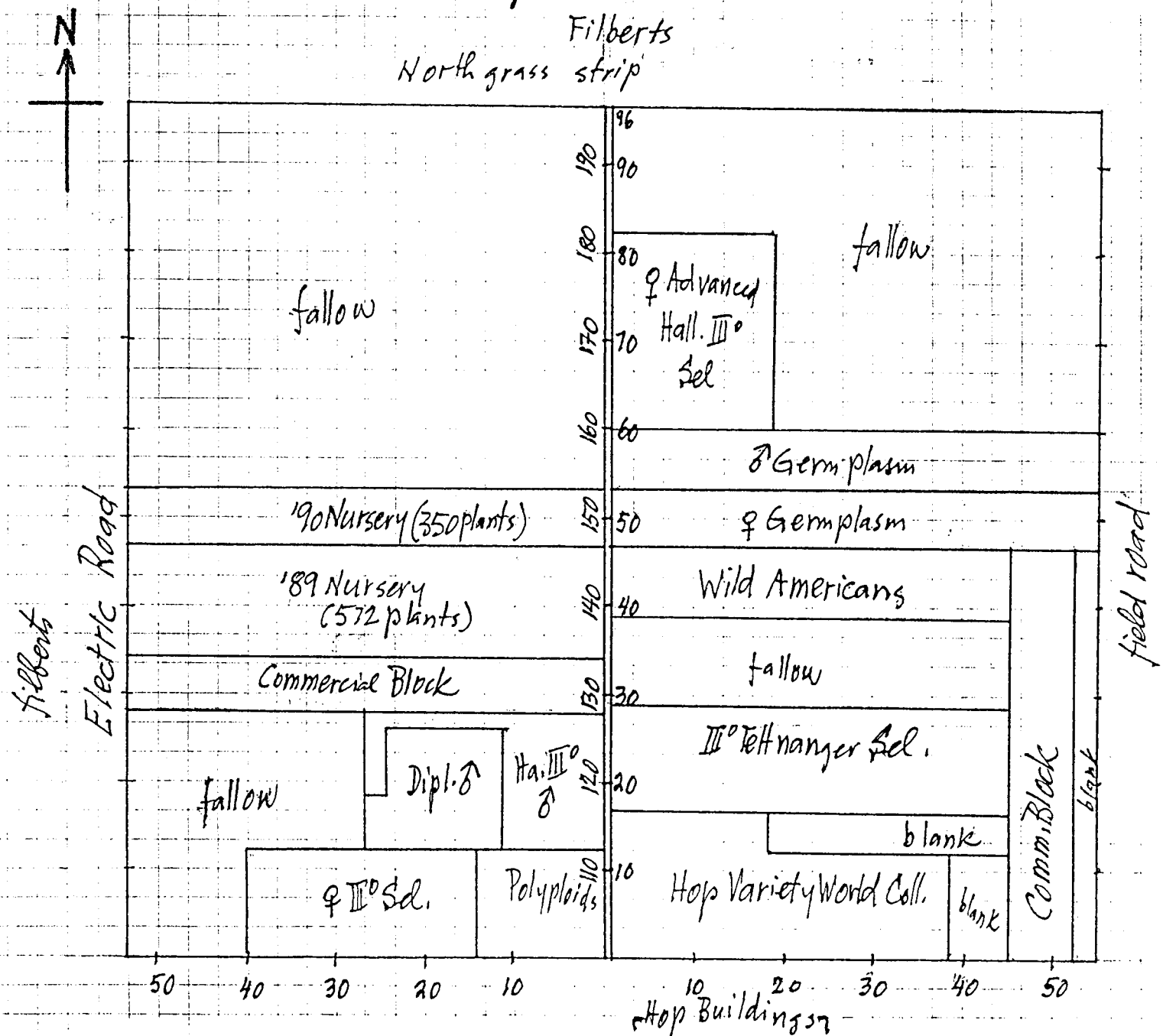


Table 1: Hop germplasm and plant or cone samples distributed in 1990.

Recipient	Date sent	Variety or selection	Amount	Reason and remarks
Alexander, Dr. Albert	March 14	21014, Hallertauer m.f.	5	botanical studies
Univ. de Moncton		21015, Tettnager	5	"
Nuveau Brunswick		48209, Fuggle H	5	"
Canada		21041, Willamette	5	"
		56013, Cascade	5	"
		21227, Perle	5	"
		21226, Chinook	5	"
		21011, L-16 Late Cluter	5	"
		21182, Galena	5	"
		21183, Eroica	5	"
		21193, Nugget	5	"
		21225, Olympic	5	"
		21040, Columbia	5	"
		65101, Talisman	5	"
Anderson, Wayne	March 16	21455, Mt. Hood	30	nursery increase
Corvallis, OR 97330		21041, Willamette	5	"
Beatson, Dr. Ron	Feb. 27	21173, Strisselspalt	5	hop breeding
DSIR, Motueka		21014, Halltertauer m.f.	5	"
New Zealand		21185, Hersbrucker G	5	"
		21207, Yugoslavian 27P04	5	"
		21208, Yugoslavian 32P02	5	"
		21087M, Yugoslavian 3/3	5	"
Brooks, Dr. S.N.	March 14	56013, Cascade	10	hobby gardening
Cortez, CO 81321				
Bailey, Libby	Oct. 18	21609, Pacific Gem	5	potted plants, nematode
OSU, Dept. Soils		21610, New Zeal. Hallertauer	5	studies
Crosby, Kevin	March 6	19009M	40	dipl. pollinator for
Woodburn, OR 97071		19036M	50	Nugget
		19039M	15	"
		19040M	30	"
		19058M	50	"
		19061M	30	"
		19062M	20	"
		21017M	50	"
		21059M	30	"
		21060M	50	"
		21087M	25	"
		21089M	20	"
		21090M	20	"
		21325M	30	"

Table 1: continued.

Recipient	Date sent	Variety or selection	Amount	Reason and remarks
Coleman, John	March 19	21175M	15	early tripl. pollinator
Gervais, OR 97137		21176M	5	"
		21189M	15	"
		21190M	5	"
		21191M	15	"
		21539M	20	"
		21542M	20	"
		21544M	20	"
		21545M	20	"
		21546M	20	"
		21547M	20	"
Galovic, Vladislava	March 19	19058M	6	hop breeding
Novi Sad-Backi Petrovac		64035M	6	"
Yugoslavia		64037M	6	"
Goschie, Herman	March 27	21541M	15	early tripl. pollinator
Silverton, OR 97381		21542M	40	"
		21543M	20	"
		21544M	20	"
		21545M	15	"
		21547M	25	"
		21548M	15	"
Hohmann, Ken	March 14	21455, Mt. Hood	6	hobby gardening
Wallowa, OR 97885				
Kirk, Terry	April 17	21175M	50	early tripl. pollinator
St. Paul, OR		21176M	50	"
		21189M	50	"
		21190M	50	"
		21191M	50	"
		21192M	50	"
Klein, Dr. Robert	Feb. 26	21539M	2	early tripl. poll., virus
Wash. State Univ.		21540M	2	" indexing
IAREC, Prosser, WA		21541M	2	"
		21542M	2	"
		21543M	2	"
		21544M	2	"
		21545M	2	"
		21546M	2	"
		21547M	2	"
		21548M	2	"
	June 25	19105	10 leaves	virus indexing
		21451	"	"
		21494	"	"
		21495	"	"
		21505	"	"

Table 1: concluded.

Recipient	Date sent	Variety or selection	Amount	Reason and remarks
Klein, Dr. Robert	June 25	19060M	10 leaves	virus indexing
Wash. State Univ.		19061M	"	"
IAREC, Prosser, WA		19182M	"	"
		21059M	"	"
		21064M	"	"
		21069M	"	"
		21272M	"	"
- " -	July 12	21123	10 leaves	virus indexing
		21439	"	"
		58112	"	"
		60029	"	"
- " -	Dec. 18	48209, Fuggle H	20	virus cleanup
Kralj, Dr. Dragica	March 19	21455, Mt. Hood	6	variety collection
Hop Res. Institute				
Zalec, Yugoslavia				
Maurer, Paul	March 28	21455, Mt. Hood	7	home brewing
Versilles, KY 40383				
McFerson, Dr. Jim	April 2	21041, Willamette	8	germplasm collection
USDA Germplasm Rep.		56013, Cascade	8	"
Geneva, NY 14456-0462		21193, Nugget	8	"
		21182, Galena	8	"
		21455, Mt. Hood	8	"
Russel, Dr. Inge	March 19	21193, Nugget	8	brewery demonstration
Labatt Brewing Co.				
London, Ont. Canada				
Seghetti, Guy M.	March 19	21455, Mt. Hood	6	high school display
Roseburg, OR				
Stoltenow, Sandra I.	Aug. 20	various genotypes	30	dried leaf and flower specimen for demonstration
Div. Criminal Invest.				
Iowa Dep. Publ. Safety				
Des Moines, IA 50319				
Schaller, Jack	Nov. 20	21041, Willamette	300 g	dried hop cones for trial brewing
Chicago Brewing Co.				
Chicago, IL 60622				
Weiss, Dr. James M.	March 16	21015, Tettnanger	5	hobby gardening
Boulder, CO 80301		21077, Saazer	5	"
		21455, Mt. Hood	5	"

Table 2. Hop Germplasm received at Corvallis in 1990.

Supplier	Date received	Amount	Variety/ Pedigree	Remarks
Dr. Robert Klein IAREC, Prosser, WA	July 18	6	21538 (virusfree Osvald 72C)	Potted plants, virus-free Osvald 72C clone (heat treated and meristem tip cultured USDA 21532)
Dr. R.A. Beatson DSIR Motueka New Zealand	April 23	6	21609 Pacific Gem	virusfree, triploid, aroma
		6	21610 NZ Hallertauer	virusfree, triploid, aroma
Dr. Dragica Kralj Inst. for Hop Res. Zalec, Yugoslavia	June 15	4	21611, Celeia	triploid, aroma, late
		4	21612, Ceres	triploid, aroma, late
		4	21613, Cekin	triploid, aroma late
		4	21614, Cicero	triploid, aroma, late (did not survive)

Table 3: New Accession numbers assigned in 1990.

Accession No.	1990 Location	Source	Name or Pedigree	Remarks
21609	Greenhouse	New Zealand	Pacific Gem tetrapl. SmoothCone (66056) x OP	triploid, aroma, v. high yield, α 15, β 8, CoH<30, H/C 2.5, med. late, good storage (see 1987 USDA Rep. p. 95)
21610	Greenhouse	New Zealand	New Zealand Hallertau tetrapl. Hallertauer x OP	triploid, aroma, high yield, α 8-12, β 6-8; CoH <10, H/C 2.1, poor storage
21611	Greenhouse	Yugoslavia	Celeia tetrapl. Sav. Golding (21049) x ♂ 105/58	triploid, aroma, high yield, quality like Saazer, α 4-7, β 5-8, H/C 2.4, tannoids
21612	Greenhouse	"	Cerera tetrapl. Sav. Golding (21049) x ♂ 105/58	triploid, aroma, high yield, late, quality like Saazer, α 4-7, β 5-8; H/C 2.4, tannoids
21613	Greenhouse	"	Cekin Aurora (21053) x tetrapl. ♂ 3/3 (21087M)	triploid, aroma, high yield, late, quality like Styrian, α 5-8, β 5-8; H/C 3.0
21614	Greenhouse	"	Cicero Aurora (21053) x tetrapl. ♂ 3/3 (21087M)	triploid, aroma, high yield, late, quality like Styrian, α 5-8, β 5-8; H/C 2.6 (lost in greenhouse; to be replaced spring '91).
21615M	55:53-54	Sel. 7303-52M	62013 x 21110M Comet x Bullion-ZS	male, vigorous, med. early, good storage, α 45-50, β 21, CoH 30

Table 4. Hop genotypes discarded in 1990.

Accession Number	1990 Location	Name or Pedigree	Reason
21501	206:12-16	56013 x 19058M	very small cones, DM crown infection, poor growth, late
21495	236:17-21	56013 x 21136M	♀♂, DM crown infection, stunted cones
21506	235:23-27	56013 x 21137M	poor growth, DM crown infection
21508	218:28-32	64003 x 21271M	virus, poor growth, bronze leaves, late
21509	220:28-32	- " -	DM crown infection, very late
21384	223:28-32	64100 x 64035M	♀♂, variegated leaves, short arms, poor growth, poor cone set
21229	31:9-12	Cluster seedling (?)	too different from Cluster, fair to poor storage
21054	43:47-48	62013 x 6616-35M	poor growth, sparse set, ruffled cones, v. short arms
19200	7:49-50	Urbann x LCS	too late
21299	43:49-50	21055 x 21170M	weak arms, small ruffled cones, poor picker, mites
21439	44:49-50	56013 x 19005M	sleeper, v. poor growth
21440	45:49-50	56013 x 19010M	v. poor growth, late
21442	53:49-50	56013 x 19072M	♀♂, large ruffled cones, poor set
54002	54:49-50	19100 x 16048M	sleeper, very poor, too late
21212	3:51-52	Wild Yugoslavian 41P36	too late
21152	22:51-52	19001 x 63023M	v. poor set, large cones
21023	29:51-52	63018 x OP	♀♂,poor set, v. short arms, late
21474	6:62-71	21397 x 64037M	v. poor set, poor vigor
21477	9:62-71 104:29-30	21397 x 64035M	poor growth, sparse set, wrong α/β
21482	14:62-71 107:29-30	21397 x 64037M	poor growth, sparse set, v. low α
21483	15:62-71	- " -	poor growth, sparse set
Commercial test plots removed (hops remain in Germplasm Collection)			
21456	Weathers	21456	HRC discontinued testing
21287	Annen	Banner (21287)	too susceptible to downy mildew

Table 5: Seed collections (OP crosses) and controlled crosses made in 1990.

Cross No.	Source Loc. of	Coll. site or Pedigree[1/]	No. Seeds	Seed color	Remarks
9001	Logan, ND	Logan W-1E	>500	blue	
02	"	-2E	"	"	
03	"	-3E	"	"	
04	"	-4E	"	"	large seeds
9005	Minot, ND	Minot E-1S	>400	"	
06	"	-2S	341	"	
07	"	-3S	>400	blue + tan	
08	"	-4S	"	"	
09	"	-5S	"	"	
9010	Minot, ND	Minot W-1	>500	blue	v. large cones
11	"	W-2	>400	blue + tan	v. large cones
9012	Burlington, ND	Burlington N-1	>500	blue + tan	
13	"	" N-2	"	"	
14	"	" N-3	"	"	
9015	White Earth, ND	White Earth S-1	70	blue	
16	"	" S-2	145	"	
17	"	" S-3	>500	"	old remnant barn nearby
9018	Mohall, ND	Mohall W-1	>500	blue + tan	near shrubs, knoll
19	"	" W-2	"	"	near shrubs, terrace
20	"	" W-3	"	"	lg. cones, shrubs over terrace
21	"	" W-4	"	tan	grassy knoll, S. side
9022	Northgate, ND	Northgate E-1	216	blue	above culvert
23	"	" E-2	71	"	lg. seeds; N of culvert, E side
24	"	" E-3	219	"	lg. seeds; E side in mowed weeds
25	"	" E-4	30	"	lg. seeds; W end of culvert
26	"	" E-5	6	"	W side, first spotted; nr. snowberry
27	"	" E-6	>500	"	farther W, large cones
28	"	" E-7	>500	blue + tan	farthest W in buckthorn
9029	Oxbow, SAS	Oxbow S-1	28	blue	recollection of 8945 (plant A)
30	"	" S-2	83	"	" " (plant B)
31	"	" S-3	42	"	" " (plant C)
32	"	" S-4	>500	tan	" " (100 m away from A,B,C)
9033	Ind. Head, SAS	Indian Head B	>1000	blue	recollection of 8950
9034	QuApelle, SAS	QuApelle E-1	315	blue + tan	
35	"	" E-2	>500	"	smaller cones, good aroma

Table 5 : concluded.

Cross No.	Source Loc. of	Coll. site or Pedigree[1/]	No. Seeds	Seed color	Remarks
9036	Greenhouse	21534 x 21088M tetrapl. Saazer x Yug. 5/9	182	blue + tan	tetrapl. x dipl., get Saazer-type triploids
9037	"	21534 x 21361M tetr. Saazer x (Cas x 65009-64035M)	139	blue + tan	" " "
9038	"	21534 x 21429M tetr. Saazer x Cas - 19058M	119	"	" " "
9039	"	21534 x 64035M tetr. Saazer x Zattler Seedling	235	"	" " "
9040	"	21534 x 64037M tetr. Saazer x Zattler Seedling	241	"	" " "
9041	208:09	21521 x 64035M Saazer 36 x Zattler Seedling	>1000	"	diploid x dipl., get Saazer-type diploids
9042	221:09	21522 x 64035M Saazer 38 x Zattler Seedling	57	blue	" " "
9043	221:08	21522 x 21361M Saazer 38 x (Cas x 65009-64035M)	>500	"	" " "
9044	221:09	21522 x 21429M Saazer 38 x Cas-19058M	>500	blue + tan	" " "
9045	221:06	21522 x 8309-26M Saazer-38 x (tet.Hall.-21381M)	>1000	tan	dipl. x tetrapl; get Saazer-type triploids
9046	221:10	21522 x 8309-32M Saazer x (tet. Hall.-21381M)	>1000	tan	" " " " "
9047	109:3-4	21534 x OP tetraploid Saazer x OP	344	blue + tan	get Saazer-type triploids
9048	136:49	8802-35 x OP (Tett x 8309-32M) tetrapl. x OP	>500	blue + tan	get Tettnanger or Saazer type triploids

[1/] 8309-26M: Cas x 65009-64035M
8309-32M: - " -

Table 6. Hop varieties and selections grown in the Seeded Observation Nursery (Smith Yard). Corvallis, 1990. Pruned March 28; trained May 4, 14.

Accession or Sel. No.	Location Row:Hill	Name or Pedigree	Maturity[1]	Cone set[2] vigor	Harvest date	Yield[3]	Quality					Remarks
							α	ß	ratio	CoH	H/C	
					Sept.	lb/A	%	%		%		
21368	201:1-5	tetr. Atlas + (NBxSavG-TG)	M	VG	5	1527	12.0	4.4	73	37	2.26	triploid, high myrcene
21369	202: "	- " -	ML	VG	6	1288	9.6	4.8	66	33	2.60	" "
21498	203: "	Yeoman	E	P	8/28	316	12.9	4.1	75	26		
21370	204: "	tetr. Atlas x (NBxSavG-TG)	ML	G	6	1220	10.6	3.6	74	34	3.11	triploid, high myrcene
8401-04	205: "	21397 x 19172M	ML	G	6	1504	4.7	4.9	49	30	1.84	
21056	206: "	Bullion 10A	ME	VG	6	2006	9.9	4.9	67	37	2.35	
21514	207: "	Herbrucker-6	ML	G	6	1166	3.6	4.9	42	19		
21499	209: "	Zenith	E	P	8/28	117	10.0	3.1	76	25	3.49	
8401-41	212: "	21397 x 19172M	L	G	14	1809	3.3	4.9	40	26		
21287	213: "	Banner	ME	VG	6	1766	11.4	6.0	66	35	2.49	♂, high myrcene
21049	214: "	Styrian Golding	E	VG	8/28	1056	4.1	2.3	64	31	2.87	
8019-03	215: "	19185 x 21266M	ME	VG	6	1271	5.1	3.9	57	37		downy mildew
21515	216: "	Herbrucker-8	ML	VG	6	1237	3.6	6.0	38	20	2.02	high myrcene
8303-17	217: "	21397 x 64035M	M	G	6	742	3.7	3.4	53	26		top crop
21227	220: "	Perle	E	G	8/28	734	11.2	4.4	72	30	3.12	
8303-37	221: "	21397 x 64035M	M	G-P		1000e	3.9	4.8	45	19		
21519	222: "	Apolon x (Dunav[2]xNB-OP)	ME	G	7	623	7.8	3.5	69	29	2.23	
8601-25	223: "	61021 x 8309-26M	M	VG		1000e	8.6	3.7	70	25		baby, diploid
8020-32	224: "	19185 x 21267M	M	VG	7	1869	6.4	2.7	70	42		
8021-11	225: "	19185 x 21268M	M	G		1400e	4.7	2.1	70	24		sparse set
21041	227: "	Willamette	ML	G	7	689	5.8	3.8	61	35	3.06	sleeper
21520	228: "	Ba x (Groene Bel[2]xNB-OP)	ML	VG	7	960	3.6	3.2	53	36		♂
21403	229: "	Sticklebract	L	VG	14	2483	10.0	5.3	65	47	2.39	compact cone, high myrcene
8401-68	230: "	21397 x 19172M	ML	VG	7	1587	4.6	3.8	55	29		
21404	231: "	Green Bullet	L	P		200e	4.1	2.2	65	44		Roundup damage
64007	232: "	19105 x 19058	L	VG	14	1408	1.9	6.9	22	29	2.74	
8401-70	233:"	21397 x 19172M	ME	VG	7	1647	3.3	5.0	39	28		top crop
21238	234: "	Blisk	ME	VG	8/28	1886	12.7	4.0	76	34	2.39	triploid
8303-66	236: "	21397 x 64035M	L	VG	14	1152	3.4	4.3	44	26		high myrcene
21193	237: "	Nugget	ML	VG	7	2201	14.4	5.3	73	31	2.28	

Table 6. continued

Accession or Sel. No.	Location Row:Hill	Name or Pedigree	Maturity[1]	Cone set[2] vigor	Harvest date	Yield[3]	Quality					Remarks
							α	ß	ratio	CoH	H/C	
					Sept.		%	%		%		
21182	239:1-5	Galena	ME	VG	8/28	2560	14.6	9.4	61	41	2.20	♂, DM/cones
21405	240: "	SuperAlpha	L	G	14	1212	11.3	6.6	63	39		
21406	241: "	Alpharoma	L	VG	14	2193	10.0	4.1	71	31		
21003	242: "	tetraploid Fuggle	E	P		200e	3.8	2.0	66	28		
8401-76	243: "	21397 x 19172M	ML	VG	7	1792	2.4	3.3	42	31		v. large cones
8303-77	244: "	21397 x 64035M	ML	G		1000e	4.8	3.1	61	27		
21397	245: "	tetrapl. Hallertauer m.f.	M	P		200e	1.7	3.1	36	30		sleeper
8303-88	246: "	21397 x 64035M	ME	G		1200e	2.6	3.9	40	22		
8401-132	202:6-10	21397 x 19172M	ME	G	7	1024	3.8	4.6	45	23		
8403-121	204: "	21397 x 64035M		G-P		1000e	3.1	3.9	44	22		top crop
8301-01	205: "	21397 x 19058M	ML	VG	7	1638	4.2	4.7	48	33		
21521	208: "	v.f. Saazer 36	E	P		200e	4.1	3.8	52	24	3.25	used for crossing
21522	209: "	v.f. Saazer 38	E	P		100e	5.2	4.7	52	34		
8401-145	210: "	21397 x 19172M	L	G	14	793	5.5	4.6	55	33		sleeper
8301-57	211: "	21397 x 19058M	ML	VG	17	1105	4.3	4.8	47	32		
8401-158	212: "	21397 x 19172M	L	G		1200e	4.8	3.0	61	27		top crop
-163	213: "	"	M	G		1200e	2.8	2.0	59	27		
8303-122	215: "	21397 x 64035M	M	G		1400e	5.6	3.0	65	23		top crop
21485	216: "	SB x [Ha-OP x(Saazer x Ha-OP)]	L	VG	17	1237	10.8	5.5	66	23	2.11	
21516	217: "	Hersbrucker-9	L	G	17	747	5.3	6.7	44	19	2.57	
21517	218: "	Hersbrucker-red stem	L	VG	17	1203	6.2	7.3	46	20	2.32	
21518	219: "	Hersbrucker-alpha	L	VG	17	853	7.0	5.2	58	22	2.21	
8401-175	220: "	21397 x 19172M	L	VG	17	836	6.3	4.8	57	32		
21523	222: "	v.f. Lubelska	VE	G-P	8/28	282	6.5	4.9	57	24	3.54	
21524	223: "	v.f. Nadwislanska	E	P	8/28	69	5.0	4.5	53	24	3.66	
8401-192	224: "	21397 x 19172M	E	VG	8/29	1450	5.5	3.6	60	29		
-196	225: "	"	E	VG	8/29	1357	4.9	3.9	56	24		poor climber
8601-58	226: "	61021 x 8309-26M	ML	G		700e	5.6	2.6	68	21		baby, diploid
8405-38	228: "	21397 x 21337M	ML	G	10	503	5.1	3.6	58	26		top crop
8021-40	230: "	19185 x 21268M	E	VG	8/29	1348	5.9	3.7	62	34		

Table 6. continued

Accession or Sel. No.	Location Row:Hill	Name or Pedigree	Maturity[1]	Cone set[2] vigor	Harvest date	Yield[3]	Quality					Remarks
							α	ß	ratio	CoH	H/C	
					Sept.	lb/A	%	%		%		
8602-35	231:6-10	61021 x 8309-26M				200e	8.0	3.0	72	28		baby, diploid
-55	232: "	"				100e	9.1	4.4	67	27		baby, diploid
8303-124	233: "	21397 x 64035M	M	VG	10	992	3.6	3.4	52	26		sleeper
8405-39	234: "	21397 x 21337M	E	VG	8/29	1058	6.4	4.1	61	29		
8303-142	235: "	21397 x 64035M	M	G	10	864	8.0	5.5	59	30		top crop
8405-84	236: "	21397 x 21337M		P		600e	6.2	3.6	63	24		
8602-119	238: "	61021 x 8309-26M				100e	2.7	2.1	57	30		baby diploid
8405-101	239: "	21397 x 21337M	M	G-P	10	717	5.4	4.0	57	23		
8304-67	241: "	21397 x 64037M	ME	G	10	843	4.0	5.8	41	27		
8602-162	242: "	6021 x 8309-26M				400e	8.6	3.9	69	27		baby, diploid
8406-04	243: "	21397 x 21361M	M	VG	10	887	6.3	3.3	65	26		
21407	245: "	Cascade x OP	L	VG	10	2073	11.6	5.1	69	41		
8406-38	246: "	21397 x 21361M	E	VG	8/29	964	4.4	3.4	56	23		
21408	247: "	65009 x 63012M	L	VG		1600e	11.2	5.9	65	56		v. high CoH
21513	202:12-16	Cas x 19058M	L	VG	10	2261	12.0	5.8	67	32	2.44	
8602-189	203: "	61021 x 8309-26M				300e	9.9	3.7	73	21		baby diploid
-207	204: "	"		VG		400e	6.3	7.9	44	27		baby diploid
21500	205: "	Cas x 19058M	L	VG	10	1817	10.9	6.4	63	29	4.45	
8602-274	207: "	61021 x 8309-26M		VG		400e	12.3	3.6	77	39		baby diploid
-278	208: "	"		VG		1200e	10.3	3.8	73	28		baby diploid
8406-84	210: "	21397 x 21361M	ME	P-G	8/30	785	6.6	4.2	61	23		
-90	212: "	"	ME	P-G	8/30	853	2.8	5.3	34	24		
8407-06	213: "	21397 x 21380M	ME	G	8/30	1013	6.0	5.6	52	24		sleeper
-20	214: "	"	ME	P-G	8/30	700	7.4	4.0	65	24	2.78	sleeper
-26	216: "	"	ML	P-G	11	597	6.7	4.3	61	32		
-35	217: "	"	ML	P-G	11	597	7.3	4.3	63	27		
21228	218: "	Hallertauer (Fu-type)	E	VG	8/30	1224	4.6	2.6	64	27	2.94	
8025-57	219: "	19185 x 21344M	ME	VG	8/30	1361	6.2	2.1	75	26		
5026-152	222: "	19185 x 21353M	L	G	11	845	5.2	3.2	62	31		
21502	223: "	Cas x 19058M	L	VG	11	1604	8.4	8.5	50	33		

Table 6. continued

Accession or Sel. No.	Location Row:Hill	Name or Pedigree	Maturity[1]	Cone set[2] vigor	Harvest date	Yield[3]	Quality					Remarks
							α	ß	ratio	CoH	H/C	
					Sept.	lb/A	%	%		%		
21382	224:12-16	Cas x 19058M	L	VG	11	1408	10.4	8.7	54	24		
21251	225: "	21055 x 21109M	L	VG	11	1237	14.6	6.1	70	40	0.08	no humulene
8602-300	226: "	61021 x 8309-26M				600e	7.8	4.2	65	31		baby, diploid
-305	227: "	"				600e	9.1	4.3	73	23		baby, diploid
8407-43	228: "	21397 x 21380M	ME	P-G	8/20	631	5.2	5.3	49	27		
21200	229: "	v.f. Eroica	L	VG	11	1468	13.4	5.8	70	41		
21261	230: "	65009 x 19046M	L	VG	11	1450	8.7	6.7	56	23	1.96	
8602-411	231: "	61021 x 8309-26M				400e	7.2	5.3	58	31		baby, diploid
-578	232: "	"				400e	6.6	3.7	64	33		baby, diploid
21409	233: "	65009 x 19046M	L	G	11	1041	6.9	7.3	48	28		top crop
21503	234: "	Cas x 19058M	L	VG	11	1681	5.6	8.7	39	32	2.32	
8408-01	235: "	21397 x 21381M	ME	P	8/30	290	6.2	5.3	54	29	3.26	sleeper
8304-90	236: "	21397 x 64037M	ME	P	8/30	282	2.1	4.9	30	26		
-120	237: "	"	ME	G-P	8/31	555	2.8	5.4	34	24		
8603-73	239: "	61021 x 8309-32M		G		600e	6.2	5.3	54	31		baby, triploid
-77	240: "	"		G		600e	5.5	5.8	49	26		baby, diploid
-97	242: "	"		G		300e	4.8	3.9	55	29		baby, diploid
-232	243: "	"		G		200e	6.9	5.3	57	28		baby, ?
-288	202:17-21	"		G		200e	2.6	4.6	37	23		baby, diploid
-314	204: "	"	L	G		200e	6.0	5.3	53	23		baby, diploid
8408-66	206: "	21397 x 21381M	ME	G-P	8/31	444	6.3	6.7	48	23		
8603-346	208: "	61021 x 8309-32M		G		300e	12.3	3.5	78	22		baby, diploid
8408-70	209: "	21397 x 21381M	L	G	17	1374	4.8	5.6	46	32		sleeper
21199	212: "	65009 x 19182M	E	VG	8/31	1382	9.8	5.9	62	38	2.10	
8408-74	214: "	21397 x 21381M	L	P		800e	3.1	2.5	56	31		
21247	215: "	21055 x 21108M	ME	VG	8/31	1519	14.3	4.7	75	40		
8308-44	217: "	21397 x 21362M	L	P-G	12	512	5.5	4.0	58	24		
-46	219: "	"	ME	G-P	8/31	614	6.7	4.5	60	28		
8408-126	221: "	21397 x 21381M	L	G	11	1416	6.8	5.9	53	27	3.82	top crop
8031-02	222: "	56013 x 21271M	M	VG	8/31	1092	9.2	4.6	67	30		

Table 6. continued

Accession or Sel. No.	Location Row:Hill	Name or Pedigree	Maturity[1]	Cone set[2] vigor	Harvest date	Yield[3]	Quality					Remarks
							α	ß	ratio	CoH	H/C	
					Sept.	lb/A	%	%		%		
8409-18	224:17-21	21397 x 64033M	L	P		1000e	6.4	4.1	61	26		sleeper
21250	226: "	21055 x 21108M	ME	VG	8/31	1664	12.6	3.7	77	29	1.36	
8309-04	227: "	21397 x 21381M	L	G	12	819	2.4	4.6	35	31		
8603-481	228: "	61021 x 8309-32M	ME	VG		1400e	7.6	4.2	64	24		baby, triploid
8309-05	232: "	21397 x 21381M	ME	VG	8/31	1399	5.9	7.2	45	23	3.56	
21494	234: "	Cas x 21136M	M	VG	4	1024	6.4	6.3	51	26		
8309-07	235: "	21397 x 21381M	ME	G-P	4	512	7.1	5.9	55	26		
-08	237: "	"	ME	G	4	1092	7.1	6.1	54	24		
8603-564	238: "	61021 x 8309-32M	ML	G		700e	10.7	3.2	77	25		baby, diploid
8309-10	239: "	21397 x 21381M	ME	P-G	4	572	5.4	4.3	56	24		
21120	240: "	19005 x 19046M	L	G		200e	1.0	6.3	13	52		baby
8309-24	241: "	21397 x 21381M	ME	G	4	896	5.5	4.4	56	27		
21484	204:23-27	21397 x 21237M	ME	P		300e	3.0	3.8	44	30		treeshaded
8309-34	209: "	21397 x 21381M	ML	G-P	4	606	5.1	4.3	54	26		
21490	210: "	"	L	P-G	17	563	3.4	7.5	31	30	3.63	
21254	214: "	21055 x 21109M	ML	G		1000e	6.1	2.4	72	31		
21455	215: "	Mt. Hood	ML	P		400e	3.5	4.7	43	26		
21256	219: "	21055 x 21110M	M	G	4	725	14.9	6.2	70	42	1.37	
21457	220: "	21397 x 64035M	ME	P	4	213	5.0	3.9	56	24	3.56	sleeper
21257	224: "	21055 x 21110M	M	VG	5	2039	18.8	7.0	73	38	1.48	highest alpha
8254-167	225: "	21285 x 64037M	L	G	12	964	7.5	7.9	49	19	3.96	sleeper, Prosser
-244	227: "	"	ME	P	5	495	5.5	7.7	42	23	3.58	sleeper, Prosser
65009	228: "	BG x EG-XS	ML	VG	5	1553	10.7	7.8	58	42		
21469	229: "	21397 x 19058M	L	P	12	734	4.2	6.5	39	26	2.77	
21491	230: "	21397 x 21337M	M	G-P	5	572	6.4	4.4	59	23	2.30	
8036-83	231: "	64003 x 21268M	ML	G-P	5	589	7.9	4.5	64	37		
-84	232: "	"	L	VG	5	1212	4.2	2.5	62	25	3.55	weak arms
21505	234: "	"	L	VG	12	1186	7.4	2.7	73	31	4.33	
21497	237: "	Tettnanger B	E	P	13	111	6.8	6.6	51	25	3.79	
21470	238: "	21397 x 19058M	M	G	12	1007	2.7	6.3	31	29	2.43	

Table 6. concluded

Accession or Sel. No.	Location Row:Hill	Name or Pedigree	Maturity[1]	Cone set[2] vigor	Harvest date	Yield[3]	Quality					Remarks
							α	ß	ratio	CoH	H/C	
					Sept.		%	%		%		
21486	239:23-27	Cas x 21137M	ME	VG	5	1928	11.8	6.9	63	33		
21471	241: "	21397 x 19058M	ME	P	5	452	6.2	6.1	50	24		sleeper
21473	242: "	21397 x 64035M	ME	P	5	384	2.5	4.4	36	25		
21459	207:28-32	21397 x 21362M	L	P		300e	2.3	3.3	41	29		tree shaded
21202	208: "	YC x 64037M	L	VG	13	1613	6.5	6.8	49	31		
8407-35	213: "	21397 x 21380M	ML	P		500e	5.6	4.5	55	28		
-43	214: "	"	ME	P		500e	4.1	5.9	41	30		
21492	215: "	21397 x 21381M	L	P	13	35	4.3	4.8	47	29		
21507	216: "	Centennial	ME	P	14	452	12.6	4.2	75	29	2.42	
8308-20	219: "	21397 x 21362M	ML	G-P		1000e	7.2	3.8	66	26		top crop
21226	226: "	Chinook	L	G	13	828	13.8	4.2	77	37	2.34	
8309-05	227: "	21397 x 21381M	ME	VG	8/29	1237	5.1	6.5	44	23		
8408-74	228: "	"	L	G	13	614	4.9	3.9	56	28		
21490	229: "	"	L	VG	13	1322	4.7	7.4	39	24	3.55	
21536	231: "	65009 x 19046M	L	VG	13	2256	10.9	8.9	55	45	0.27	no humulene
21197	232: "	Swiss Tettnanger St-1	E	G	8/29	631	5.1	2.6	66	26	3.03	
21493	233: "	21397 x 21381M	E	G	8/29	640	7.6	4.8	61	22	3.52	sleeper
21222	234: "	Aquila	L	G	13	717	8.2	5.1	62	49	0.30	no humulene
21197	235: "	Swiss Tettnanger St-2	E	P-G	8/29	435	4.7	2.7	64	28	2.97	
21511	238: "	21254 x 21328M	L	G-P	14	589	12.4	5.3	70	35		
21512	239: "	21254 x 21335M	L	G-P	14	687	8.7	2.1	80	33		
21246	241: "	21055 x 21108M	L	VG	14	1049	13.9	3.9	78	40	1.06	

[1] E, ME, M, ML, L = early, med. early, medium, med. late, late
[2] VG, G, P = very good, good, poor
[3] green weight/5-hill plot x 0.08532; e = visual estimate and chem. analysis from 5-sample

Table 7. Agronomic and quality data of hops grown in the Seeded Hop Variety World Collection, Corvallis. 1990. Pruned March 26; trained May 7-8.

Accession No.	Location Row:Hill	Name	Maturity[1]	Cone set[2]	Harvest date	Yield[3]	Quality					Remarks
							α	ß	ratio	CoH	H/C	
					Sept.	lb/A	%	%		%		
19001	1:1-4	Brewer's Gold	L	G	7	1600	8.6	3.7	70	39	1.75	
21403	2: "	Sticklebract	L	VG		2200e	7.8	4.6	63	48		triploid
21404	3: "	Green Bullet	L	VG		1900e	5.8	2.9	66	45		triploid
21185	4: "	Hersbrucker - G	L	P	17	120	2.8	5.0	35	24	3.61	
21011	5: "	Late Cluster, L-16	L	G	14	1450	6.5	4.5	59	47		
21179	6: "	Hersbrucker-E	L	P	17	312	3.4	7.1	33	29		sleeper
21014	7: "	Hallertauer m.f.	E	P	8/20	261	5.0	4.1	55	18	3.58	
21015	8: "	Tettnanger	E	P	8/20	171	5.8	4.0	59	30	3.13	
21016	9: "	Fuggle-N	E	G	8/20	1152	5.2	2.2	70	27	2.74	
48209	10: "	Fuggle-H	E	G	8/20	1067	4.9	2.1	70	25		
56001	11: "	Hallertauer	E	P	8/20	405	4.3	4.0	52	20		sleeper
56002	12: "	Backa	ME	G-P	8/29	608	3.2	4.8	40	25		
56013	13: "	Cascade	ME	VG	8/29	1061	6.1	5.1	55	38		
21167	14: "	Hybrid-2	L	P-G		600e	8.8	5.4	62	37		
21039	15: "	Golden Star	L	VG		2200e	4.3	3.5	55	51		
60042	16: "	Shinshuwase	L	VG		2200e	3.9	2.9	57	57		
60019	17: "	Yugoslavian Golding	E	P	8/20	569	4.0	2.1	66	26		
61020	18: "	Savinja Golding	E	G	8/20	1035	4.0	1.9	68	27		
61021	19: "	Swiss Tettnanger	E	P	8/20	149	4.4	3.5	56	22	3.65	
62013	20: "	Comet	L	VG	14	1237	11.6	4.0	74	42	0.19	no humulene
21186	22: "	Spalter	E	P	8/20	192	3.9	3.1	55	22	3.64	
21169	24: "	Tardif de Bourgogne	L	P-G	14	896	4.0	4.6	47	20		
21170	25: "	Elsässer	ME	P	8/29	373	4.2	5.8	42	23	3.82	
21406	26: "	Alpharoma	L	VG		2200e	5.8	3.1	65	23		triploid
21187	28: "	Southern Brewer	ME	VG	8/29	1562	8.2	3.0	73	40		soft rot/crown
21188	29: "	NP 2/55	L	VG		1600e	4.9	3.4	59	33		
21284	30: "	Bramling	ME	P	8/29	277	5.0	1.9	72	27		
21173	31: "	Strisselspalt	L	P	14	352	4.4	2.7	62	28		
21227	32: "	Perle	E	G-P	8/20	747	9.6	3.3	75	28	2.82	
21405	33: "	SuperAlpha	L	VG		1800e	5.4	3.5	61	39		triploid

Table 7. continued

Accession No.	Location Row:Hill	Name	Maturity[1]	Cone set[2]	Harvest date	Yield[3]	Quality					Remarks
							α	ß	ratio	CoH	H/C	
					Sept.	lb/A	%	%		%	H/C	
21498	34:1-4	Yeoman	E	P	8/20	480	10.8	3.5	76	25	2.58	
21499	35: "	Zenith	E	P	8/20	373	9.1	2.3	80	22		
21193	36: "	Nugget	M	VG	8/29	1275	12.2	4.4	74	26		
21225	37: "	Olympic	ME	G	8/29	725	13.7	5.3	72	32	1.06	
21226	38: "	Chinook	ML	G	14	725	14.3	3.9	79	35		
62052	1:5-8	Density	L	VG		2000e	4.4	2.2	67	40		
62053	2: "	Defender	E	P	8/20	469	3.7	1.2	76	26		
64100	3: "	Bullion	ME	VG	8/29	2581	8.0	4.1	66	46	1.49	
64107	4: "	Northern Brewer	E	P	8/20	437	7.8	3.0	77	24		
65101	5: "	Talisman	L	G	14	757	5.3	2.6	67	54		
65102	6: "	Yakima Cluster, L-1	M	G-P	14	569	6.2	3.9	61	44		
21196	7: "	Bullion 6A	ME	VG	8/29	3162	9.9	4.9	67	43		
21182	8: "	Galena	ME	VG	8/29	1786	11.3	7.2	61	42		
66051	9: "	Progress	E	G	8/20	715	6.9	2.3	75	30		
66052	10: "	Pride of Ringwood	L	VG	14	1088	8.4	6.2	57	34		
66050	12: "	Alliance	E	G	8/20	1081	6.1	1.9	76	30		
21183	13: "	Eroica	L	VG	14	1653	11.7	4.7	71	43		
66054	14: "	Calicross	L	VG		2200e	7.3	4.9	60	40		
66055	15: "	First Choice	L	VG		1700e	7.8	7.8	50	40		
66056	16: "	Smooth Cone	L	VG		2000e	8.6	4.5	66	30		
68052	17: "	Petham Golding	L	G	17	1098	6.6	2.2	75	31	1.88	
21043	18: "	Wye Challenger	ME	G	8/29	608	7.6	4.2	65	24	3.15	
21044	19: "	Wye Northern	E	G-P	8/20	455	8.1	4.3	65	23	2.26	
21049	20: "	Styrian Golding	E	F	8/20	800	4.2	1.8	70	27	2.76	
21238	22: "	Blisk	ME	VG	8/29	2538	10.3	3.3	76	37		triploid
21040	23: "	Columbia	L	G	17	747	7.0	4.1	63	42	2.09	triploid
21041	24: "	Willamette	ML	VG	17	1237	6.1	3.7	62	37	2.70	triploid
21215	27: "	Nordgaard 1478	E	P	8/20	139	7.5	3.1	71	29		
21216	28: "	Groene Bel	ME	G	8/29	885	5.9	3.6	62	26		
21217	29: "	Star	E	P	8/20	331	2.7	1.3	67	21		

Table 7. continued

Accession No.	Location Row:Hill	Name	Maturity[1]	Cone set[2]	Harvest date	Yield[3]	Quality					Remarks
							α	ß	ratio	CoH	H/C	
					Sept.	lb/A	%	%		%		
21097	30:5-8	Hüller Bitterer	L	G	17	853	8.4	4.5	65	31	2.05	
21220	31: "	Eroica v.f.	L	G	17	1035	10.4	4.4	70	44		
21197	32: "	Swiss-Tettnanger St-1	E	P-G	8/20	480	4.0	1.8	69	25		Fuggle type
21055	33: "	Com x (BGxFu-Colo 2-1)	ME	G	8/29	1045	15.3	4.3	78	48	1.33	
21514	34: "	Hersbrucker-6	L	P	17	171	3.4	4.7	42	21		
21515	35: "	Hersbrucker-8	L	P-G	17	405	4.2	5.3	44	18	2.05	
21516	36: "	Hersbrucker-9	L	G	17	821	4.3	5.5	44	17		
21517	37: "	Hersbrucker-redstem	L	P	17	299	4.9	5.0	50	21		
21518	38: "	Hersbrucker-alpha	L	P	17	331	4.7	5.1	48	16		
21519	39: "	Ap 71/74-2a	L	P	17	128	6.7	2.2	75	24		
21050	1:9-12	Ahil	ME	VG	8/30	1531	10.8	4.3	72	24	2.14	
21052	2: "	Atlas	ME	P	8/30	341	10.6	3.6	74	38		
21053	3: "	Aurora	ME	G	8/30	805	10.3	3.6	74	21	2.94	
21051	4: "	Apolon	ME	VG	8/30	949	10.8	3.8	74	24		
21081	5: "	Dunav	ME	VG	8/30	960	6.9	3.3	68	28	3.46	
21082	6: "	Neoplanta	ME	G	8/30	782	13.0	4.6	74	40		
21083	7: "	Vojvodina	ME	P	8/30	427	8.2	3.1	73	29		
21080	8: "	Backa	L	P		400e	3.8	4.1	48	25		
21079	9: "	Blue No. Brewer	E	P	8/20	85	4.2	1.7	72	24		
21093	12: "	Northern Brewer	E	P	8/20	203	8.4	2.8	75	22	2.54	
21056	13: "	Bullion v.f.	ME	VG	8/29	3061	11.1	5.0	69	40		
21092	14: "	Cascade v.f.	ME	G	8/30	549	7.6	5.7	57	38	2.54	
21116	15: "	Brewer's Gold v.f.	ML	VG	8/30	1095	11.7	4.9	70	37		
21112	16: "	Wye Target	ME	VG	8/30	1701	11.4	4.8	70	35	1.97	
21239	17: "	Bobek	E	VG	8/21	1440	7.2	4.0	64	26	2.55	
21113	18: "	Lublin	E	P	8/21	469	3.5	4.0	47	21		
21114	19: "	Nadwislanska	E	P	8/21	171	2.8	4.1	41	25	3.16	
21115	20: "	Pocket Talisman	L	P	17	483	4.3	2.3	65	58	1.35	
21078	21: "	Record	ME	VG	8/30	1072	6.9	6.3	52	27	2.66	
21240	22: "	Buket	E	G	8/21	960	10.0	4.3	70	22		

Table 7. continued

Accession No.	Location Row:Hill	Name	Maturity[1]	Cone set[2]	Harvest date	Yield[3]	Quality					Remarks
							α	ß	ratio	CoH	H/C	
					Sept.	lb/A	%	%		%		
21276	23:9-12	Early Prolific	E	P	8/21	448	4.0	1.9	68	23	2.68	
21277	24: "	Early Promise	E	P	8/21	181	5.0	1.3	80	25		
21278	25: "	Keyworth's Early	ME	G-P	8/30	597	8.8	3.4	72	31		
21179	26: "	Keyworth's Midseason	E	VG	8/21	2133	7.4	3.0	71	45		
21280	27: "	Pride of Kent	E	VG	8/21	1280	8.8	5.9	60	39		
21281	28: "	Sunshine	E	P	8/21	320	8.1	2.6	75	28		sleeper
21282	29: "	Wye Saxon	E	P	8/21	213	7.7	3.5	69	17		
21283	30: "	Wye Viking	E	P	8/21	341	7.2	3.4	68	22	2.51	
21396	32: "	Tolhurst	E	P	8/21	228	1.5	2.8	35	27		
65104	33: "	Late Cluster, L-8	L	G	17	1024	5.6	4.2	57	46		
21520	39: "	Ba 11/72-19a	L	P	17	213	5.5	4.0	58	34		

[1] E, ME, M, ML, L = early, med. early, medium, med. late, late
[2] VG, G, P = very good, good, poor
[3] Green weight/4-hill plot x 1.0665; e = visual estimate

Table 8: Preliminary Tettnanger-type vigorous triploid selections from the '89 Nursery. Corvallis, 1990.
Pruned: March 27; trained May 2, 7, 1990.

Selection No.	Location Row:Hill	Pedigree[1]	Maturity	Yield	α	β	ratio	CoH	Oil	Percent of oil [2]					Major hydroc	Remarks
										C	F	H	M	H/C		
				lbs/A	%	%		%	ml/100 g	%	%	%			%	
8802-02	136:16	61021 x 8309-32M	early	3370	6.7	4.9	58	23	1.32	8.3	0	29.7	41.8	3.56	79.8	
-12	26	"	early	2133	6.0	4.1	60	26	1.67	8.3	0	28.6	46.7	3.44	83.6	
-18	32	"	early	2432	8.2	5.4	60	22	1.50	3.3	7.9	11.6	58.3	3.53	81.1	
-19	33	"	med. ea.	1749	5.6	4.2	57	23	1.22	6.3	8.3	21.2	48.9	3.36	84.7	
-24	38	"	med. ea.	1706	7.9	6.6	55	21	1.75	5.8	11.0	20.3	44.4	3.52	81.5	
-27	41	"	medium	2602	6.6	3.9	63	24	1.34	7.0	10.0	22.4	43.6	3.20	83.0	
-29	43	"	med. ea.	1920	7.3	4.4	63	27	1.51	9.5	trace	32.0	28.9	3.36	70.4	posthumulenes?
-37	51	"	med. ea.	1749	8.3	4.9	63	25	1.99	4.4	7.6	15.2	59.3	3.49	86.5	
-42	137:04	"	med. ea.	2474	8.7	4.8	64	23	1.68	7.5	9.2	24.9	40.2	3.34	81.8	2n - 29(?)
-45	07	"	medium	1536	8.3	5.2	61	23	1.35	5.3	11.0	19.2	43.8	3.62	79.3	
-46	08	"	early	1322	6.0	4.4	58	24	1.71	6.4	0	20.2	52.9	3.15	79.5	
-48	10	"	med. ea.	2688	9.5	5.4	64	26	1.48	5.0	10.1	17.3	49.6	3.49	82.0	
-57	19	"	medium	1365	6.9	6.3	52	23	1.81	6.3	trace	20.6	54.5	3.26	81.4	
-59	21	"	med. ea.	1024	9.0	5.9	61	22	1.70	5.9	7.5	18.4	52.7	3.11	84.5	
-64	26	"	med. ea.	2218	5.6	3.8	59	26	1.37	5.3	10.1	17.2	54.3	3.27	86.9	2n - 31(?)
-68	30	"	medium	1164	8.1	5.3	60	22	1.56	7.8	14.3	26.1	25.3	3.34	73.5	
8804-03	33	21497 x 8309-26M	early	1322	6.0	2.9	67	26	0.65	5.9	18.5	21.1	38.3	3.60	83.8	2n - 21(?)
-05	35	"	early	1152	5.0	3.0	62	31	0.48	6.1	14,5	21.4	33.3	3.52	75.3	2n - 20
8805-06	138:11	21497 x 8309-32M	early	2218	6.0	5.1	54	24	1.35	7.2	11.0	23.8	42.7	3.31	84.7	
-07	12	"	early	1877	6.2	2.6	71	25	1.11	9.5	0	31.9	44.1	3.36	85.5	
-11	16	"	med. ea.	2815	8.0	4.8	63	25	1.54	9.5	0	31.7	41.5	3.35	82.7	
-13	18	"	early	2730	9.8	5.6	64	22	1.41	5.5	11.5	19.6	41.3	3.57	77.9	
-15	20	"	med. ea.	2432	6.7	5.3	56	21	1.35	8.1	trace	26.5	41.9	3.27	76.5	
-40	45	"	early	2090	9.4	4.8	66	21	0.83	4.4	7.9	15.2	57.6	3.42	85.1	
8806-02	52	21497 x 8309-26M/32M	early	1109	7.1	4.3	62	21	1.05	7.7	0	27.8	44.7	3.59	80.2	
-11	139:09	"	med. ea.	1237	5.3	4.4	52	24	1.65	5.0	trace	17.6	63.1	3.51	85.7	
-12	:10	"	early	1792	7.0	5.9	54	20	0.89	4.0	11.6	14.6	46.1	3.64	76.3	
-13	:11	"	early	1578	7.6	4.8	61	21	0.49	3.5	5.6	12.2	59.5	3.53	80.8	
-17	:15	"	early	1834	4.8	5.6	46	20	1.11	4.3	9.2	15.3	55.4	3.58	84.2	
21521	208:6-10	Saazer-36 control	early	200	4.1	3.8	52	24	0.07	3.3	11.1	10.8	57.3	3.25	82.5	
61021	19:1-4	Swiss Tettn. control	early	150	4.4	3.5	56	22	0.31	5.8	16.4	21.3	34.9	3.67	78.4	
21497	commercial	Tettnanger B control	early	725	4.0	4.8	45	25	0.52	5.1	16.3	17.1	44.2	3.65	82.7	

[1] 61021 - Swiss Tettnanger
21497 - Tettnanger
8309-26M - Cas x 65009-64035M
8309-32M - - " -

[2] Caryophyllene; Farnesene; Humulene; Myrcene

Table 9 : Triploid Tettnanger-type baby selections grown for the first year in a 4-hill Observation Nursery, Main Yard, Corvallis. 1990.
Planted Oct. 1989; pruned March 27, 1990; trained May 9.

Selection Number	Location Row:Hill	Pedigree	Yield[1]	Quality α	Quality ß	Quality ratio	Quality CoH	Remarks
			lb/A	%	%		%	
8802-02	7:17-20	61021 x 8309-26M	300e	9.4	5.9	62	23	
-12	17: "	"	200e	8.0	4.3	65	23	
-18	23: "	"	300e	6.7	5.9	53	25	
-19	24: "	"	300e	4.9	4.0	55	23	
-24	28: "	"	200e	6.9	7.5	48	23	
-26	30: "	"	200e	11.6	5.9	66	28	
-27	31: "	"	200e	7.7	4.9	61	26	
-46	5:21-24	"	300e	7.4	4.3	63	22	
-48	7: "	"	400e	8.8	5.8	60	26	
-57	16: "	"	200e	5.7	6.8	46	26	
-59	18: "	"	400e	7.3	4.6	62	24	
-68	25: "	"	300e	5.7	6.0	49	24	
8805-06	33:21-24	61021 x 8309-32M	200e	5.8	4.2	58	26	
-11	34: "	"	100e	9.1	5.5	62	29	
-13	35: "	"	200e	7.6	4.9	61	21	
-15	36: "	"	100e	5.0	5.2	49	23	
-18	38: "	"	100e	7.0	4.3	64	26	
8806-02	15:25-28	21497 x 8309-26M/32M	400e	5.1	5.5	48	29	
-11	23: "	"	100e	5.4	3.8	58	26	
-12	24: "	"	300e	6.7	6.3	52	26	
-13	25: "	"	200e	6.5	4.6	59	24	
-17	29: "	"	200e	5.2	5.0	51	25	

[1]e = visual estimate; chem. analysis is on 5-cone samples

Table: 10 Vigorous zero-alpha/high-beta selections from the '89 Nursery, Corvallis, 1990.
Pruned: March 27; trained: May 2.

Accession or Selection No.	Location Row:Hill	Pedigree[1]	Maturity[2]	Harv. Date	Yield[3]	α	ß	ratio	CoH	oil	Percent of oil[4] M	H	C	F	H/C	Major Hydroc.	Remarks
				Sept	lbs/A	%	%		%	ml/100g	%	%	%	%		%	
8808-03	139:32	21120 x 19046M	L	7	1280	1.4	8.2	15	42	0.96	56.0	1.8	2.9	0.1	0.62	60.8	top crop
-09	38	- " -	L	7	1408	0.5	8.1	5	53	0.99	56.9	1.7	3.1	0.1	0.55	61.8	large cones
-11	40	- " -	L	7	1792	0.3	7.6	4	27	0.88	38.3	14.9	8.9	0.1	1.67	62.2	high humulene
-25	140:02	- " -	ML	7	2858	3.0	8.9	25	31	1.93	74.7	0.8	0.8	0.1	0.99	76.5	compact cones
-34	11	- " -	ME	7	1962	0.6	7.7	7	49	0.97	72.5	1.0	6.1	0.1	0.97	79.7	
-46	23	- " -	L	11	1194	0.0	8.8	0	41	1.39							
-55	32	- " -	ML	11	1066	1.7	7.6	18	38	0.97	50.3	3.3	2.8	0.1	1.17	56.5	
-65	42	- " -	ME	11	2560	1.2	8.7	12	38	1.70	33.2	5.4	3.1	0.1	1.75	41.8	
74	51	- " -	E	11	1109	0.5	7.7	6	57	0.83	54.8	7.0	2.9	0.1	2.41	64.8	
-130	142:03	- " -	ME		1200e	1.8	7.6	19	40								
-136	09	- " -	ML		1200e	0.9	7.5	11	37								top crop
-142	15	- " -	E		1400e	0.4	9.7	4	43								compact mlg cone
8809-22	143:03	21120 x 21119M	ME	13	1706	1.5	7.3	17	35	0.84	33.5	9.4	3.8	11.8	2.45	58.5	high farnesene
-56	37	- " -	L	14	1024	0.4	7.5	5	35	1.21							
-63	44	- " -	L		1300e	0.8	7.1	10	53								
-71	52	- " -	L		1200e	0.1	6.9	2	52								
-92	144:21	- " -	L		1200e	2.1	8.0	21	32								
-105	34	- " -	L		1200e	0.0	8.9	0	43								
-115	44	- " -	ML		1200e	1.6	8.3	16	39								
-132	145:09	- " -	L		1300e	0.3	8.0	3	53								sparse set
-146	23	- " -	ME		1000e	0.3	8.6	3	45								hard pick
8811- 05	146:39	21121 x 21119	E	14	1280	2.8	8.2	25	36	1.62	65.3	13.0	1.0	0.0	1.82	79.3	lg cones, humulene
21120	1:47-48	19005 x 19046M	ML	7	1216	1.6	5.8	21	40	1.00	54.9	1.6	2.5	0.1	0.65	59.1	control

[1]21120 = (LGpS x Fu-FuS) x LCS-FuS
21121 = - " -
21119M = - " -
19046M = LCS x FuS

[2]E, ME, ML, L = early; med. early; med. late; late

[3]green wt. of single hill x 0.42659; e = visual estimate

[4]M, H, C, F = myrcene, humulene, caryophyllene, farnesene

Table 11 : Agronomic and quality data of Native North American female hops grown at Corvallis, OR in 1990. Planted June 1989.

Accession No.	Location Row:Hill	Name or Pedigree	Vigor[1]	Yield[2]	Quality α	Quality ß	Quality ratio	Quality CoH	Remarks
				lb/A	%	%	%	%	
21596	2:39-40	Utah 11	VG	811	1.9	2.3	45	30	
21599	3: "	Utah 12	VG	1386	2.6	2.8	49	76	late
21600	4: "	Utah 13	VG	100e	1.7	1.4	55	79	large cones
21552	6: "	Missouri 4	VG	640	5.0	2.5	67	62	compact cones, late
21557	19: "	Missouri 3	VG	640	3.7	2.4	61	59	late
21562	12: "	Iowa 2	VG	853	1.4	1.4	50	64	
21564	13: "	Iowa 4	VG	896	2.9	4.5	39	69	
21565	14: "	Iowa 5	G	100e	0.7	1.6	29	67	
21578	21: "	Montana 6	G	100e	2.4	2.3	51	59	early, compact cones
21583	24: "	Montana 10	G	100e	5.3	2.3	69	73	compact cones
21586	25: "	Montana 12	G	100e	5.2	5.3	49	67	compact cones
21594	27: "	Montana 20	G	100e	3.8	2.9	57	66	compact cones
21602	30: "	Montana 24	G-P	100e	4.7	4.6	50	67	
58016	1:41-44	Utah 526-5	VG	853	2.4	1.4	63	27?	late, aphid resistant
60020	3: "	New Mexico 2-4	VG	400e	1.6	3.1	33	44	early
60021	4: "	New Mexico 3-5	VG	100e	2.8	1.7	62	67	early
60024	6: "	Colorado 1-2	VG	200e	5.3	3.8	58	58	♂, early, monoecious
60027	8: "	Colorado 2-2	VG	565	1.3	2.6	33	65	early
60029	10: "	Colorado 3-1	VG	114	3.8	3.0	55	65	late
60032	11: "	Colorado 5-1	VG	600e	2.4	1.7	58	47	♂, early, monoecious
60037	12: "	Wyoming 2-1	VG	1290	4.0	3.4	54	44	late
60038	13: "	Wyoming 3-1	VG	224	1.6	3.0	35	60	early, aphid susceptible
60015	15: "	Arizona 1-4	VG	512	3.1	3.4	48	73	
60016	16: "	New Mexico 1-3	VG	300e	2.6	2.2	54	67	early
60025	17: "	Colorado 1-3	G-VG	200e	6.3	2.2	74	53	ruffled cones
60033	19: "	Colorado 6-1	VG	200e	1.8	2.5	42	68	early
60035	20: "	Colorado 7-2	VG	142	3.1	5.0	38	49	early
21551	22: "	Nebraska 3	VG	437	3.5	3.2	53	62	late, compact cones
21554	23: "	Nebraska 6	G	491	2.5	2.4	51	58	
21556	24: "	Missouri 2	VG	704	2.3	1.7	58	61	compact cones, late
21559	25: "	Missouri 5	P	200e	0.9	2.2	28	53	late
21563	27: "	Iowa 3	G	384	1.0	1.1	48	52	
21566	28: "	Iowa 6	G	384	4.0	4.1	49	66	
21567	29: "	Iowa 7	VG	150e	2.5	3.2	44	76	small compact c., late
21568	30: "	No. Dakota 1	VG	405	4.5	5.7	44	68	
21576	33: "	Montana 4	G	100e	4.6	4.2	53	58	early
21579	34: "	Montana 7	VG	100e	4.4	4.0	52	58	hard pick
21581	35: "	Montana 9	VG	100e	3.2	2.8	53	77	early, hard pick
21590	41: "	Montana 16	G	100e	1.0	1.7	36	66	early, hard pick
21591	42: "	Montana 17	G	100e	1.5	1.2	56	61	small compact cones
21592	43: "	Montana 18	VG	100e	5.2	4.4	54	64	

[1]VG, G, P = very good; good; poor
[2]Yield factors: 2-hill plot: 0.21329; 4-hill plot: 0.10665 e = visual estimate

Table 12: Native North American male hops grown at Corvallis, OR in 1990. Planted June 1989.

Accession No.	Location Row:Hill	Name or Pedigree	Vigor[1/]	Quality α	Quality β	Quality ratio	Quality CoH	Remarks
21595M	1:39-40	Montana 21	G	26.8	36.7	42	48	
21555M	8: "	Missouri 1	VG	32.7	36.0	48	53	
21558M	10: "	Missouri 4	VG	37.8	39.6	49	51	
21561M	11: "	Iowa 1	VG	23.5	54.7	30	61	♂, monoecious
21569M	15: "	No. Dakota 2	G	40.9	36.7	53	43	
21570M	16: "	No. Dakota 3	G					not collected
21572M	17: "	No. Dakota 5	G					not collected
21573M	18: "	No. Dakota 6	G	42.1	37.7	53	41	
21582M	23: "	Missouri 7	VG	32.4	48.9	40	46	
21597M	28: "	Montana 22	G-P					not collected
21601M	29: "	Montana 23	G	35.3	38.2	48	47	
60013M	2:41-44	Arizona 1-2	VG	38.5	22.8	63	58	
60023M	5: "	Colorado 1-1	VG	26.5	40.1	40	38	
60026M	7: "	Colorado 2-1	VG	27.1	40.3	40	57	early
60028M	9: "	Colorado 2-3	VG	39.8	30.3	57	49	early
21117M	14: "	Native Wisconsin	VG	29.9	36.3	45	32	not Wild American
60031M	18: "	Colorado 4-1	VG	35.7	42.5	46	36	
21549M	21: "	Nebraska 1	VG	33.5	45.8	42	53	
21560M	26: "	Missouri 6	VG	34.5	48.0	42	47	
21571M	31: "	No. Dakota 4	G	39.5	28.5	58	43	
21574M	32: "	No. Dakota 7	G					not collected
21585M	37: "	Montana 11	P					not collected
21587M	38: "	Montana 13	VG	30.5	44.9	40	49	long arms
21588M	39: "	Montana 14	VG	24.3	53.9	31	44	
21589M	40: "	Montana 15	G	25.7	49.3	34	42	

[1/] P, G, VG = poor, good, very good

Table 13: Oregon commercial off-station plots in 1990.

USDA Access. No.	Grower	Acres	Seeds	Leaf + Stem	Total Production	Yield	No. Bales	Quality "as is" α	β	CoH	Oil	C	F	H	M	Major hydroc. C+F+H+M	Remarks
			%	%	lbs	lb/A		%	%	%	ml/100 g	%	%	%	%	%	
21455	Goschie	3.0	1	1	4024	1341	20	4.9	6.3	26	1.24	9.3	0.2	23.5	50.0	83.0	Mt. Hood
21457	Coleman	3.5	1	0	5213	1489	27	4.1	3.5	24	1.12	8.3	0.3	28.3	45.9	82.7	
21459	Stauffer	3.3	0	1	6339	1920	32	3.1	3.4	27	0.64	5.3	4.7	18.2	53.2	81.4	
21484	Butsch	3.5	0	1	8035	2296	40	2.6	3.7	30	0.60	11.9	0.3	43.3	27.4	82.9	baby
21490	Weathers	4.9	0	1	10710	3010	54	3.1	5.7	23	1.23	7.0	0.3	22.5	52.2	82.0	HRC lot
"	"		0	1	4038	3010	20	3.1	5.7	24	1.12	6.4	0.2	21.0	55.0	82.7	Stroh lot
21491	Serres	2.5	0	5	3103	1241	16	3.9	3.5	20	0.68	12.9	0.1	34.1	35.0	82.1	hard pick
21496	Weathers	3.0	1	6	1438	479	7	3.7	4.2	21	0.52	7.1	12.1	20.3	44.2	83.7	
21497	Goschie	3.0	7	1	2176	725	11	4.0	4.8	25	0.52	5.1	16.3	17.1	44.2	82.7	
21120	Annen	2.0	16	0	2586	1293	13	1.2	7.1	65	2.54	1.6	0.1	0.8	70.2	72.7*	spec. aroma

*posthumulene sesquiterpenes are 6.3% of total oil.

Yield comparison of Liberty (USDA 21457) from 3-acre commercial trials with the state averages of representative aroma hops Willamette and Tettnanger over a three-year period. 1988 to 1990.

		yield, lbs per acre		
Year	Cultivar	Oregon	Washington	Idaho
1988	Liberty	1636	soil problem	798
	Willamette	1340	1020	480
	Tettnanger	1100	890	not grown
1989	Liberty	1925	1025	560
	Willamette	1590	1310	not grown
	Tettnanger	1080	1040	not grown
1990	Liberty	1738	996	809
	Willamette	1420	1280	not grown
	Tettnanger	1290	980	not grown
3 yr avg.	Liberty	1766	1011 1/	722
	Willamette	1450	1203	480 2/
	Tettnanger	1157	970	not grown

1/ based on 2-year data

2/ grown only one year

INFORMATION SHEET, USDA 21257
(Selection No. 7313-83)

Pedigree: 21055 x 21110M
[Comet x (BG x Fu-Colo2-1)] x Bu-ZS

Genetic composition: 1/4 Comet; 1/4 Bullion; 1/8 Brewer's Gold; 1/8 German mildew-resistant aroma hop; 1/16 Fuggle; 1/16 Colorado Wild American; 1/8 unknown.
Diploid: Chromosome number 2n = 2x = 20.

Maturity: Medium early (about August 25 in Western Oregon).

History:
1973: Cross 7313 made at Oregon State University.
1974: Seeds germinated in the spring; 111 seedlings transplanted to the field.
1975: Single-hill nursery plant, no cone samples.
1976: Second year nursery plant, little downy mildew infection despite no control measures; compact cones.
1977: Five-hill seedless observation nursery, no cone samples.
1978: First production year, medium early, sparse set.
1979: Second production year, early.
1980: Accession Number 21257 assigned; excellent cone set, medium early.
1981: Established at seedless Smith Yard.
1982: First production year, seedless Smith Yard, 5-hill plot.
1983: To Prosser, Washington.
1983 to
1990: Large tapered compact cones like USDA 65009; early; occasionally somewhat sparse cone set; downy mildew observed in 1989.

Pruning and training: Like any other hop, no special precautions required.

Picking and drying: Compact cones, little shatter, easy to dry.

Cone type: Large compact, tapered, 250-350 mg dry weight per cone.

Storage stability: Fair to good, comparable to Centennial (21507), better than Chinook or Eroica; not as good as Nugget or Galena. In six different tests since 1979 the alpha remaining has ranged from 50-75%, with an average of 63%.

Diseases: No systemic downy mildew infection. Downy mildew cone infection observed only once. No Verticillium wilt.

Yield and quality data of USDA 21257 (5-hill plots)

Year	Location	Yield[1]	α	β	Ratio	CoH	6 mo. storage	Oil	Percent of total oil[2]					Major Hydroc.	Remarks
									H/C	C	F	H	M	(C+F+H+M)	
		lb/A	%	%		%	%α remain	ml/100 g		%	%	%	%		
1976	Main Yard		15.9	4.5	78										single hill
1978	Will. Yard	1152	15.7	6.3	71			2.14							
1979	"	1424	15.4	6.5	70	36	64	2.78	1.52	6.4	0	9.7	67.1	83.2	
1980	"	1305	15.9	6.7	70	36	53	3.31	1.83	5.4	0	9.9	62.1	77.4	
1982	Smith Yard	1200e	13.4	6.2	68	42									
	Will. Yard	1400e	12.2	5.4	67	40									
1983	Smith Yard	1400e	13.3	5.6	70	34									
	Will. Yard	1000e	11.2	5.2	68	38									
1984	Smith Yard	1937	16.8	7.7	69	41	68	3.44							
1985	"	2218	18.3	7.8	70	39	68	3.34							
1986	"	1500e	13.9	6.8	67	38									
1987	"	1800e	15.1	7.6	66	40									
1988	"	1689	15.9	6.1	72	37	75	2.54							
1989	"	1766	16.2	8.0	67	41	50	2.35	1.42	6.0	trace	8.6	60.6	75.2	
1990	"	2039	18.8	7.0	73	38	in progress	2.49	1.48	3.2	0	4.7	72.4	80.3	
Average (Oregon)		1559	15.2	6.5	70	39	63	2.80	1.56	5.3	0	8.2	65.6	79.1	
1988	Prosser, WA	2760	12.1[3]	6.6		39		2.34	1.53	7.0	0	10.7	59.3	77.0	α> Nug., Galena

[1] e = visual estimate [2] Caryophyllene, Farnesene, Humulene, Myrcene
[3] second highest of all hops in the test (behind the low producing Yeoman)

The 1982 and 83 data for OR were 5-cone samples. If these are not used the averages would be: alpha 16.2; beta 6.9

14 yrs Galena (Or) 1881 10.6 6.6 63 39 75 1.16 2.10 4.6 o.1 10.0 55.6 70.3

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HOP VARIETY : GALENA (21182)

Pedigree	Bred from Brewers Gold by open pollination.
Maturity	Early to mid-season.
Yield	1900 - 2500 kg/ha. or 1700-2230 lb/ac.
Growth Habit	Neat and columnar.
Disease Reaction	Exhibits reaction to infection with Prunus necrotic ring-spot virus. Some resistance to downy mildew.
Pickability	Good.
Drying-Baling	Normal.
Cone-Structure	Medium compact and plump.
Quality:	
Lupulin	Abundant, yellow in color.
Aroma	Medium but pleasant hoppiness.
Alpha Acids	12.0 - 14.0% w/w.
Beta Acids	7.0 - 9.0% w/w.
Co-Humulone	32 - 42% of alpha-acids.
Storageability	75 - 80% alpha-acids remaining after six (6) months storage @ 20° C.
Total Oil	0.9 - 1.2% v/w.
Myrcene	55 - 60% of whole oil.
Humulene	10 - 15% of whole oil.
Caryophyllene	3 - 5% of whole oil.
Farnesene	<1% of whole oil.
General Trade Perception	An excellent high alpha-acids hop with balanced bittering properties combined with an acceptable aroma profile.
Other Information	Released in 1978 and now a major U. S. high alpha-acids hop.

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HOP VARIETY: NUGGET (2/1/93)

Pedigree	Selected from a cross between Brewers Gold and a high alpha-acids male with good storage properties.
Maturity	Mid-season.
Yield	1900 - 2500 kg/ha. or 1700-2230 lb/ac.
Growth Habit	Good.
Disease Reaction	Little visual reaction to infection with Prunus necrotic ring-spot virus. Moderate to good resistance to downy mildew.
Pickability	Excellent.
Drying-Baling	Normal.
Cone-Structure	Heavy, tight and moderately long.
Quality:	
Lupulin	Plentiful and yellow-orange in color.
Aroma	Quite heavy and herbal.
Alpha Acids	12.0 - 14.0% w/w.
Beta Acids	4.0 - 6.0% w/w.
Co-Humulone	24 - 30% of alpha-acids.
Storageability	70 - 80% alpha-acids remaining after six (6) months storage @ 20° C.
Total Oil	1.7 - 2.3% v/w.
Myrcene	51 - 59% of whole oil.
Humulene	12 - 22% of whole oil.
Caryophyllene	7 - 10% of whole oil.
Farnesene	<1% of whole oil.
General Trade Perception	A high alpha-acids hop with a good aroma profile.
Other Information	Released in 1982 and now a major high alpha-acids variety in the U. S. A.

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HOP VARIETY: CHINOOK (2/226)

Pedigree	From a cross between Petham Golding and a USDA-selected male with high alpha-acids and good storage properties.
Maturity	Mid-season to late.
Yield	2000 - 2500 kg/ha. or 1780-2230 lb/ac.
Growth Habit	Good and neat.
Disease Reaction	Tolerant to infection with Prunus necrotic ring-spot virus, moderately resistant to downy mildew. Not excessively sensitive to insects.
Pickability	Good.
Drying-Baling	Normal.
Cone-Structure	Long, medium compact with turned outward petals.
Quality:	
Lupulin	Abundant and yellow-orange in color.
Aroma	Mild to medium-heavy, spicy.
Alpha Acids	12.0 - 14.0% w/w.
Beta Acids	3.0 - 4.0% w/w.
Co-Humulone	29 - 34% of alpha-acids.
Storageability	65 - 70% of alpha acids remaining after six (6) months storage at 20° C
Total Oil	1.5 - 2.5% v/w.
Myrcene	35 - 40% of whole oil.
Humulene	20 - 25% of whole oil.
Caryophyllene	9 - 11% of whole oil.
Farnesene	<1% of whole oil.
General Trade Perception	A high alpha-acids hop with a highly acceptable aroma profile.
Other Information	Released to U. S. industry in 1985 and becoming increasingly popular.

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HOP VARIETY: PERLE (21227)

Pedigree	Bred in Germany from the English Northern Brewer variety.
Maturity	Early.
Yield	1300 - 1800 kg/ha. or 1160-1600 lb/ac.
Growth Habit	Good.
Disease Reaction	Mainly tolerant to Prunus necrotic ring-spot virus infection. Fairly resistant to downy mildew.
Pickability	Normal to good.
Drying-Baling	Normal.
Cone-Structure	Fairly loose, medium-long.
Quality:	
Lupulin	Plentiful, fairly dark yellow.
Aroma	Pleasant and slightly spicy.
Alpha Acids	7.0 - 9.5% w/w.
Beta Acids	4.0 - 5.0% w/w.
Co-Humulone	27 - 32% of alpha-acids.
Storageability	80 - 85% alpha-acids remaining after six (6) months storage @ 20° C.
Total Oil	0.7 - 0.9% v/w.
Myrcene	45 - 55% of whole oil.
Humulene	28 - 33% of whole oil.
Caryophyllene	10 - 12% of whole oil.
Farnesene	<1% of whole oil.
General Trade Perception	A hop with German type aroma properties combined with moderate bittering potential.
Other Information	Only recently established in the U. S. industry.

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HOP VARIETY: MOUNT HOOD (2/455)

Pedigree	A triploid seedling of the German Hallertauer variety.
Maturity	Early to mid-season.
Yield	1700 - 2200 kg/ha. or 1520-1960 lb/ac.
Growth Habit	Fairly vigorous but manageable.
Disease Reaction	Moderately resistant to downy mildew. Reaction to Prunus necrotic ring-spot virus not yet known.
Pickability	Normal to good.
Drying-Baling	Normal.
Cone-Structure	Medium size and fairly compact.
Quality:	
Lupulin	Moderate amount, yellow in color.
Aroma	Mild, pleasant and clean.
Alpha Acids	5.0 - 8.0% w/w.
Beta Acids	5.0 - 7.5% w/w.
Co-Humulone	22 - 23% of alpha-acids.
Storageability	50 - 60% alpha-acids remaining after six (6) months storage @ 20° C.
Total Oil	1.0 - 1.3% v/w.
Myrcene	55 - 65% of whole oil.
Humulene	15 - 25% of whole oil.
Caryophyllene	7 - 10% of whole oil.
Farnesene	<1% of whole oil.
General Trade Perception	Aroma variety with marked similarities to the German Hallertauer and Hersbrucker varieties.
Other Information	Released in the U. S. in 1988.

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HOP VARIETY: WILLAMETTE (21041)

Pedigree	A triploid seedling of the English Fuggle variety.
Maturity	Early to mid-season.
Yield	1500 - 1900 kg/ha. or 1340-1700 lb/ac.
Growth Habit	Good, vigorous but manageable.
Disease Reaction	No visible reaction to Prunus recrotic ring-spot virus. Fair resistance to downy mildew. Susceptible to Verticillium wilt.
Pickability	Good.
Drying-Baling	Normal.
Cone-Structure	Small to medium sized, round, and fairly light.
Quality:	
Lupulin	Moderate amount, golden yellow in color.
Aroma	Mild and pleasant, slightly spicy.
Alpha Acids	4.5 - 7.0% w/w.
Beta Acids	3.0 - 4.0% w/w.
Co-Humulone	30 - 35% of alpha-acids.
Storageability	60 - 65% alpha-acids remaining after six (6) months storage @ 20° C.
Total Oil	1.0 - 1.5% v/w.
Myrcene	45 - 55% of whole oil.
Humulene	20 - 30% of whole oil.
Caryophyllene	7 - 8% of whole oil.
Farnesene	5 - 6% of whole oil.
General Trade Perception	A quality aroma hop.
Other Information	Released in 1976 and well established in the U. S. industry.

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HOP VARIETY: CASCADE (56013)

Pedigree	Open pollination of a Fuggle seedling, itself derived from crosses between Fuggle and the Russian hop Serebrianker.
Maturity	Mid-season.
Yield	1600 - 2200 kg/ha. or 1430-1960 lb/ac.
Growth Habit	Good.
Disease Reaction	Not seriously affected by Prunus necrotic ring-spot virus. Good crown and cone resistance to downy mildew, partly tolerant to Verticillium wilt. Prone to insects.
Pickability	Good.
Drying-Baling	Normal.
Cone-Structure	Compact, medium sized.
Quality:	
Lupulin	Moderate amount, yellow color.
Aroma	Pleasant, flowery and spicy.
Alpha Acids	4.5 - 7.0% w/w.
Beta Acids	4.5 - 7.0% w/w.
Co-Humulone	33 -40% of alpha-acids.
Storageability	48 -52% alpha-acids remaining after six (6) months storage @ 20°.
Total Oil	0.8 - 1.5% v/w.
Myrcene	45 - 60% of whole oil.
Humulene	10 -16% of whole oil.
Caryophyllene	3 - 6% of whole oil.
Farnesene	4 - 8% of whole oil.
General Trade Perception	Aroma variety with well balanced bittering potential.
Other Information	Released in 1972 and well established in U. S. industry.

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HOP VARIETY: FUGGLE (48209)

Pedigree	A chance seedling selected in 1875 in England.
Maturity	Early.
Yield	1200 - 1800 kg/ha. or 1070-1600 lb/ac.
Growth Habit	Neat and manageable.
Disease Reaction	Not seriously affected by Prunus necrotic ring-spot virus. Resistant to downy mildew. Not excessively sensitive to insects.
Pickability	Good.
Drying-Baling	Normal.
Cone-Structure	Small and rather light, medium compact.
Quality:	
Lupulin	Moderate amount, yellow color.
Aroma	Mild and pleasant.
Alpha Acids	4.0 - 5.5% w/w.
Beta Acids	1.5 - 2.0% w/w.
Co-Humulone	25 - 32% of alpha-acids.
Storageability	60 - 65% alpha-acids remaining after six (6) months storage @ 20° C.
Total Oil	0.7 - 1.2% v/w.
Myrcene	40 - 50% of whole oil.
Humulene	20 - 26% of whole oil.
Caryophyllene	6 - 10% of whole oil.
Farnesene	4 - 5% of whole oil.
General Trade Perception	Traditional aroma hop.
Other Information	Also known overseas as Styrian (Savinja) Golding.

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YAKIMA, WASHINGTON 98909 USA
(509) 457-3200
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HOP VARIETY: TETTNANGER (21015)

Pedigree	Traditional German variety developed in the area of the same name.
Maturity	Early.
Yield	1000 - 1500 kg/ha. or 900-1340 lb/ac.
Growth Habit	Fairly neat.
Disease Reaction	Can display reaction to Prunus necrotic ring-spot virus infection. Moderately resistant to downy mildew. Sensitive to insects and mites.
Pickability	Fair to good.
Drying-Baling	Normal.
Cone-Structure	Medium compact fairly small light cone.
Quality:	
Lupulin	Moderate amount, pale yellow.
Aroma	Very fine and slightly spicy.
Alpha Acids	4.0 - 5.0% w/w.
Beta Acids	3.5 - 4.5% w/w.
Co-Humulone	20 - 25% of alpha-acids.
Storageability	55 - 60% of alpha-acids remaining after six (6) months storage at 20° C
Total Oil	0.4 - 0.8% v/w.
Myrcene	36 - 45% of whole oil.
Humulene	18 - 23% of whole oil.
Caryophyllene	6 - 7% of whole oil.
Farnesene	10 - 12% of whole oil.
General Trade Perception	A true noble aroma variety.
Other Information	Only recently established in U. S. industry.

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HOP VARIETY: HALLERTAUER (2/014)

Pedigree	Traditional German variety selected in the area of the same name.
Maturity	Early.
Yield	900 - 1400 kg/ha. or 800-1250 lb/ac.
Growth Habit	Rather variable and often quite weak in the U. S.
Disease Reaction	Can display reaction to Prunus necrotic ring-spot virus infection. Fairly sensitive to downy mildew and insects.
Pickability	Fair to good.
Drying-Baling	Normal.
Cone-Structure	Fairly loose, small and light.
Quality:	
Lupulin	Moderate amount, quite pale.
Aroma	Very mild, pleasant and slightly flowery.
Alpha Acids	3.5 - 5.5% w/w.
Beta Acids	3.5 - 5.5% w/w.
Co-Humulone	18 - 24% of alpha-acids.
Storageability	52 - 58% alpha-acids remaining after six (6) months storage @ 20° C.
Total Oil	0.6 - 1.0% v/w.
Myrcene	35 - 44% of whole oil.
Humulene	30 - 38% of whole oil.
Caryophyllene	10 -12% of whole oil.
Farnesene	<1% of whole oil.
General Trade Perception	Traditional superior aroma hop.
Other Information	Declining production in Germany due to sensitivity to Verticillium wilt.

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HOP VARIETY: CLUSTER (LI = 65102)

Pedigree	Not known but possibly the result of a cross between an English variety and an American male hop.
Maturity	Early to late.
Yield	1900 - 2400 kg/ha. or 1700-2140 lb/ac.
Growth Habit	Vigorous but manageable.
Disease Reaction	Very susceptible to downy mildew. Not seriously affected by Prunus necrotic ring-spot virus.
Pickability	Good.
Drying-Baling	Normal.
Cone-Structure	Medium compact cone.
Quality:	
Lupulin	Plentiful, yellow in color.
Aroma	Medium and quite spicy.
Alpha Acids	5.5 - 8.5% w/w.
Beta Acids	4.5 - 5.5% w/w.
Co-Humulone	36 - 42% of alpha-acids.
Storageability	80 - 85% alpha-acids remaining after six (6) months storage @ 20° C.
Total Oil	0.4 - 0.8% v/w.
Myrcene	45 - 55% of whole oil.
Humulene	15 - 18% of whole oil.
Caryophyllene	6 - 7% of whole oil.
Farnesene	<1% of whole oil.
General Trade Perception	An excellent general purpose hop with medium and well balanced bittering potential and no undesirable aroma properties.
Other Information	For years the standard U. S. cultivar, improved by mass selection in the mid-sixties.

June 21, 1990, First Day of Summer.

Field Trip to Oregon Off-station Experimental Hop Plots

Alfred Haunold, Hop Breeding and Genetics

In contrast to the past three weeks which had unsettled weather and below average temperatures which greatly reduced hop growth, we seem to be headed toward a period of near normal summer weather. This should greatly help hop growth, in particular the development of sidearms and flowering.

Weathers Hop Farms, Salem, Oregon

USDA 21490: Excellent growth, practically all plants are 2-4 ft above the wire and sidearms are 2-3 ft long. Very even growth and lots of bottom growth but occasionally mildew spikes. Grower has not burned off the bottom and I will advise them to do so, which is critical before mildew gets out of hand. Suckering to be done with Des-i-cate on 6/25 . Spikes are beginning to dry up, perhaps the result of an Aliette spray. Lower leaves show some honeydew, but I could not find any signs of aphids, and therefore they must have been sprayed rather recently. At this stage insects do not seem to be a problem. All indications point toward another 10-11 bale crop in this yard.

Adjacent Perle: About half of the plants have reached the top wire but have just begun to arm out. The bottom has been hand-stripped but not sprayed. Growth is as expected of Perle at this stage but considerably behind that of USDA 21490.

Adjacent Willamette Yard: Somewhat further along in development. Many plants have just reached the top wire or are slightly above it and they are beginning to arm out. Growth again is substantially behind that of USDA 21490.

USDA 21496, Tettnanger A: Signs of verticillium wilt. Most plants that I cut into have substantial vascular browning but in contrast to the verticillium reaction in Willamette or Fuggle there is no basal swelling of the main vine near the soil surface. The wilt infestation in view of the cool wet weather that we have had during the past three weeks is not surprising. What is surprising, however, is the high degree of infection in Tettnanger, which is also found in the adjoining commercial Tettnanger (green-stemmed clone) in this field. Some plants here are almost completely dead and substantial vascular browning was noted. This field, which is about 1-2 years ahead in physiological development as compared to Tettnanger A, showed better development of most plants, but Verticillium at this stage is a concern. Approximately 10-15% of all plants seem to be infected, with visual symptoms quite evident.

Most plants of USDA 21496 (Tettnanger A) are above the wire and sidearms are about 1-2 ft long. An occasional plant must have flowered early, since there are cones on short, stubby sidearms. Other plants are just beginning to bloom while others are still arming out. Yield will be spotty but should reach about 5 to 5.5 bales per acre, perhaps slightly better. The adjoining

commercial Tettnanger is somewhat better, and if Verticillium does not continue to spread yield should be above 6 bales.

For the future I recommend removing Tettnanger A after the 1990 season since it appears to offer no advantage over the standard commercial Tettnanger.

Coleman, Gervais, Oregon

USDA 21457: Excellent development of this experimental hop. Very nice and even growth; all plants are at or over the wire by at least 1-3 ft, and the sidearms are 1-3 ft in length and still growing. No sign of bloom, no sign of downy mildew, no sign of Verticillium wilt. With the warm weather we are having now (temperatures are expected to reach 90 today), sidearms should develop well and form the basis for an excellent yield, probably in excess of 10 bales/acre. Grower has sprayed with Ridomil+ (Ridomil + copper), but there is no danger of downy mildew. There are also no signs of any insect infestations (no aphids and no mites), and the yard is in excellent shape. Plants have a deep bluish-green color, indicative of excellent nutritional status. The adjacent increase nursery has been maintained well, is basically free of weeds but plants have not been hilled up as much as in past years, since apparently there are plenty of roots available in case that we should decide to release this experimental hop. The adjacent three-acre field, which is planted at 7.5 ft spacing, has not been trained since the grower was advised against it. The Hop Research Council apparently is satisfied with the production from the current three acres. However, the adjacent three acres could be trained next year and produce an essentially mature crop.

John I. Haas, Riverside Ranch, St. Paul, Oregon

USDA 21120: The field for the planting of this 4-acre experimental plus adjoining commercial planting has been prepared now for well over three weeks. Initial plans were to fumigate this field but continued rain made this impossible. Current plans are to fumigate early next week (June 25-26). This is unfortunate, since we would have to wait another 6 weeks at the least before planting can begin, and therefore hops will not have a chance to develop a good crown before the end of dormancy next fall. I talked to the manager and advised him to check with Central Management to see whether fumigation could be eliminated. He promised to call Management today. (Word just received: Experimental plants growing well in greenhouse pots. Will be transplanted later this summer).

Stauffer Farms, Hubbard, Oregon

USDA 21459: Excellent development of all plants in this experimental plot. All plants are well over the wire (2-4 ft) and well armed out, 3-4 ft for most plants, and still growing. Plants show even development, 2-3 vines trained on each string. There are no signs of any disease or any insect problems. The bottom has been sprayed (probably Des-i-cate or paraquat) and is nice and clean. This plot is perhaps the furthest along in vegetative development of any experimental plot that I have seen so far today. If

development continues, with the warm weather now which is likely, we could expect an excellent crop above 10 bales/acre.

Annen Farms, Mt. Angel, Oregon

USDA 21120: This now three-year old plot has finally reached its normal development stage that we had expected already last year. Most plants are at or over the wire and are well armed out, with sidearms sometimes up to 3 ft or more in length. Laterals have started to develop, and all indications are for a good crop at this stage. Plants have been hilled up but the ridges have not been pushed down. I don't know whether the grower intends to leave the ridges or eventually will push them down, but it has to be done soon because the bottom sidearms are hanging down and would interfere with tractor work. There is only an occasional basal mildew spike which should not pose any problem. Plants have been hand-stripped and look very healthy. There are no signs of any insect problems. I also didn't see many missing hills. Even in the lower portion of the yard, which in previous years had lagged behind in development, most plants are well developed, nice and even, and point to a good crop, probably in the 9 bale range. There are indications that some chemical stripping (probably Des-i-cate or paraquat) was done some time ago, but there is no visible damage to the main vines, although they show some discoloration. Plants have developed quite well and everything points toward an excellent crop.

USDA 21491, Paul Serres, Woodburn, Oregon

USDA 21491: Excellent development of most plants in this experimental plot. All plants at or over the wire, often by 2-4 ft. Sidearm development has just started but all indications are that it will be very good. Base of the plants has been sprayed (probably Des-i-cate or paraquat) and excellent sucker control was obtained. There are no indications of any downy mildly or any other disease or insect problems. Development of plants in this plot is somewhat ahead of the adjoining Willamette, but Willamette plants are also at or near the top wire for the most part. Sidearm development of Willamette, however, is somewhat behind that of USDA 21491. Most plants of USDA 21491 have from four to six vines trained (two or three on each string) and all indications point toward a very good yield, probably above 9 bales/acre. Plants are conspicuous by their dark bluish-green color, a combination of the triploid status and excellent nutritional level in this field.

USDA 21484, Butch Farms, Silverton, Oregon

USDA 21484: This is the first year that this experimental hop is on the string. It was planted in May/June of 1989. Excellent development of all these plants and practically no missing hills at all. Very even growth, two to three vines were trained per string. Most plants are over the wire, sometimes by as much as 4 ft. Sidearms have developed quite well, anywhere from 1 ft to 3 ft out and are still growing. The second laterals are coming now and they are developing very nicely. Plants have been suckered (paraquat with apparently no damage to the main vines, although thee is some discoloration due to the chemical contact). There are no disease or insect problems noticeable at this time. The bine is deep red, the leaves have a bluish-green

color and look very healthy. An occasional plant has some flowers in burr, I am not sure whether this is a very early hop or whether it is due to the early pruning. These hops were pruned in early March, while most other hops were pruned later. I expect that this hop may be in full burr in about 2-3 weeks. If development continues as well as it has thus far, a yield in excess of eight to nine bales is possible.

Goschie Farms, Silverton, Oregon

USDA 21497, Tettnanger B: Uneven development of this experimental plot. Many plants which should have by now developed into fully mature plants look like babies. Quite a few hills have only a single vine per string and there are still a few missing hills. Other plants are only one third along the wire and the terminal tip is fluffy and has quit growing. Older leaves show peculiar bronzing. Other plants again show very good development, with at least one shoot per plant well over the wire. There has been some early bloom and some cones are developing. It appears that this plot is physiologically out of synch and yield will be disappointing, maybe about five bales.

The adjacent commercial Oregon Tettnanger is much better in development, similar to the last few years. This is the clone with the green vine. It also has much healthier leaf development and does not show the bronzing.

During the past two years this plot has consistently been better than Tettnanger A, but this year it looks worse. If there is no compelling reason to continue either Tettnanger A or B for another year, I would recommend pulling out both plots since their yield potential apparently is substantially below that of the accepted commercial Tettnanger grown both in Oregon and in Washington. In contrast to the Tettnanger A, however, I could not find any Verticillium problems here, only an occasional mildew spike, which apparently is not sporulating (perhaps Aliette protection). Plants have been hand-stripped, but otherwise look healthy. Bottom growth has not been burned back.

USDA 21455, Mt. Hood: The original planting, now in its fifth year, looks weak. It has been deep-pruned this year by mistake, and the signs are very clear. This hop does not like deep pruning. Regrowth was spotty, and plants are just now reaching the top of the wire, some have not even reached it. It looks more like a baby crop to me at this stage. Hopefully, with the warm weather, plants will arm out and produce a decent crop, but I doubt that it will be more than seven bales/acre.

New Planting, Mt. Hood: Now in its third year, second year on the string. Plants here look much better, are further along in development than the original Mt. Hood planting; most plants are over the wire. The grower used Coir yarn rather than paper since they have noticed a tendency of Mt. Hood plants to fall away from the string and not climb as well as they should. There is still some tendency of falling away, but most plants are fairly well along in growth. I expect the yield in this field to be about a bale better than the original Mt. Hood planting discussed earlier.

Mr. Goschie says that about three Oregon growers bought roots from him this year and a total of about 50 acres of Mt. Hood are in the ground in Oregon, mainly by growers who were interested to experiment on their own before they make a full-scale commitment. Goschie's Mt. Hoods have been sold on a commercial basis for the next three years.

Distribution: HRC members
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G.Nickerson
U. Gampert
B.Studer

Thursday, June 28, 1990

Impressions from a Field Trip to the Hop Growing Areas of Northern Idaho, Sandpoint and Bonner's Ferry

Alfred Haunold, USDA ARS, Corvallis, Oregon

I was invited by Don and Carl Weathers, Oregon hop growers, to fly in their private plane to Bonner's Ferry to see the hop growing areas of northern Idaho. The last time I saw hops in this area was in 1978 when the U.S. Brewers Association had a meeting at Coeur d'Alene and subsequently we visited Bonner's Ferry. At that time there were 200 acres of hops in Bonner's Ferry on a ranch owned by the S. S. Steiner Corporation.

The Steiner Ranch has now been purchased by Anheuser-Busch to grow hops that Anheuser-Busch has been importing from Europe for many years. At the time of purchase, the Steiner Ranch had about 180 acres of Hallertauer mittelfrüher and a few experimental plots of European noble aroma hops.

Anheuser-Busch purchased an additional 2,000+ acres of land in this valley to expand the hop-growing operations. There are now three ranches in this valley, one of about 1,200 acres, another one of appoximately 600 acres, and the old Steiner Ranch of 200 acres. This land had previously been in either cereals (wheat or barley) or in pasture. It is excellent flat ground with plenty of water, both from wells and from a nearby river.

The Steiner Ranch (200 acres) at the present time has no hops. The trellis is still in place, but two years ago a severe frost (wind chill factor to -65°F) killed out most of the hops. A decision was made not to replant but to start the new hop operations on the recently purchased land. No decision has been made whether to replant the Steiner Ranch, but preliminary plans are to concentrate on the newly purchased land.

The first planting on the newly purchased land was made about three years ago. These hops are now mature, and the first crop was obtained last year.

Hallertauer mittelfrüher

Planting of this variety came from the old Hallertauer mittelfrüher stock from the Steiner Ranch. Hops at the time of our visit were over or near the wire and appeared to be growing vigorously. They were arming out, looked excellent, both in growth and health. There were no nutritional deficiencies. Leaves had a dark green color, side arms were developing well. There was some downy mildew on basal spikes. The manager, Mr. Brad Studer, stated that downy mildew has been a continuous problem, not only this spring but also in past years. Ridomil, ridomil plus copper, and cocide are employed to control the disease. At the present time, a weekly spray of cocide is

applied to keep the disease in check. Temperatures in this area are relatively cool with occasional rain even this late in the season, which favors continued development of this disease. I did not notice any major problems, and it appears that the manager has the disease well under control.

I was surprised by the excellent development of Hallertauer mittelfrüher in this area. Last year, yields of 6-7 bales per acre were obtained, and there are all indications that this year's yield will be at least as good. This is a seedless area which means that the cones will be relatively small, similar to those from Germany (about 100 mg per cone). If they would be seeded or semi-seeded, the yield could be even higher. Anheuser-Busch, however, wants hops that are very comparable to those that they purchase from Europe, and there are all indications that they are able to obtain such hops from northern Idaho.

Tettnanger

This hop originated from the old Swiss Tettnanger (USDA 61021) which was originally brought to the Yakima Valley by Mr. Charles Zimmermann, former USDA plant physiologist. It was then heat-treated by Dr. Skotland at Prosser, Washington and is now grown as commercial Tettnanger both in Oregon and Washington, and now in northern Idaho. The variety has a green stem color and is somewhat different in quality from the German Tettnanger. The alpha acids content from Oregon and Washington plots of the commercial U.S. Tettnanger is about twice that of the beta acids content. The cohumulone content in previous analyses was approximately 26%. I asked Mr. Studer to send me a sample from this year's crop so we can obtain an analysis of this hop grown in northern Idaho.

Tettnanger, like Hallertauer, also showed excellent development, even more vigorous growth than the Hallertauer mittelfrüher. Most plants were over the wire by two to three feet, were arming out, and growing well. Downy mildew is being kept well under control, and there are no problems with growth or production. Yield in previous years has been in excess of six bales, sometimes higher than seven bales, and there are all indications that this crop will be similar. There are no signs of bloom (like in Hallertauer) and, judging from the growth, both Hallertauer and the adjacent Tattnanger will bloom in about two weeks or about mid-July. Flowering should be completed by about late July and harvest traditionally starts at the end of August or early September.

This is a relatively short interval between flowering and harvest (approximately six weeks) which may also be responsible for the relatively small cone size of these hops in that northern location.

The climate in this valley seems to be relatively mild; in addition to cereals (wheat, barley, both malting and feed barley,

some oats), there are fruit-growing operations (apricots, peaches, apples, melons, etc.) close to this area. The winters, however, are severe, usually with snow cover. If there is no snow cover, like last year, then winter kill in hops can be expected.

New Plantings

The established hops discussed in the previous paragraphs are on about 400-500 acres. The remainder (over 1,200 acres) is newly planted, either last year or this year, and another 200 acres are yet to be planted. Most of the plantings came from virus-free (Prunus necrotic ringspot-free) stock which was increased by vegetative cuttings at commercial operations in the Yakima Valley. Anheuser-Busch had to obtain an import permit to bring hops into the three counties in northern Idaho since they are under a quarantine by the State of Idaho. This was obtained in cooperation with the plant pathologist at Prosser (Dr. Skotland) and the nursery inspectors from the State of Idaho.

The recent shipment (about 600,000 potted plants, approximately 10-15 weeks old) were Saazer, Clone 72Y, virus-free, (USDA Accession Number 21535). The plants came in three-inch pots; some were transplanted about three weeks ago and they are now growing vigorously. Shoots are about three feet long. They will be trained on a single string and should reach a height of about three to six feet by the end of the season.

We saw a Tettnanger planting which came from similarly-treated potted plants last year, but it was disappointing. Plants had reached a height of about six to ten feet and apparently stopped growing. The internodes became shorter and shorter, there was a fluffy tip, and the bottom leaves were brownish-bronze in color. This appears to be physiological, perhaps related to the cool spring temperatures this area experienced about one month ago. A few plants, however, are still growing vigorously and are arming out.

The manager stated that he experimented with various management techniques in the spring. There is no pruning as we know it in Oregon, but early spring growth is burned back with paraquat (grammoxone) in the spring after shoots have reached about two to three feet in length. This also controls the early weed growth. New growth then comes back vigorously and plants are trained about the second week of May. This seems to be very beneficial. Areas that had been burned back showed excellent growth, mush better than those that were not treated with grammoxone. Unfortunately, this was done on only about a few acres on an experimental basis. The adjacent unburned areas show the previously-mentioned physiological symptoms, namely poor growth and early termination of growth of the leading shoot. Mr. Studer stated that he will employ this technique next year on all hop operations.

Hops are not hilled up very much. He sees no particular benefit from hilling other than extra work. I mentioned that some hilling might be beneficial because it aids in development of the crown. He stated that he will do some, but will try to get by with as little hilling as possible. In Oregon we have tried flat culture, but invariably yields have been depressed.

The stand on the newly-planted land (about 1,500 acres at the present time) is excellent. There are very few missing hills, and if so they are immediately replanted with reserve potted plants. There are no male plants in this area since it is totally seedless. Verticillium wilt does not seem to be any problem, and downy mildew is being kept in check very well. Aliette is not approved for use in northern Idaho, and therefore this is making the control of the disease somewhat more difficult than in Oregon. However, I did not notice any problems at the present time. Insect pests are also being kept under control. There is no problem at the present time with aphids. Late in the summer, when temperatures occasionally reach 90°F, there is some buildup of spider mites, but this can be controlled quite easily.

Yard Construction and Management

Mr. Studer is the overall manager of this operation of nearly 2,000 acres of hops. The 200 acres of trellis on the old Steiner Ranch are still in place, but at the present time brewing barley is being grown there. There is one picking machine still at the location, but it may be moved to the new operation, about 10 miles away.

Yards are generally on flat land that had previously been in cereals or in pasture. It is excellent ground with plenty of subsoil moisture and a river nearby from which land can be irrigated with sprinklers. Mr. Studer said they have 16 miles of three-inch hand lines which are used for irrigation.

Yard construction is very substantial. Eight-inch anchor posts, sometimes even larger, and six-inch center posts, with heavy cables and substantial cross wires are capable of supporting well in excess of 10 bales per acre. It is unlikely such yields will be reached, but I see no problem at all with any stability in these yards. Yards are relatively large; it appears that at least 100 or more acres are under a single trellis, but with sturdy poles and anchoring this should not be any problem at all.

Roadways are in excellent shape. They have been oiled to keep the dust down. Recently, a biodegradable papermill waste product has been used on the roads to keep the dust down. All yards are on a rectangular shape and are easily accessible and can be reached with any machinery very easily. One yard (the latest being developed and planted now) is about five miles north of the main 1,200 acre yard, immediately adjacent to the Canadian border. It is also on level, excellent ground and has ample

water supply from the adjacent river. There are apparently no restrictions for irrigating with river water.

Labor Supply

Mr. Studer is the overall manager of this operation of nearly 2,000 acres of hops. In addition, Anheuser-Busch, Inc. owns several thousand additional acres of timber land on the slopes of the valley. There are no plans at the present time to expand this operation since land has become very scarce. Adjoining farms are mainly in grain and the rotation seems to be wheat, barley, wheat, barley. Lower land with higher moisture levels is generally in hay for livestock feeding.

Across the Canadian border, about 15 miles, is a large Labbatt brewery, a large Canadian brewer. In Canada beer cannot be shipped from one province to the next, so all major Canadian breweries tend to have a brewery in each province to sell their beer. We tasted their "Kootenay" brand at lunch; it was excellent - less carbonation than most American beers, apparently higher malt content, and a very pleasant, mild hoppy flavor.

In addition to Mr. Studer, each of the three ranches has one manager and several foremen. They have daily meetings and discuss strategy, but otherwise they seem to have a free hand. Most of the labor force (about 260 full-time) is of Mexican origin. They have worked in this area before, and there is a return rate of about 80% from year to year. Workers go back to Mexico after the season but come again in the spring to work on hops. Many of them have become very skilled and they are very reliable workers.

Laborers are paid $4.75/hour and they can work as many hours as they want to, but are expected to put in a core time of work, usually about eight to ten hours per day. Tractor drivers get higher pay. There is no charge for housing. Initially, plans were to charge 25 cents per hour (substracted from the wages, which at the time were $5.00 per hour). This caused some problems and questions in workers' minds, so this year they are being paid a flat $4.75 an hour and housing is supplied free of charge.

Anheuser-Busch constructed two labor camps, one on each farm, which are a model of migrant housing. They looked more like motels with one- or two-bedroom units, kitchen, bathroom, and some furniture. Each worker is assigned his living quarters. Many have families, which has caused some problems in the adjoining community because children are going to local schools. However, this operation is paying substantial taxes which should compensate for the additional burden. Athletic fields, playgrounds, and other recreational facilities have been constructed for the workers. The labor camp (i.e., motel) has been inspected by the State of Idaho and OSHA, and they were full of praise. I inquired about the cost of the smaller camp which

is just now being finished (about 35 units), and Mr. Studer indicated a cost of about $450,000.

Hop Picking, Drying, and Processing Facilities

At the main 1,200-acre ranch, there are approximately six picking machines installed with all additional facilities such as drying kilns, storage rooms, machinery sheds, etc. On the newest ranch near the Canadian border, two machines will be installed which will also have additional modifications developed by Mr. Paul Serres, an Oregon grower. Otherwise, the machines are essentially Dauenhauer machines purchased from Mr. Dauenhauer, Santa Rosa, CA. The layout is spacious, and kilns are well separated from the picking machines as is the hop storage facility (common storage). After harvest hops are being shipped to Yakima for frozen storage.

At the present time it appears that this will be an excellent hop-growing operation with full production in about one to two years. I mentioned to Mr. Studer that European hops, and particularly the Saazer hops which are being planted now, may take from three to five years to reach full production. It is, therefore, not surprising to see a somewhat dissappointing appearance of baby hops (first year on the string or one year after planting) such as we saw earlier where hops had quit growing half way up the wire. With the change in spring management (burn back with grammoxone, etc.), Mr. Studer hopes to overcome this growth problem and have full production in one or two years. He is somewhat concerned of an impending visit by Mr. August Busch, III, CEO of Busch companies, who is planning to come in one or two weeks. There should be no problem. I think everyone associated with the operation has done an excellent job, and I was amazed at the progress that had been made.

When I last visited this area in 1978, Hallertauer hops at the Steiner Ranch were in full bloom in late July-early August, and it appeared that the yield at that time was below expectations (3-4 bales). There have been years when hop yields at this ranch were in excess of six bales, but from what I have been told by people who visited the operation over the years, this was perhaps the exception. From the way it appears under the Studer management, this should not be an exception. Yields in the neighborhood of six bales might be common if hops continue to look as good as the established Hallertauer mittelfrüh or Tettnanger hops mentioned earlier.

The flight to and from Bonner's Ferry took about three hours. Mr. Chris Weathers, an experienced pilot and the son of Don, did an excellent job. We had very good flying weather, occasionally somewhat bumpy but generally quiet and enjoyable for a novice like myself who had never flown in a small plane. This was a Beechcraft two-engine plane, and without the generous offer of Don and Carl, I would not have been able to make this trip. I, therefore, thank them very much for the opportunity to accompany them on this trip. I would also like to thank Anheuser-Busch Co. and Mr. Brad Studer for their generous hospitality and the opportunity to see their impressive hop operations in northern Idaho.

Dr. Alfred Haunold, USDA-ARS
Corvallis, OR 97331

USDA-ARS Hop Research

October 12, 1990

Historical perspective:

The present USDA-ARS hop research project was started at Oregon State University in 1931 primarily as a response to the recently introduced downy mildew disease which threatened the U.S. hop industry. Most hops at that time were grown in Oregon and nearly all of them were Clusters, a variety extremely susceptible to the new disease. The project was designed to serve the U.S. hop industry which was concentrated in Oregon, California, and Washington. Oregon had the largest acreage at that time. In the 1950s Idaho became a hop producing state and California started a slow decline until 1989 when the last hop yard in that state was removed.

One agronomist and one plant pathologist did most of the early hop research. Emphasis was primarily on disease and insect control plus germplasm and variety testing to find a replacement for Clusters. Eventually it was recognized that Clusters were too susceptible to be grown in the moist climate of the Willamette Valley and the Cluster acreage shifted to the Yakima Valley, Washington in the 1950s.

Oregon's acreage dropped from nearly 30,000 acres to less than 5,000 acres but has since recovered to about 8,000 acres. Washington now grows about 25,000 and Idaho about 3,000 acres. Together the three states produce nearly 60 million pounds of hops annually with a farmgate value of approximately 150 million dollars. The U.S. currently is the second largest hop producer worldwide. From 50 to 70% of our annual production is exported every year resulting in a very favorable trade balance for this commodity.

In the 1950s USDA hop research was expanded to include agronomic and varietal evaluation, studies on genetic resistance to downy mildew, and studies on hop quality. State scientists at Prosser, Washington, Corvallis, Oregon, Davis, California, and Parma, Idaho, cooperated with the USDA hop research effort.

A well balanced team of USDA scientists had been assembled at Oregon State University by the mid-1960s, which included an agronomist (project leader), geneticist, plant pathologist, plant physiologist, and a research chemist. Due to budgetary constraints most positions except the geneticist have now been eliminated. The cooperative research with Prosser, Washington, primarily due to pressure by the Washington hop industry, was formalized into a USDA cooperative agreement in the early 1980s which, however, included only nominal oversight on part of the USDA. About 30% funding was provided for a state chemist at Oregon State University from federal funds.

The USDA hop research project was scheduled for closeout in 1983 with a three-year phase-down to accomplish a complete closeout in the fall of 1986. The major reasons given at the time were that "USDA had done enough for the U.S. hop industry" and "that the financially strong brewing and hop growing

industry should be able to carry the program on its own" and that it was "not cost-effective to run small research programs that serve only a single commodity."

The phase-out was reversed through the intervention of political leaders from Oregon and Washington with strong support from the brewing and hop growing industry who felt that "once a research project is eliminated, the efficiency and productivity of the industry which it serves will gradually decline leading to the demise of the U.S. hop growing industry."

Present status:

Fortunately for the U.S. hop industry the USDA hop research project at Oregon State University which serves the now remaining three hop growing states Oregon, Washington, and Idaho has continued to be productive. Nugget, a new "Superalpha" hop was released in 1983. This cultivar alone now accounts for over 12% of total U.S. hop production. Willamette, another USDA release now is the second largest U.S. hop variety in terms of acreage and third largest in terms of production. Cascade, released by USDA in the early 1970s is one of the backbones of the Washington hop industry. Although these three varieties were first selected and tested at Corvallis, they also grew well in Washington.

Another USDA release, Mt. Hood (1989), is now grown on nearly 600 acres in Oregon and Washington. It is valued worldwide for its similarity to European noble aroma hops which are in short supply worldwide. Canadian, Japanese, and South American breweries have expressed keen interest in this new release.

Cooperative work with Prosser, Washington, resulted in the release of the three cultivars Chinook, Olympic, and Centennial. Chinook appears to be the most promising of the three. It is grown primarily in Washington with a 1989 production of over 2 million pounds.

Cooperative work with Idaho identified the two superalpha hops Galena and Eroica which are now grown widely in the three hop producing states.

Summary of Accomplishments:

New or improved hop varieties:

Talisman - Cooperative work with Idaho, released in 1968.

Fuggle H - Reselection and virus cleanup of Fuggle, released in 1972.

Cascade - New hop cultivar released in 1972.

Comet - New high-alpha hop cultivar released in 1974.

Willamette - First commercially successful triploid hop released in 1976.

Columbia - Sister selection of Willamette, released in 1976.

Galena - Superalpha hop, cooperative work with Idaho, released in 1978.

Eroica - Superalpha hop, cooperative work with Idaho, released in 1982.

Nugget - Superalpha hop, released in 1983.

Olympic - Superalpha hop, cooperative work with Washington, released in 1983.

Chinook - High-alpha plus aroma hop, cooperative work with Washington, released in 1985.

Mt. Hood - Noble aroma European-type hop, released in 1989.

Centennial - High-alpha hop, cooperative work with Washington, released in 1990.

In addition 31 germplasm lines have been released during the past 21 years. Many are valued for hop breeding. Triploid, nearly sterile males were released to growers for use as yield stimulators to produce higher cone yields without undesirable seeds.

The incumbent geneticist currently handles both the germplasm work (curator, germplasm introduction and characterization), cytology, cytogenetics, hop breeding and agronomy. A research assistant (M.S. level, supported with industry funds) manages the day to day operations of two field locations (15 acres and 3 acres, respectively) plus the field laboratory (100 x 50 ft building, fuel storage shed, chemical shed - all built with either industry or USDA funds and owned by the hop project).

Major emphasis of the present research efforts is on germplasm development, polyploidy breeding and genetics, development of superior aroma and high-resin cultivars, disease control, and chemistry of aroma and flavor compounds.

Contributions by the USDA hop chemist included procedures to measure the storage stability of hop resins (Hop Storage Index - a key quality parameter now used worldwide), analysis of male lupulin glands and characterization of alpha acid analogs in breeding material.

The loss of the USDA hop chemist position in 1982 following the retirement of the incumbent necessitated some rearrangement of priorities. Basic work for the time being has to be deferred to support the higher priority germplasm and breeding work. Some industry funding allowed establishment of cooperative work with Ag Chemistry (Oregon State University), primarily on flavor research.

Major contributions in plant pathology include procedures for hop downy mildew screening, adaptation of the ELISA technique for hop virus screening and evaluation of Ridomil and Aliette for systemic hop downy mildew control.

The plant physiologist (transferred to Prosser in 1970) studied plant hormones in relation to flowering and cone production, which resulted in

commercial use of Gibberellins by U.S. hop growers. He also made selected crosses with germplasm supplied from Corvallis which resulted in the previously mentioned cultivars Olympic, Chinook, and Centennial.

Future trends:

Hops are now grown commercially in Washington, Oregon, and Idaho. The 1989 production was nearly 60 million pounds with a farmgate value of $150 million. Over 60% of these hops were exported worldwide. New hop cultivars developed either by USDA alone or through cooperative research now account for nearly 70% of total U.S. hop production.

There is no question that hops, a vital segment of the U.S. agricultural industry, need continued support by an active research program. Current work on European aroma hops, which was started in 1983, will likely result in the release of two or more new cultivars within the next two years. Foreign brewers who have often discounted American-grown hop because of their perceived "inferior aroma properties" have now taken note of Mt. Hood, the first American hop that resembles European noble aroma hops. This interest is spreading quickly. Five foreign brewers (in Japan, the Netherlands, and Canada) have now joined the Hop Research Council, an industry group composed primarily of American hop growers, brewers and trades people, which actively supports all phases of hop research in the three hop producing states.

The cooperative work with Prosser, Washington (funded under a USDA cooperative agreement since 1980) could perhaps be strengthened in the future. It would be desirable to more closely integrate the hop cultivar development work at Prosser with the Corvallis program, which would free additional time for Dr. Kenny's work on hop agronomy, quality, physiology, and long-range basic studies (insect resistance, DNA markers, isozyme analysis, restriction fragment polymorphism) which he has started recently with industry supplied funds.

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
WASHINGTON, DC 20250

and

OREGON AGRICULTURAL EXPERIMENT STATION
OREGON STATE UNIVERSITY
CORVALLIS, OR 97331

NOTICE OF RELEASE OF AN EARLY-FLOWERING TRIPLOID HOP POLLINATOR COMPOSITE FOR YIELD STIMULATION

The U.S. Department of Agriculture, Agricultural Research Service, Washington, D.C. and the Oregon Agricultural Experiment Station, Oregon State University, Corvallis, OR. announce the release of an early flowering triploid hop pollinator composite.

The composite consists of ten different genotypes, USDA Accession Numbers 21539 to 21548, which originated from crosses made on tetraploid Hallertauer mittelfrüh (USDA 21397) in 1983 at Corvallis, Oregon. Seedling plants were screened cytologically in 1984, increased by softwood cuttings and established in 4-hill nursery plots near Corvallis, Oregon. After three years of preliminary testing, selected genotypes were established in 2-hill observation plots to assess their maturity and pollen shedding potential.

Since all ten genotypes originated from crosses on tetraploid Hallertauer mittelfrüh, they are phenotypically similar. All mature early to medium early and normally reach their pollen shedding peak the second week of July. All are vigorous climbers and, depending on spring temperatures, may reach the top of the trellis (5.5 m) by late June or early July. All ten appear to be resistant to hop downy mildew (incited by Pseudoperonospora humuli Miy. et Tak., G.W. Wilson). Except for an early spring soil drench with Metalaxyl, a systemic fungicide registered for downy mildew control in hops, no other control measures were required to keep plants free of the disease during the entire growing season.

Verticillium wilt (incited by various Verticillium species) has never been observed in any of the ten pollinators despite the fact that the test location is known to carry some natural Verticillium wilt infestation.

Recent tests involving the ELISA technique have shown that all 10 genotypes have remained free of ILAR viruses such as Prunus necrotic ringspot (serotype NRSV-hop) and apple mosaic (ApMV), respectively, despite 6 years of field evaluation near other hop plants infected with these viruses. Aphid transmitted CARLA viruses such as hop mosaic (HMV), hop latent (HLV), and American hop latent (AHLV) commonly found in commercial hop yards have gradually invaded these hops during the past 6 years but failed to produce visual symptoms.

All ten pollinators show vigorous spring regrowth after pruning. They produce abundant, moderately coarse, erect shoots that are easy to train and rapidly climb a supporting string to the top of the trellis (5.5 m). They

differ somewhat in sidearm length and time of maximum pollen shedding, but all produce abundant quantities of pollen over a two-week period, coinciding with maximum receptiveness of early flowering commercial hop cultivars such as Fuggle, Tettnanger and Perle in western Oregon. All ten genotypes produce mostly medium-size 3-5 lobed dark green leaves with moderately deep lobing, pronounced ridges, and sharp serration along the edges. The main stem is green with a reddish hue, primarily at the point of sidearm branching and occasionally has red stripes along the stem ridges. Sidearms vary in length from 12 to 36 inches (30-92 cm) and have well developed secondary and tertiary branches with abundant flowers.

Although brewing quality factors are not important for these pollinators, analysis of isolated lupulin glands showed them to be similar among each other. All have a good balance of alpha and beta acids (alpha ratio between 45-60) and low cohumulone content.

The ten pollinators thus far have only been tested in Oregon, the only one of the three hop producing states in the United States where male hops are permitted for yield stimulation. Stimulated female flowers develop into cones up to 20% larger than non-stimulated cones and thus produce higher yields. Such cones rarely contain seeds but phenotypically look like seeded cones.

Since these pollinators are phenotypically similar, they are likely to be used as a composite. They will be kept separate by USDA Accession numbers to permit slight variations of the composite mixture for distribution to growers, depending on continued performance of individual components.

The U.S. Department of Agriculture, ARS, in cooperation with the Oregon Agricultural Experiment Station and the USDA Pacific Northwest Clonal Germplasm Repository near Corvallis, Oregon will maintain planting stock of the ten pollinators. Small amounts of rhizomes will be supplied to research institutions and interested growers upon request.

T.R. Dutson, Director
Oregon Agricultural Experiment Station

May 5, 1990
Date

R.D. Plowman, Administrator
Agricultural Research Service

MAY 10 1990
Date

Oct. 25, 1990.

Hop Chemistry/Bioanalytical Services
Agricultural Chemistry Department
Oregon State University
Corvallis, Oregon 97331-6502

HOP OIL COMPOSITION

GAS-LIQUID CHROMATOGRAPHIC CONDITIONS

Equipment:

Hewlett-Packard Model 5890 Gas Chromatograph equipped with split/splitless capillary inlet and flame ionization detector (FID). Inlet insert packed with 80-100 mesh Chromosorb W (acid-washed). Inlet temperature 230°C, detector temperature 250°C.

Hewlett-Packard Model 7672A Automatic sampler with Precision Sampling syringes with 0.028" OD needles and 10 microliter total capacity. Autosampler is connected to HP 19405A sample event control module (S/ECM is connected to HP-IL loop).

Hewlett-Packard Model 3393A Integrator controlling the GC and autosampler via HP-IL loop. HP model 82169A HP-IL/HP-IB interface connects integrator and HP 2225A ThinkJet printer and HP 9122 3.5" dual disc drives. Solvent peak ignored by starting integration at 6.5 min, attenuation 2^3, area reject 100, threshold 1, peak width 0.04 to 0.12 at 65 min. Minimum area detected approximately 0.005%.

Column: Supelcowax 10 fused silica capillary column, 60m, 0.25mm ID, 0.25 micro meter film thickness. (Supelco Catalog #2-4081)

Carrier Gas: Helium (50 psi tank pressure) 170 kPa column head pressure, 0.7 mL/min through column (measured at 80°C), 1:100 split ratio. Septum purge 1.5 mL/min.

Makeup Gas: Nitrogen (about 30 mL/min)

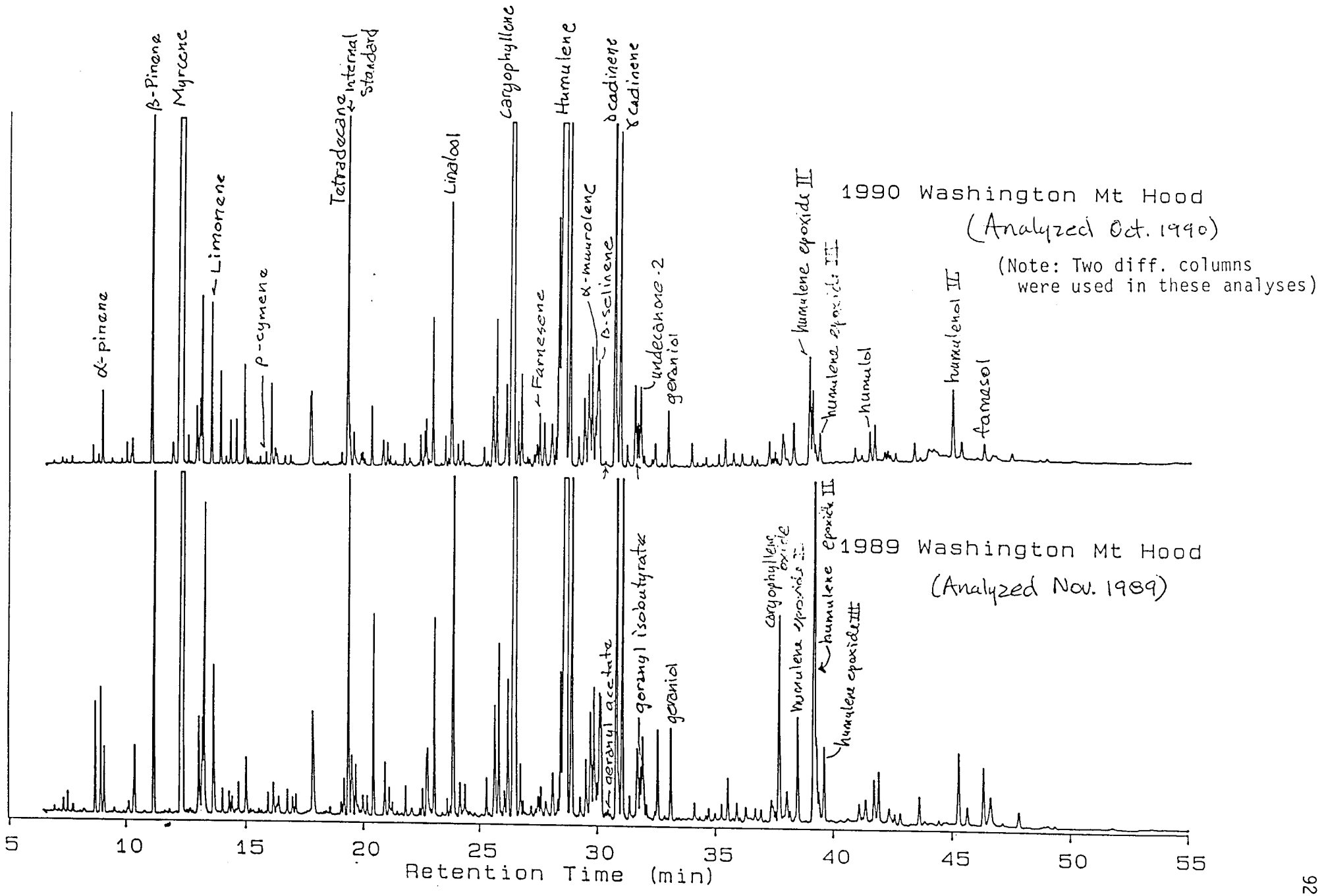
Temperature Program:

Isothermal at 80°C for 5 min
80°C to 160°C at 5°C/min
160°C to 240°C at 4°C/min
Isothermal at 240°C for 24 min

Total Run Time: 65 min

Sample: 2 microliters of a 10% solution of hop oil in pentane with tetradecane added as an internal standard (0.025 mL/250g hops or 0.5% of oil).

October 1990


α-pinene
β-Pinene
Myrcene
Limonene
p-cymene
Tetradecane
Internal Standard
Linalool
Caryophyllene
Farnesene
Humulene
α-muurolene
δ-selinene
δ cadinene
γ cadinene
undecanone-2
geraniol
humulene epoxide II
humulene epoxide III
humulol
humulenol II
farnesol
1990 Washington Mt Hood
(Analyzed Oct. 1990)
(Note: Two diff. columns were used in these analyses)
geranyl acetate
geranyl isobutyrate
geraniol
caryophyllene epoxide
humulene epoxide II
humulene epoxide III
1989 Washington Mt Hood
(Analyzed Nov. 1989)
5
10
15
20
25
30
35
40
45
50
55
Retention Time (min)

*Agricultural Chemistry Department**Oregon State University**Agricultural Research Service**U S Dept Agriculture**Corvallis, Oregon*

♀ 1990 Bale and 5-Cone Analyses at 8% Moisture Content(Bale) or As Is Basis(5-Cone) as of November 7, 1991

By Acc/Sel.No.

Accession or Nursery Number	Identification	Type	Location	Harvest Date	Yield Lb/Ac	Alpha Lb/ac	Alpha %	Beta %	Alpha Ratio	CoH	HSI	6 Mo HSI	%A+B Remain	Oil mL/ 100g	Oil H/C	Oil H/F	Oil Myr (%)	Oil Hum (%)	Serial Number
19001	Brewers Gold	Bale	001:01-04	09/07/90	1600	138	8.6	3.7	70	39	0.34	1.04	37	1.82	1.75	135.24	79.14	4.60	450
19027	Fu x Fu-S	Bale	033:49-50	09/07/90	725	9	1.3	2.9	30	39	0.33	0.69	54	0.48	3.04	2.87	39.46	24.00	522
19028	EGr x EC-S	Bale	034:49-50	09/07/90	1792	39	2.2	5.5	28	44	0.32	0.98	38	0.54	2.11	21.85	81.04	2.14	527
19105	LGp-S(Fu Fu-S)	Bale	001:49-50	09/10/90	1088	16	1.5	6.1	19	37	0.32	1.73	14	0.88	2.00	216.60	78.64	4.33	599
19110	Belg 31-S OP	Bale	002:49-50	08/24/90	1024	54	5.3	5.0	52	55	0.29	0.45	79	0.40	0.00	0.00	0.00	0.00	123
19120	Sunshine-S	Cone	003:49-50	09/06/90	800	38	4.7	1.4	77	25	0.30	0.55	62	0.00	0.00	0.00	0.00	0.00	272
19137	Sunshine-S	Cone	004:49-50	09/06/90	800	32	4.0	1.9	68	26	0.47	0.54	64	0.00	0.00	0.00	0.00	0.00	271
19151	Fu-RedU-OP	Cone	005:49-50	09/06/90	2000	37	1.8	3.5	35	52	0.30	0.85	41	0.00	0.00	0.00	0.00	0.00	277
19185	LGpFuRedU-OP	Cone	006:49-50	09/06/90	1800	53	3.0	1.6	65	40	0.28	0.61	57	0.00	0.00	0.00	0.00	0.00	282
21001	Fu R-2	Bale	031:49-50	08/28/90	277	15	5.4	3.8	59	39	0.30	0.44	88	0.96	2.02	2.61	52.97	13.97	132
21003	Fu T4	Bale	102:01-02	08/21/90	896	35	3.9	1.8	69	28	0.37	0.54	75	0.58	2.58	7.90	49.97	23.35	41
21003	Fu T4	Bale	103:01-02	08/21/90	768	33	4.3	2.1	68	25	0.32	0.66	61	0.81	2.66	7.31	43.75	23.66	39
21003	Fu T4	Bale	104:01-02	08/21/90	1258	54	4.3	2.1	67	25	0.34	0.51	75	0.89	2.82	6.59	55.70	19.73	56
21003	Fu T4	Cone	242:01-05	09/07/90	200	8	3.8	2.0	66	28	0.32	0.64	55	0.00	0.00	0.00	0.00	0.00	380
21007	6735-005	Bale	041;49-50	08/24/90	891	33	3.7	2.3	61	34	0.33	0.45	87	0.59	0.00	0.00	0.00	0.00	111
21011	L-16	Bale	085:01-04	09/14/90	1450	93	6.4	4.5	59	47	0.29	0.39	84	0.75	0.00	0.00	0.00	0.00	768
21014	Hallertau MF	Bale	007:01-04	08/20/90	261	13	5.0	4.1	55	18	0.26	0.48	75	0.75	3.58	463.05	50.08	27.32	33
21015	Tettnanger	Bale	008:01-04	08/20/90	171	10	5.8	4.0	59	30	0.26	0.00	0	0.36	3.13	2.00	45.10	15.38	26
21016	Fu N, UF	Bale	009:01-04	08/20/90	1152	60	5.2	2.2	70	27	0.30	0.40	81	0.98	2.74	6.78	56.17	19.21	32
21023	6532-014	Cone	029:51-52	09/07/90	600	74	12.4	4.7	73	34	0.27	0.54	63	0.00	0.00	0.00	0.00	0.00	352
21039	Golden Star	Cone	015:01-04	09/17/90	2200	94	4.3	3.5	55	51	0.24	0.60	58	0.00	0.00	0.00	0.00	0.00	731
21040	Columbia	Bale	023:05-08	09/17/90	747	52	7.0	4.1	63	42	0.28	0.69	56	1.98	2.09	4.60	67.29	10.31	828
21041	Willamette	Bale	024;05-08	09/17/90	1237	75	6.1	3.7	62	37	0.30	0.73	57	1.91	2.70	4.08	60.42	15.37	819
21041	Willamette	Bale	227:01-05	09/07/90	689	40	5.8	3.8	61	35	0.30	0.44	85	0.56	3.06	4.69	79.53	6.29	460
21042	6769-002	Cone	108:13-14	09/11/90	2000	54	2.7	1.7	61	41	0.29	0.60	58	0.00	0.00	0.00	0.00	0.00	507
21043	Wye Challenger	Bale	018:05-08	08/29/90	608	46	7.6	4.2	65	24	0.30	0.42	81	1.44	3.15	27.60	66.28	11.73	178
21044	Wye Northdown	Bale	019:05-08	08/20/90	455	37	8.1	4.3	65	23	0.27	0.53	69	1.50	2.26	52.16	67.65	14.26	31
21049	Styrian, Yugo	Bale	020:05-08	08/20/90	800	34	4.2	1.8	70	27	0.34	0.44	87	0.46	2.76	7.73	55.56	19.78	35
21049	Styrian, Yugo	Bale	214:01-05	08/28/90	1056	43	4.1	2.3	64	31	0.32	0.87	44	1.34	2.87	4.95	60.10	16.62	135
21050	Ahil, Yugo	Bale	001:09-12	08/30/90	1536	166	10.8	4.3	72	24	0.27	1.02	32	2.62	2.14	.78	67.19	7.32	329
21051	Apolon, Yugo	Bale	004:09-12	08/30/90	949	103	10.8	3.8	74	24	0.26	1.29	20	2.17	0.00	0.00	0.00	0.00	324
21052	Atlas, Yugo	Bale	002:09-12	08/31/90	341	36	10.6	3.6	74	38	0.29	0.72	53	1.13	0.00	0.00	0.00	0.00	221
21053	Aurora, Yugo	Bale	003:09-12	08/30/90	805	83	10.3	3.6	74	21	0.29	0.55	70	0.95	2.94	3.52	70.41	9.73	318
21054	6806-067	Cone	043:47-48	09/05/90	800	80	10.0	3.7	73	39	0.29	0.70	51	0.00	0.00	0.00	0.00	0.00	259
21055	6806-080	Bale	033:05-08	08/29/90	1045	160	15.3	4.3	78	48	0.32	0.46	83	2.05	1.33	1.51	62.78	6.41	164
21055	6806-080	Bale	044:47-48	08/23/90	384	53	13.9	3.8	78	45	0.31	0.44	89	1.51	0.00	0.00	0.00	0.00	87
21056	Bullion, 10A,UF	Bale	013:09-12	08/29/90	3061	340	11.1	5.0	69	40	0.26	1.15	26	0.60	0.00	0.00	0.00	0.00	163
21056	Bullion, 10A,UF	Bale	206:01-05	09/06/90	2006	198	9.9	4.9	67	37	0.30	1.10	28	2.35	0.00	0.00	0.00	0.00	475
21057	PrRingwood Sel	Cone	036:49-50	09/06/90	2000	81	4.0	3.0	57	39	0.26	0.35	84	0.00	0.00	0.00	0.00	0.00	293
21062	6512-024	Bale	043:51-52	08/24/90	853	39	4.6	2.1	69	51	0.33	0.77	51	1.04	0.00	0.00	0.00	0.00	116
21078	Record, Belg	Bale	021:09-12	08/30/90	1072	74	6.9	6.3	52	27	0.27	0.68	56	1.99	2.66	324.65	63.48	15.58	331
21079	Blue N.B., Belg	Bale	009:09-12	08/20/90	85	4	4.2	1.7	72	24	0.35	0.00	0	0.61	0.00	0.00	0.00	0.00	14
21080	Backa, Yugo	Cone	008:09-12	09/17/90	400	15	3.8	4.1	48	25	0.22	0.46	71	0.00	0.00	0.00	0.00	0.00	724
21081	Dunav, Yugo	Bale	005:09-12	08/31/90	960	67	6.9	3.3	68	28	0.33	0.43	90	0.74	3.46	20.82	74.03	9.64	227
21082	Neoplanta, Yugo	Bale	006:09-12	08/30/90	782	102	13.0	4.6	74	40	0.31	0.54	49	0.90	0.00	0.00	0.00	0.00	321
21083	Vojvodina, Yugo	Bale	007:09-12	08/30/90	427	35	8.2	3.1	73	29	0.27	0.37	84	0.53	0.00	0.00	0.00	0.00	436
21084	Yugo IV/12	Cone	037:49-50	09/05/90	600	29	4.8	3.1	60	22	0.25	0.52	65	0.00	0.00	0.00	0.00	0.00	248
21085	Yugo VII/23	Cone	039:49-50	09/05/90	600	22	3.7	3.9	49	22	0.25	0.68	52	0.00	0.00	0.00	0.00	0.00	251
21086	Yugo VIII/27	Cone	040:49-50	09/05/90	600	33	5.5	3.7	60	24	0.24	0.66	54	0.00	0.00	0.00	0.00	0.00	256
21092	Cascade UF	Bale	014:09-12	08/30/90	549	42	7.6	5.7	57	38	0.24	0.81	42	1.79	2.54	2.39	70.84	7.51	327

*Agricultural Chemistry Department**Oregon State University**Agricultural Research Service**U S Dept Agriculture**Corvallis, Oregon*

1990 Bale and 5-Cone Analyses at 8% Moisture Content(Bale) or As Is Basis(5-Cone) as of November 7, 1991

Accession or Nursery Number	Identification	Type	Location	Harvest Date	Yield Lb/Ac	Alpha Lb/ac	Alpha %	Beta %	Alpha Ratio	CoH	HSI	6 Mo HSI	%A+B Remain	Oil mL/ 100g	Oil H/C	Oil H/F	Oil Myr (%)	Oil Hum (%)	Serial Number
21093	H. Brewer VF	Bale	012:09-12	08/20/90	203	17	8.4	2.8	75	22	0.30	0.39	90	1.04	2.54	514.54	56.60	20.07	20
21094	6903-112	Cone	009:49-50	09/06/90	1000	58	5.8	4.5	56	35	0.24	0.43	74	0.00	0.00	0.00	0.00	0.00	284
21095	6903-259	Cone	010:49-50	09/06/90	2000	157	7.9	5.2	60	38	0.22	0.42	75	0.00	0.00	0.00	0.00	0.00	281
21097	Huller Bitterer	Bale	030:05-08	09/17/90	853	72	8.4	4.5	65	31	0.26	0.69	53	0.88	2.05	49.43	79.31	2.32	823
21098	6913-068	Bale	112:03-04	08/21/90	3946	324	8.2	4.7	64	24	0.27	1.20	23	1.47	1.26	33.62	53.70	8.10	38
21099	6921-006	Bale	101:11-12	08/22/90	2133	204	9.5	6.5	60	31	0.29	0.60	66	1.98	0.00	0.00	0.00	0.00	64
21112	Wye Target	Bale	016:09-12	08/30/90	1701	194	11.4	4.8	70	35	0.27	0.74	49	1.99	1.97	138.25	74.26	6.08	328
21113	Lubelska, Pol	Bale	018:09-12	08/21/90	469	16	3.5	4.0	47	21	0.31	0.46	77	0.28	0.00	0.00	0.00	0.00	51
21114	Nadwislanska	Bale	019:09-12	08/21/90	171	5	2.8	4.1	41	25	0.28	0.00	0	0.33	3.16	2.40	26.45	28.69	57
21115	Pocket Talisman	Bale	020:09-12	09/17/90	483	21	4.3	2.3	65	58	0.27	0.68	55	0.86	1.35	40.71	71.36	3.66	869
21116	Brewers Gold VF	Bale	015:09-12	08/30/90	1095	128	11.7	4.9	70	37	0.26	0.98	34	2.71	0.00	0.00	0.00	0.00	320
21120	7001-013	Bale	001:47-48	09/07/90	1216	19	1.6	5.8	21	40	0.32	1.36	21	1.00	0.65	26.83	54.87	1.61	446
21120	7001-013	Cone	240:17-21	09/14/90	200	2	1.0	6.3	13	52	0.26	1.12	28	0.00	0.00	0.00	0.00	0.00	693
21121	7001-039	Cone	002:47-48	09/05/90	1600	12	0.7	2.9	20	63	0.31	1.39	18	0.00	0.00	0.00	0.00	0.00	242
21122	7001-047	Cone	003:47-48	09/05/90	1600	29	1.8	2.5	42	49	0.30	0.69	51	0.00	0.00	0.00	0.00	0.00	239
21123	7001-054	Cone	004:47-48	09/07/90	1000	4	0.4	3.3	11	62	0.36	1.18	26	0.00	0.00	0.00	0.00	0.00	354
21125	7001-067	Cone	006:47-48	09/05/90	1800	8	0.4	1.5	22	42	0.32	0.62	56	0.00	0.00	0.00	0.00	0.00	240
21127	7001-081	Cone	008:47-48	09/05/90	1600	7	0.4	3.3	11	61	0.30	1.30	21	0.00	0.00	0.00	0.00	0.00	236
21128	7001-123	Cone	009:47-48	09/05/90	1200	4	0.4	1.2	23	51	0.46	1.22	24	0.00	0.00	0.00	0.00	0.00	231
21138	6701-054	Bale	016:49-50	09/10/90	896	15	1.7	1.9	47	29	0.39	0.55	80	0.51	0.00	0.00	0.00	0.00	607
21139	6704-138	Bale	024:49-50	09/07/90	1365	44	3.2	5.9	35	49	0.26	0.47	68	0.37	0.63	7.42	60.10	1.98	519
21143	6028-001	Bale	050:51-52	08/24/90	640	24	3.8	1.7	69	28	0.34	0.53	82	0.96	0.00	0.00	0.00	0.00	119
21144	6185-001	Bale	051:51-52	09/10/90	0	0	4.7	6.4	42	39	0.28	0.93	39	1.91	0.00	0.00	0.00	0.00	581
21145	6305-004	Cone	052:51-52	09/07/90	341	12	3.5	3.7	48	37	0.31	0.47	70	0.00	0.00	0.00	0.00	0.00	358
21149	6616-002	Cone	048:51-52	09/07/90	1800	178	9.9	7.7	56	49	0.27	1.06	31	0.00	0.00	0.00	0.00	0.00	363
21150	6616-010	Bale	049:51-52	08/24/90	1386	68	4.9	4.5	52	35	0.32	0.83	47	1.11	0.00	0.00	0.00	0.00	124
21151	6616-020	Cone	030:51-52	09/07/90	1800	117	6.5	5.4	55	40	0.27	0.91	38	0.00	0.00	0.00	0.00	0.00	365
21156	6806-094	Bale	009:51-52	08/24/90	1365	83	6.1	2.4	72	37	0.34	0.55	77	0.51	0.00	0.00	0.00	0.00	114
21158	6806-099	Cone	049:49-50	09/05/90	1400	141	10.1	3.2	76	31	0.27	0.71	50	0.00	0.00	0.00	0.00	0.00	257
21159	6818-043	Cone	010:51-52	09/06/90	1400	54	3.9	8.2	32	28	0.23	0.50	67	0.00	0.00	0.00	0.00	0.00	278
21160	6901-140	Cone	051:49-50	09/05/90	2000	64	3.2	3.8	46	28	0.23	0.73	49	0.00	0.00	0.00	0.00	0.00	252
21161	6903-226	Cone	039:51-52	09/07/90	1000	20	2.0	5.0	28	30	0.28	0.59	59	0.00	0.00	0.00	0.00	0.00	353
21162	6903-263	Cone	040:51-52	09/07/90	1800	76	4.2	4.4	49	23	0.29	0.47	70	0.00	0.00	0.00	0.00	0.00	362
21163	6907-058	Cone	052:49-50	09/05/90	1800	96	5.4	7.7	41	33	0.26	0.45	72	0.00	0.00	0.00	0.00	0.00	267
21164	6907-077	Cone	055:49-50	09/05/90	1800	94	5.2	8.3	39	41	0.22	0.44	73	0.00	0.00	0.00	0.00	0.00	264
21167	Hybrid 2, India	Cone	014:01-04	09/17/90	600	53	8.8	5.4	62	37	0.23	0.42	75	0.00	0.00	0.00	0.00	0.00	734
21169	Tardif d Bourg	Bale	024:01-04	09/14/90	896	36	4.0	4.6	47	20	0.29	0.78	48	1.37	0.00	0.00	0.00	0.00	770
21170	Elsasser	Bale	025:01-04	08/29/90	373	16	4.2	5.8	42	23	0.27	0.43	79	0.08	3.82	114.05	4.69	40.15	166
21173	Strisselspalter	Bale	031:01-04	09/14/90	352	16	4.4	2.7	62	28	0.35	0.76	52	1.14	0.00	0.00	0.00	0.00	772
21179	Hersbrucker Eng	Bale	006:01-04	09/17/90	400	10	2.6	4.9	34	30	0.31	0.56	62	0.54	3.75	345.16	61.17	19.33	887
21179	Hersbrucker Eng	Cone	006:01-04	09/17/90	400	14	3.4	7.1	33	29	0.23	0.51	66	0.00	0.00	0.00	0.00	0.00	730
21180	7003-143	Bale	034:51-52	09/10/90	2709	228	8.4	6.1	58	32	0.26	0.85	42	1.71	1.59	523.77	57.09	15.71	582
21181	7003-243	Cone	035:51052	09/07/90	100	5	4.9	4.6	51	54	0.25	0.66	53	0.00	0.00	0.00	0.00	0.00	346
21182	Galena (43-16)	Bale	008:05-08	08/29/90	1786	202	11.3	7.2	61	42	0.28	0.39	85	0.97	0.00	0.00	0.00	0.00	174
21182	Galena (43-16)	Bale	239:01-05	08/28/90	2560	373	14.6	9.4	61	41	0.25	0.38	83	1.39	2.20	238.25	61.42	7.62	144
21183	Eroica (34-5)	Bale	013:05-08	09/14/90	1653	194	11.7	4.7	71	43	0.29	0.55	59	0.61	0.00	0.00	0.00	0.00	773
21185	Hersbrucker Ger	Bale	004:01-04	09/17/90	200	6	2.8	5.0	35	24	0.28	0.80	45	0.38	3.61	65.17	41.76	29.52	888
21185	Hersbrucker Ger	Cone	004:01-04	09/17/90	200	5	2.3	4.1	37	27	0.24	0.51	66	0.00	0.00	0.00	0.00	0.00	736
21186	Spalter	Bale	022:01-04	08/20/90	192	7	3.9	3.1	55	22	0.31	0.55	65	0.51	3.64	1.25	65.83	9.97	17
21187	Southern Brewer	Bale	028:01-04	08/29/90	1562	128	8.2	3.0	73	40	0.29	0.36	91	0.81	0.00	0.00	0.00	0.00	168

*Agricultural Chemistry Department**Oregon State University**Agricultural Research Service**U S Dept Agriculture**Corvallis, Oregon*

1990 Bale and 5-Cone Analyses at 8% Moisture Content(Bale) or As Is Basis(5-Cone) as of November 7, 1991

Accession or Nursery Number	Identification	Type	Location	Harvest Date	Yield Lb/Ac	Alpha Lb/ac	Alpha %	Beta %	Alpha Ratio	CoH	HSI	6 Mo HSI	%A+B Remain	Oil mL/ 100g	Oil H/C	Oil H/F	Oil Myr (%)	Oil Hum (%)	Serial Number
21188	S.Af. MP2/55	Cone	029:01-04	09/17/90	1600	79	4.9	3.4	59	33	0.25	0.84	42	0.00	0.00	0.00	0.00	0.00	729
21193	Nugget	Bale	036:01-04	08/29/90	1275	155	12.2	4.4	74	26	0.28	0.40	82	0.80	0.00	0.00	0.00	0.00	177
21193	Nugget	Bale	237;01-05	09/07/90	2201	316	14.4	5.3	73	31	0.26	0.52	67	1.97	2.28	127.69	59.01	14.56	448
21194	7006-311	Bale	032:51-52	08/24/90	640	74	11.5	5.5	68	25	0.28	0.65	56	1.69	0.00	0.00	0.00	0.00	109
21194	7006-311	Bale	238:01-05	08/28/90	1152	164	14.3	7.0	67	30	0.25	1.14	24	1.80	0.00	0.00	0.00	0.00	133
21195	7006-408	Cone	036:51-52	09/07/90	1600	171	10.7	3.8	74	30	0.26	0.39	79	0.00	0.00	0.00	0.00	0.00	345
21195	7006-408	Bale	210:28-32	09/13/90	538	59	10.9	6.1	64	34	0.30	0.43	84	0.84	0.00	0.00	0.00	0.00	858
21196	Bullion 6A	Bale	007:05-08	08/29/90	3152	312	9.9	4.9	67	43	0.29	1.05	32	2.33	0.00	0.00	0.00	0.00	169
21197	Tettnang? VF	Bale	032:05-08	08/20/90	480	19	4.0	1.8	69	25	0.36	0.43	89	0.59	0.00	0.00	0.00	0.00	21
21197	Tettnang? VF	Bale	232:28-32	08/29/90	631	32	5.1	2.6	66	26	0.31	0.56	68	0.96	3.03	4.25	65.49	13.08	157
21197	Tettnang? VF	Bale	235:28-32	08/29/90	435	21	4.7	2.7	64	28	0.35	0.67	60	1.01	2.97	4.55	62.21	14.35	161
21198	7003-038	Cone	010:47-48	09/05/90	2000	166	8.3	5.9	59	36	0.24	0.46	71	0.00	0.00	0.00	0.00	0.00	243
21199	7004-003	Bale	212:17-21	08/31/90	1382	135	9.8	5.9	62	38	0.25	0.70	49	2.21	2.10	362.90	56.03	18.87	211
21201	7005-070	Bale	046:47-48	08/23/90	1066	109	10.2	6.8	60	34	0.30	0.45	81	1.44	0.00	0.00	0.00	0.00	96
21202	6903-107	Bale	208:28-32	09/13/90	1613	104	6.5	6.8	49	31	0.26	0.43	77	1.07	0.00	0.00	0.00	0.00	860
21203	Yugo 20P14	Bale	047:47-48	09/18/90	1066	39	3.7	3.0	55	18	0.25	0.48	75	0.38	0.00	0.00	0.00	0.00	882
21204	Yugo 21P01	Bale	048:47-48	09/18/90	1301	38	3.0	8.2	26	32	0.25	0.51	71	0.20	0.00	0.00	0.00	0.00	892
21205	Yugo 24P07	Bale	049:47-48	09/18/90	1834	38	2.1	2.6	44	25	0.32	0.45	80	0.41	0.46	.62	11.76	3.48	877
21207	Yugo 27P04	Bale	051:47-48	09/18/90	1130	34	3.0	3.2	48	25	0.32	0.59	68	0.65	2.20	13.54	42.96	27.58	876
21208	Yugo 32P02	Bale	052:47-48	09/18/90	1280	64	5.0	3.3	60	22	0.25	0.44	69	0.16	0.00	0.00	0.00	0.00	872
21209	Yugo 33P13	Bale	053:47-48	09/18/90	512	14	2.7	1.9	59	19	0.31	0.53	75	0.33	0.00	0.00	0.00	0.00	893
21209	Yugo 33P13	Bale	105:01-02	08/21/90	1600	61	3.8	2.0	66	28	0.36	0.54	78	0.80	2.88	7.44	48.44	23.73	47
21210	Yugo 33P4	Bale	054:47-48	09/18/90	469	10	2.1	2.6	45	25	0.32	0.53	70	0.20	0.00	0.00	0.00	0.00	890
21211	Yugo 40P19	Bale	055:47-48	09/18/90	2304	130	5.6	3.6	61	17	0.25	0.41	78	0.20	2.57	1.04	21.69	20.52	881
21213	Aromat, Yugo	Bale	035:05-08	08/20/90	405	14	3.4	2.3	60	21	0.32	0.00	0	0.35	0.00	0.00	0.00	0.00	27
21215	Norgard 1478, Y	Bale	027:05-08	08/20/90	139	10	7.5	3.1	71	29	0.29	0.40	84	0.80	0.00	0.00	0.00	0.00	29
21216	Groene Bel	Bale	028:05-08	08/29/90	885	52	5.9	3.6	62	26	0.28	0.67	55	1.31	0.00	0.00	0.00	0.00	165
21217	Star, Belg	Bale	029:05-08	08/20/90	331	9	2.7	1.3	67	21	0.36	0.46	84	0.39	0.00	0.00	0.00	0.00	19
21218	7005-149	Cone	045:47-48	09/05/90	2000	62	3.1	0.9	78	41	0.25	0.43	74	0.00	0.00	0.00	0.00	0.00	258
21219	65009 VF	Cone	008:49-50	09/06/90	2400	289	12.0	7.9	61	34	0.24	0.84	42	0.00	0.00	0.00	0.00	0.00	285
21220	Eroica VF	Bale	031;05-08	09/17/90	1035	107	10.4	4.4	70	44	0.26	0.69	54	0.93	0.00	0.00	0.00	0.00	826
21220	Eroica vf	Bale	229:12-16	09/11/90	1468	197	13.4	5.8	70	41	0.27	0.64	56	1.11	0.00	0.00	0.00	0.00	611
21222	Aquila, Id 33-6	Bale	234:28-32	09/13/90	717	59	8.2	5.1	62	49	0.27	0.92	36	1.94	0.30	6.89	65.48	.79	855
21225	Olympic	Bale	037:01-04	08/29/90	725	99	13.7	5.3	72	32	0.29	1.28	21	1.92	1.06	92.56	83.20	2.50	171
21226	Chinook	Bale	038:01-04	09/14/90	725	104	14.3	3.9	79	35	0.28	0.51	69	2.15	0.00	0.00	0.00	0.00	758
21226	Chinook	Bale	226:28-32	09/13/90	828	115	13.8	4.2	77	37	0.28	0.60	60	1.83	2.34	56.02	54.20	11.49	863
21227	Perle	Bale	032:01-04	08/20/90	747	72	9.6	3.3	75	28	0.27	0.46	86	1.18	2.82	413.33	40.49	31.00	18
21227	Perle	Bale	220:01-05	08/28/90	734	82	11.2	4.4	72	30	0.27	0.43	76	1.18	3.12	609.83	55.33	21.34	143
21228	Ha MF? VF	Bale	218:12-16	08/30/90	1224	56	4.6	2.6	64	27	0.32	0.78	52	1.33	2.94	4.58	61.12	15.19	323
21229	H. Bitter VF	Bale	031:09-12	09/17/90	1138	86	7.5	4.5	63	47	0.26	0.43	79	0.69	2.54	57.30	75.84	5.27	817
21232	Jap 69K-BH66	Bale	034:47-48	08/23/90	896	93	10.3	4.1	71	39	0.29	0.52	71	1.23	2.55	1.59	70.70	7.47	84
21233	Jap 70K-SH6	Cone	035:47-48	09/05/90	1400	137	9.8	6.2	61	41	0.30	0.83	43	0.00	0.00	0.00	0.00	0.00	263
21238	Blisk, Yugo	Bale	022:05-08	08/29/90	2358	244	10.3	3.3	76	37	0.32	1.25	23	1.54	0.00	0.00	0.00	0.00	173
21238	Blisk, Yugo	Bale	234:01-05	08/28/90	1886	240	12.7	4.0	76	34	0.26	1.13	25	2.11	2.39	.66	64.83	7.61	137
21239	Bobek, Yugo	Bale	017:09-12	08/21/90	1440	104	7.2	4.0	64	26	0.32	0.53	74	1.09	2.55	4.82	59.30	15.47	59
21239	Bobek, Yugo	Cone	208:23-27	09/14/90	400	31	7.8	2.9	73	23	0.31	0.76	47	0.00	0.00	0.00	0.00	0.00	692
21240	Buket, Yugo	Bale	022:09-12	08/21/90	960	96	10.0	4.3	70	22	0.27	0.70	52	1.47	0.00	0.00	0.00	0.00	58
21240	Buket, Yugo	Cone	212:23-27	09/14/90	300	29	9.8	6.3	61	23	0.31	0.85	41	0.00	0.00	0.00	0.00	0.00	680
21241	Pol Klon 12	Bale	036:47-48	08/23/90	183	7	3.7	1.7	68	27	0.35	0.00	0	0.85	2.71	7.55	50.00	23.39	101
21242	Pol Klon 18	Bale	037:47-48	08/23/90	96	4	4.1	2.5	63	23	0.29	0.00	0	0.42	2.96	1.38	52.54	12.96	102

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1990 Bale and S-Cone Analyses at 8% Moisture Content(Bale) or As Is Basis(S-Cone) as of November 7, 1991

Accession or Nursery Number	Identification	Type	Location	Harvest Date	Yield Lb/Ac	Alpha Lb/ac	Alpha %	Beta %	Alpha Ratio	CoH	HSI	6 Mo HSI	%A+B Remain	Oil mL/ 100g	Oil H/C	Oil H/F	Oil Myr (%)	Oil Hum (%)	Serial Number
21243	Pol Klon 30	Bale	038:47-48	08/23/90	96	6	6.5	2.2	75	26	0.34	0.53	71	0.99	0.00	0.00	0.00	0.00	105
21246	7311-032	Cone	023:47-48	09/05/90	1800	253	14.1	3.7	79	36	0.30	0.51	66	0.00	0.00	0.00	0.00	0.00	262
21246	7311-032	Bale	241:28-32	09/14/90	1049	146	13.9	3.9	78	40	0.30	0.52	72	1.80	1.06	178.00	65.99	9.61	834
21247	7311-068	Cone	024:47-48	09/05/90	1400	216	15.4	5.1	75	37	0.29	0.48	69	0.00	0.00	0.00	0.00	0.00	260
21247	7311-068	Bale	215:17-21	08/31/90	1519	217	14.3	4.7	75	40	0.27	0.40	83	1.09	0.00	0.00	0.00	0.00	383
21248	7311-095	Cone	027:47-48	09/05/90	1200	177	14.8	3.3	82	38	0.29	0.45	72	0.00	0.00	0.00	0.00	0.00	254
21248	7311-095	Bale	218:17-21	08/31/90	870	158	18.1	6.9	72	35	0.26	0.50	69	2.35	0.00	0.00	0.00	0.00	207
21250	7311-152	Bale	029:47-48	08/23/90	1322	139	10.5	2.5	81	24	0.31	0.43	89	0.92	0.00	0.00	0.00	0.00	104
21250	7311-152	Bale	226:17-21	08/30/90	1664	210	12.6	3.7	77	29	0.29	0.47	80	2.10	1.36	172.88	60.22	13.83	319
21251	7312-009	Cone	028:49-50	09/06/90	1000	94	9.4	2.7	77	38	0.27	0.41	76	0.00	0.00	0.00	0.00	0.00	289
21251	7312-009	Bale	225:12-16	09/11/90	1237	181	14.6	6.1	70	40	0.31	0.52	73	2.51	0.08	4.29	54.55	1.30	610
21252	7312-036	Bale	040:47-48	08/23/90	1066	126	11.8	2.3	84	29	0.29	0.38	89	0.70	0.00	0.00	0.00	0.00	91
21253	7312-041	Cone	041:47-48	09/05/90	800	129	16.2	5.8	74	37	0.28	0.43	75	0.00	0.00	0.00	0.00	0.00	255
21253	7312-041	Bale	213:23-27	09/04/90	1023	135	13.2	3.6	78	38	0.29	0.71	57	1.83	0.00	0.00	0.00	0.00	304
21254	7312-083	Cone	214:23-27	09/14/90	1000	61	6.1	2.4	72	31	0.49	0.47	70	0.00	0.00	0.00	0.00	0.00	689
21255	7312-134	Cone	042:47-48	09/05/90	1800	248	13.8	3.1	82	37	0.30	0.42	75	0.00	0.00	0.00	0.00	0.00	268
21256	7312-032	Cone	054:51-52	09/07/90	400	38	9.5	3.3	75	39	0.30	0.47	70	0.00	0.00	0.00	0.00	0.00	361
21256	7312-032	Bale	219:23-27	09/04/90	725	108	14.9	6.2	70	42	0.27	0.67	56	2.49	1.37	130.35	69.16	6.26	336
21257	7313-083	Bale	224:23-27	09/05/90	2039	384	18.8	7.0	73	38	0.21	0.61	58	2.49	1.48	117.88	72.37	4.72	439
21261	7003-075	Cone	055:51-52	09/07/90	600	62	10.4	6.7	61	20	0.26	0.50	66	0.00	0.00	0.00	0.00	0.00	367
21261	7003-075	Bale	230:12-16	09/11/90	1450	126	8.7	6.7	56	23	0.25	0.73	53	1.54	1.96	93.34	49.13	8.21	615
21276	Early Prolific	Bale	023:09-12	08/21/90	448	18	4.0	1.9	68	23	0.32	0.55	73	0.58	2.68	4.65	40.96	19.07	42
21277	Early Promise	Bale	024:09-12	08/21/90	181	9	5.0	1.3	80	25	0.34	0.42	90	0.43	0.00	0.00	0.00	0.00	55
21278	Keyworths Early	Bale	025:09-12	08/30/90	597	52	8.8	3.4	72	31	0.27	0.44	78	1.21	0.00	0.00	0.00	0.00	326
21279	Keyworths Mids	Bale	026:09-12	08/21/90	2133	159	7.4	3.0	71	45	0.30	0.56	69	0.48	0.00	0.00	0.00	0.00	52
21280	Pride of Kent	Bale	027:09-12	08/21/90	1280	112	8.8	5.9	60	39	0.29	1.08	31	2.48	0.00	0.00	0.00	0.00	48
21281	Sunshine	Bale	028:09-12	08/21/90	320	26	8.1	2.6	75	28	0.34	0.48	76	1.03	0.00	0.00	0.00	0.00	49
21282	Wye Saxon	Bale	029:09-12	08/21/90	213	16	7.7	3.5	69	17	0.27	0.00	0	0.47	0.00	0.00	0.00	0.00	46
21283	Wye Viking	Bale	030:09-12	08/21/90	341	24	7.2	3.4	68	22	0.28	0.50	75	1.10	2.51	1.33	53.83	12.13	44
21284	Bramling	Bale	030:01-04	08/29/90	277	14	5.0	1.9	72	27	0.31	0.44	80	0.81	0.00	0.00	0.00	0.00	167
21285	Id sel BOR 704	Cone	002:51-52	09/06/90	1600	28	1.7	2.8	38	15	0.27	0.66	54	0.00	0.00	0.00	0.00	0.00	273
21287	Banner, Id43-11	Bale	213:01-05	09/06/90	1766	201	11.4	6.0	66	35	0.26	1.02	31	1.92	2.49	311.52	76.26	7.17	477
21287	Banner, Id43-11	Bale	244:06-10	09/10/90	1305	148	11.4	6.1	65	36	0.26	1.18	25	2.30	2.50	254.23	75.03	7.88	603
21289	7312-053	Cone	012:49-50	09/06/90	800	61	7.6	2.0	79	25	0.34	0.53	64	0.00	0.00	0.00	0.00	0.00	274
21290	7312-057	Cone	015:49-50	09/06/90	1700	152	8.9	2.2	80	37	0.28	0.41	76	0.00	0.00	0.00	0.00	0.00	295
21292	7312-081	Cone	020:49-50	09/06/90	1400	129	9.2	2.3	80	29	0.36	0.60	58	0.00	0.00	0.00	0.00	0.00	292
21293	7312-084	Cone	021:49-50	09/06/90	1400	184	13.2	3.3	80	26	0.31	0.44	73	0.00	0.00	0.00	0.00	0.00	283
21294	7312-106	Cone	022:49-50	09/06/90	2000	215	10.8	3.3	77	40	0.28	0.49	68	0.00	0.00	0.00	0.00	0.00	289
21295	7312-115	Bale	023:49-50	08/24/90	640	53	8.3	2.1	80	26	0.33	0.45	85	0.95	0.00	0.00	0.00	0.00	131
21296	7312-128	Cone	032:49-50	09/06/90	1400	160	11.4	2.8	80	36	0.29	0.37	81	0.00	0.00	0.00	0.00	0.00	291
21298	7315-035	Cone	038:49-50	09/05/90	800	112	14.1	3.7	79	25	0.27	0.40	77	0.00	0.00	0.00	0.00	0.00	249
21368	Yugo 88/150	Bale	031:47-48	08/23/90	1813	178	9.8	3.9	72	34	0.28	0.87	41	1.38	0.00	0.00	0.00	0.00	88
21368	Yugo 88/150	Bale	201:01-05	09/05/90	1527	183	12.0	4.4	73	37	0.25	1.20	24	0.48	2.26	.93	65.43	7.83	428
21369	Yugo 88/187	Bale	032:47-48	09/07/90	704	57	8.1	4.4	65	35	0.28	0.72	50	0.90	0.00	0.00	0.00	0.00	444
21369	Yugo 88/187	Bale	202:01-05	09/06/90	1288	123	9.6	4.8	66	33	0.29	1.31	19	2.19	2.60	1.42	69.79	8.09	474
21370	Yugo 88/201	Bale	033:47-48	09/07/90	1450	154	10.6	3.8	74	34	0.29	1.19	23	2.20	0.00	0.00	0.00	0.00	523
21370	Yugo 88/201	Bale	204:01-05	09/06/90	1220	129	10.6	3.6	74	34	0.28	1.56	12	2.06	3.11	.84	70.32	6.53	472
21371	7003-066	Cone	011:47-48	09/05/90	2400	81	3.4	2.9	54	32	0.25	0.54	63	0.00	0.00	0.00	0.00	0.00	235
21372	7006-061	Cone	020:47-48	09/05/90	1000	25	2.5	1.3	65	31	0.62	0.49	68	0.00	0.00	0.00	0.00	0.00	233
21373	7006-398	Cone	026:47-48	09/05/90	800	96	12.0	7.1	63	19	0.23	0.48	69	0.00	0.00	0.00	0.00	0.00	266

*Agricultural Chemistry Department**Oregon State University**Agricultural Research Service**U S Dept Agriculture**Corvallis, Oregon*

1990 Bale and 5-Cone Analyses at 8% Moisture Content(Bale) or As Is Basis(5-Cone) as of November 7, 1991

Accession or Nursery Number	Identification	Type	Location	Harvest Date	Yield Lb/Ac	Alpha Lb/ac	Alpha %	Beta %	Alpha Ratio	CoH	HSI	6 Mo HSI	%A+B Remain	Oil mL/ 100g	Oil H/C	Oil H/F	Oil Myr (%)	Oil Hum (%)	Serial Number
21382	7504-113	Bale	224:12-16	09/11/90	1408	146	10.4	8.7	54	24	0.24	0.58	59	1.10	0.00	0.00	0.00	0.00	613
21386	6929-042	Cone	102:03-04	09/11/90	1000	37	3.7	2.8	57	34	0.33	0.85	41	0.00	0.00	0.00	0.00	0.00	508
21387	7013-003	Bale	104:03-04	08/21/90	1152	17	1.4	5.2	22	36	0.33	0.84	50	0.83	0.00	0.00	0.00	0.00	37
21389	6745-019	Bale	106:05-06	08/21/90	1856	73	3.9	3.6	52	40	0.32	0.84	47	1.15	0.00	0.00	0.00	0.00	53
21390	6747-017	Bale	107:05-06	08/21/90	597	31	5.1	4.0	56	40	0.30	0.89	42	1.09	0.00	0.00	0.00	0.00	45
21391	6751-022	Bale	108:05-06	08/21/90	896	34	3.8	4.3	47	42	0.33	0.79	50	1.20	0.00	0.00	0.00	0.00	50
21393	6751-121	Bale	111:05-06	08/22/90	1173	67	5.7	4.5	56	41	0.29	0.83	50	1.39	0.00	0.00	0.00	0.00	71
21394	6751-136	Bale	112:05-06	08/22/90	1490	43	2.9	3.7	44	37	0.34	0.75	52	0.98	0.00	0.00	0.00	0.00	63
21396	Tolhurst Wye	Bale	032:09-12	08/21/90	228	3	1.5	2.8	35	27	0.36	0.64	58	0.37	0.00	0.00	0.00	0.00	36
21397	Hallertau MF T4	Cone	109:01-02	09/11/90	200	7	3.6	4.0	48	24	0.25	0.53	64	0.00	0.00	0.00	0.00	0.00	515
21397	Hallertau MF T4	Cone	110:01	09/11/90	200	7	3.7	3.9	49	24	0.26	0.64	55	0.00	0.00	0.00	0.00	0.00	509
21397	Hallertau MF T4	Bale	110:02	08/21/90	200	11	5.3	4.4	55	39	0.28	0.92	36	1.06	0.00	0.00	0.00	0.00	43
21397	Hallertau MF T4	Cone	245:01-05	09/07/90	200	3	1.7	3.1	36	30	0.54	0.88	40	0.00	0.00	0.00	0.00	0.00	378
21403	Sticklebract	Cone	002:01-04	09/17/90	2200	172	7.8	4.6	63	48	0.26	0.56	62	0.00	0.00	0.00	0.00	0.00	733
21403	Sticklebract	Bale	229:01-05	09/14/90	2483	249	10.0	5.3	65	47	0.29	0.55	67	1.21	2.39	2.24	76.37	4.11	843
21404	Green Bullet	Cone	003:01-04	09/17/90	1900	111	5.8	2.9	66	45	0.24	0.45	72	0.00	0.00	0.00	0.00	0.00	735
21404	Green Bullet	Cone	231:01-05	09/13/90	200	8	4.1	2.2	65	44	0.29	0.42	75	0.00	0.00	0.00	0.00	0.00	629
21405	Superalpha	Cone	033:01-04	09/17/90	1800	97	5.4	3.5	61	39	0.29	0.45	72	0.00	0.00	0.00	0.00	0.00	727
21405	Superalpha	Bale	240:01-05	09/14/90	1212	137	11.3	6.6	63	39	0.25	0.49	69	0.80	3.54	130.12	76.88	6.38	815
21406	AlphaAroma	Cone	026:01-04	09/17/90	2200	127	5.8	3.1	65	23	0.27	0.53	64	0.00	0.00	0.00	0.00	0.00	722
21406	AlphaAroma	Bale	241:01-05	09/14/90	2193	218	10.0	4.1	71	31	0.27	0.57	49	1.29	3.56	3.83	65.25	12.22	847
21407	Id 51-8A	Bale	245:06-10	09/10/90	2073	241	11.6	5.1	69	41	0.26	1.16	25	1.90	0.00	0.00	0.00	0.00	586
21408	U402-49	Cone	247:06-10	09/13/90	1600	179	11.2	5.9	65	56	0.26	1.16	27	0.00	0.00	0.00	0.00	0.00	632
21409	7003-081	Cone	012:47-48	09/05/90	1400	125	8.9	7.9	53	27	0.23	0.00	0	0.00	0.00	0.00	0.00	0.00	234
21409	7003-081	Bale	233:12-16	09/11/90	1041	72	6.9	7.3	48	28	0.24	0.71	48	0.33	0.00	0.00	0.00	0.00	614
21412	7013-051	Cone	106:03-04	09/11/90	1000	33	3.3	3.1	51	27	0.34	0.92	38	0.00	0.00	0.00	0.00	0.00	511
21442	7713-024	Cone	053:49-50	09/05/90	600	54	9.0	3.5	72	31	0.27	0.64	55	0.00	0.00	0.00	0.00	0.00	265
21443	7727-044	Cone	017:51-52	09/07/90	1400	82	5.9	2.7	68	23	0.34	0.56	61	0.00	0.00	0.00	0.00	0.00	347
21444	7302-016M	Bale	048:49-50	08/24/90	725	26	3.6	4.6	44	34	0.30	0.81	48	0.89	2.06	161.89	64.41	12.79	115
21450	7304-107	Cone	023:51-52	09/07/90	1400	156	11.1	2.9	80	29	0.30	0.86	41	0.00	0.00	0.00	0.00	0.00	364
21451	7306-193	Cone	025:51-52	09/07/90	800	87	10.8	5.7	65	29	0.26	0.48	69	0.00	0.00	0.00	0.00	0.00	366
21452	7311-028	Bale	026:51-52	08/24/90	1813	221	12.2	4.1	75	40	0.30	0.54	73	1.31	0.00	0.00	0.00	0.00	113
21453	7314-033	Bale	027:51-52	08/24/90	619	68	11.0	4.4	71	32	0.28	0.48	77	1.25	0.00	0.00	0.00	0.00	112
21454	7007-339	Bale	033:51-52	08/24/90	960	117	12.2	5.7	68	40	0.29	0.68	54	2.48	0.00	0.00	0.00	0.00	121
21455	Mt Hood	Bale	017:62-66	09/12/90	683	44	6.5	7.4	47	25	0.27	0.95	31	0.68	0.00	0.00	0.00	0.00	794
21455	Mt Hood	Cone	215:23-27	09/14/90	400	14	3.5	4.7	43	26	0.24	0.91	38	0.00	0.00	0.00	0.00	0.00	690
21456	8303-046	Cone	218:23-27	09/14/90	400	9	2.2	3.5	39	28	0.24	1.10	29	0.00	0.00	0.00	0.00	0.00	703
21457	8303-117	Cone	019:62-66	09/07/90	1000	38	3.8	3.6	51	27	0.30	0.78	46	0.00	0.00	0.00	0.00	0.00	360
21457	8303-117	Bale	220:23-27	09/04/90	213	11	5.0	3.9	56	24	0.29	1.06	28	1.28	3.56	356.66	59.83	18.90	389
21459	8308-066	Cone	135:01-51	09/12/90	1000	38	3.8	2.8	58	26	0.28	0.54	63	0.00	0.00	0.00	0.00	0.00	538
21459	8308-066	Cone	207:28-32	09/14/90	300	7	2.3	3.3	41	29	0.38	0.73	49	0.00	0.00	0.00	0.00	0.00	682
21460	S Afr HP1/86	Cone	041:51-52	09/07/90	1600	89	5.6	4.3	57	25	0.27	0.37	81	0.00	0.00	0.00	0.00	0.00	356
21460	S Afr HP1/86	Bale	211:23-27	09/12/90	1194	74	6.2	5.7	52	34	0.24	0.45	67	0.84	2.42	187.30	33.90	24.91	797
21469	8301-011	Bale	229:23-27	09/12/90	734	31	4.2	6.5	39	26	0.25	0.71	50	1.17	2.77	277.03	58.21	20.22	801
21470	8301-018	Bale	002:62-66	09/10/90	1458	39	2.7	4.9	36	26	0.31	0.88	40	1.05	0.00	0.00	0.00	0.00	595
21470	8301-018	Bale	238:23-27	09/12/90	1007	28	2.7	6.3	31	29	0.27	0.87	38	1.11	2.43	267.67	47.61	25.43	792
21471	8301-062	Bale	003:62-66	09/10/90	994	73	7.3	5.3	58	23	0.26	0.72	49	1.37	2.41	299.27	31.91	31.12	589
21471	8301-062	Bale	241:23-27	09/05/90	452	28	6.2	6.1	50	24	0.22	0.68	46	0.62	0.00	0.00	0.00	0.00	417
21472	8302-004	Bale	004:62-67	08/24/90	1109	27	2.5	4.2	37	28	0.30	0.78	50	0.75	3.55	644.07	49.06	28.34	128
21473	8303-001	Bale	005:62-66	09/10/90	1207	35	2.9	5.1	36	28	0.30	0.92	39	1.22	2.34	216.38	57.53	19.91	597

*Agricultural Chemistry Department**Oregon State University**Agricultural Research Service**U S Dept Agriculture**Corvallis, Oregon*

1990 Bale and 5-Cone Analyses at 8% Moisture Content(Bale) or As Is Basis(5-Cone) as of November 7, 1991

Accession or Nursery Number	Identification	Type	Location	Harvest Date	Yield Lb/Ac	Alpha Lb/ac	Alpha %	Beta %	Alpha Ratio	CoH	HSI	6 Mo HSI	%A+B Remain	Oil mL/100g	Oil H/C	Oil H/F	Oil Myr (%)	Oil Hum (%)	Serial Number
21473	8303-001	Bale	005:62-66	09/10/90	1207	30	2.5	4.3	37	30	0.29	1.24	23	1.13	3.24	12.11	55.05	21.43	598
21473	8303-001	Bale	242:23-27	09/05/90	384	9	2.5	4.4	36	25	0.26	1.42	18	1.61	0.00	0.00	0.00	0.00	416
21475	8303-047	Bale	007:62-66	09/10/90	845	39	4.6	4.7	50	27	0.27	0.81	44	1.39	0.00	0.00	0.00	0.00	588
21476	8303-053	Bale	008:62-66	09/12/90	930	38	4.1	3.5	54	23	0.30	0.76	49	1.36	0.00	0.00	0.00	0.00	793
21478	8303-076	Bale	010:65-68	08/24/90	1109	28	2.5	4.1	38	26	0.32	0.67	60	0.51	0.00	0.00	0.00	0.00	120
21479	8303-084	Bale	011:62-66	09/12/90	785	38	4.8	4.1	54	24	0.27	1.00	34	1.18	0.00	0.00	0.00	0.00	805
21480	8303-091	Bale	012:62-67	09/12/90	614	32	5.1	5.2	50	24	0.26	0.87	40	1.80	3.47	183.73	60.42	18.37	674
21481	8303-116	Bale	013:62-66	09/12/90	751	39	5.1	3.5	60	23	0.31	0.88	43	1.61	0.00	0.00	0.00	0.00	804
21482	8304-068	Bale	107:29-30	08/31/90	747	15	2.1	4.7	31	30	0.29	1.25	23	0.70	0.00	0.00	0.00	0.00	302
21484	8305-017	Bale	016:62-66	09/12/90	367	13	3.6	4.0	47	26	0.27	0.60	61	1.00	0.00	0.00	0.00	0.00	798
21484	8305-017	Cone	204:23-27	09/14/90	300	9	3.0	3.8	44	30	0.28	0.72	50	0.00	0.00	0.00	0.00	0.00	685
21485	S.Af. RF5/54	Cone	019:47-48	09/05/90	1800	165	9.1	4.0	69	19	0.24	0.47	70	0.00	0.00	0.00	0.00	0.00	230
21485	S.Af. RF5/54	Bale	112:39-40	09/06/90	1749	153	8.8	4.1	68	20	0.28	0.87	42	0.86	0.00	0.00	0.00	0.00	481
21485	S.Af. RF5/54	Bale	216:06-10	09/17/90	1237	133	10.8	5.5	66	23	0.28	0.79	46	0.83	2.11	128.46	69.76	7.32	867
21486	7507-109	Bale	239:23-27	09/05/90	1928	228	11.8	6.9	63	33	0.25	0.71	49	2.02	0.00	0.00	0.00	0.00	435
21490	8309-037	Bale	210:23-27	09/17/90	563	19	3.4	7.5	31	30	0.24	1.32	18	1.77	3.63	62.19	58.50	18.41	825
21490	8309-037	Bale	229;28-32	09/13/90	1322	62	4.7	7.4	39	24	0.25	1.24	23	0.77	3.55	148.69	72.90	10.71	857
21491	8405-026	Bale	230:23-27	09/05/90	572	37	6.4	4.4	59	23	0.25	1.33	18	2.04	2.30	390.78	63.44	16.02	415
21492	8408-022	Bale	109:29-30	08/31/90	853	54	6.3	5.9	52	26	0.27	1.53	12	2.20	0.00	0.00	0.00	0.00	303
21492	8408-022	Bale	215:28-32	09/13/90	35	2	4.3	4.8	47	29	0.32	0.00	0	0.79	0.00	0.00	0.00	0.00	901
21493	8408-096	Bale	110:29-30	08/22/90	1344	120	8.9	1.5	86	22	0.28	0.63	60	1.29	0.00	0.00	0.00	0.00	61
21493	8408-096	Bale	233:28-32	08/29/90	640	48	7.6	4.8	61	22	0.27	0.80	43	1.58	3.52	15.66	62.77	15.57	162
21494	7506-123	Bale	234:17-21	09/04/90	1024	66	6.4	6.3	51	26	0.29	1.18	26	1.35	0.00	0.00	0.00	0.00	339
21495	7506-131	Bale	236:17-21	09/04/90	981	93	9.4	6.2	60	33	0.31	0.63	61	1.22	0.00	0.00	0.00	0.00	340
21496	Tettnanger A	Cone	236:23-27	09/14/90	100	4	4.4	5.7	44	29	0.25	0.79	45	0.00	0.00	0.00	0.00	0.00	694
21497	Tettnanger B	Bale	237:23-27	09/17/90	111	8	6.8	6.6	51	25	0.27	0.00	0	1.04	3.79	.86	52.62	11.84	824
21498	Yeoman	Bale	034:01-04	08/20/90	480	52	10.8	3.5	76	25	0.30	0.40	74	1.10	2.58	326.41	38.46	24.15	13
21498	Yeoman	Bale	203:01-05	08/28/90	316	41	12.9	4.3	75	26	0.30	0.48	78	2.38	2.68	258.75	60.11	14.23	142
21499	Zenith	Bale	035:01-04	08/20/90	373	34	9.1	2.3	80	22	0.29	0.38	85	0.83	0.00	0.00	0.00	0.00	24
21499	Zenith	Bale	209:01-05	08/28/90	117	12	10.0	3.1	76	25	0.29	0.00	0	1.99	3.49	160.42	57.21	15.72	156
21500	7504-026	Bale	205:12-16	09/10/90	1817	199	10.9	6.4	63	29	0.25	0.67	47	2.01	4.45	1.36	69.79	4.93	585
21502	7504-111	Bale	223:12-16	09/10/90	1604	135	8.4	8.5	50	33	0.27	0.81	43	2.19	0.00	0.00	0.00	0.00	590
21503	7504-137	Bale	234:12-16	09/11/90	1681	94	5.6	8.7	39	32	0.24	0.91	33	1.16	2.32	3.20	73.23	6.15	669
21505	8036-099	Bale	234:23-27	09/12/90	1186	88	7.4	2.7	73	31	0.29	0.74	52	1.49	4.33	135.88	78.62	5.44	673
21506	7507-062	Bale	235:23-27	09/12/90	734	66	9.0	7.6	54	37	0.23	0.65	50	1.15	0.00	0.00	0.00	0.00	678
21507	Centennial	Bale	216:28-32	09/14/90	452	57	12.6	4.2	75	29	0.29	1.37	18	2.68	2.42	227.93	80.69	3.19	764
21509	8037-090	Bale	220:28-32	09/17/90	555	37	6.7	4.4	60	38	0.28	0.64	58	1.33	0.00	0.00	0.00	0.00	821
21511	7610-104	Bale	015:47-48	08/23/90	1173	150	12.8	2.9	81	29	0.28	0.38	85	0.67	0.00	0.00	0.00	0.00	92
21511	7610-104	Bale	238:28-32	09/13/90	589	73	12.4	5.3	70	35	0.32	0.48	79	1.62	0.00	0.00	0.00	0.00	899
21512	7611-025	Bale	018:47-48	08/23/90	1024	64	6.2	1.4	82	28	0.32	0.44	84	0.72	0.00	0.00	0.00	0.00	85
21512	7611-025	Bale	239:28-32	09/14/90	687	60	8.7	2.1	80	33	0.35	0.50	79	1.01	0.00	0.00	0.00	0.00	769
21513	7501-004	Bale	202:12-16	09/10/90	2261	270	12.0	5.8	67	32	0.25	0.63	56	0.77	2.82	2.44	82.65	2.20	587
21514	Hersbrucker-6	Bale	034:05-08	09/17/90	171	6	3.4	4.7	42	21	0.28	0.65	62	0.90	0.00	0.00	0.00	0.00	822
21514	Hersbrucker-6	Bale	034:09-12	08/31/90	242	9	3.6	3.7	50	22	0.28	0.58	65	0.83	0.00	0.00	0.00	0.00	223
21514	Hersbrucker-6	Bale	207:01-05	09/06/90	1166	42	3.6	4.9	42	19	0.29	0.76	51	0.77	2.22	52.38	60.77	9.43	478
21515	Hersbrucker-8	Bale	035:05-08	09/17/90	405	17	4.2	5.3	44	18	0.25	0.80	46	1.37	2.05	48.13	63.96	6.98	820
21515	Hersbrucker-8	Bale	035:09-12	08/31/90	389	18	4.5	5.4	46	19	0.24	0.62	55	1.14	0.00	0.00	0.00	0.00	224
21515	Hersbrucker-8	Bale	216:01-05	09/06/90	1237	45	3.6	6.0	38	20	0.28	1.15	27	1.51	2.02	49.26	62.88	7.19	476
21516	Hersbrucker-9	Bale	036:05-08	09/14/90	821	35	4.3	5.5	44	17	0.25	0.57	63	1.19	0.00	0.00	0.00	0.00	849
21516	Hersbrucker-9	Bale	217:06-10	09/17/90	747	40	5.3	6.7	44	19	0.25	0.78	45	0.79	2.57	46.53	48.44	9.45	816

*Agricultural Chemistry Department**Oregon State University**Agricultural Research Service**U S Dept Agriculture**Corvallis, Oregon*

1990 Bale and 5-Cone Analyses at 8% Moisture Content(Bale) or As Is Basis(5-Cone) as of November 7, 1991

Accession or Nursery Number [1]	Identification	Type	Location	Harvest Date	Yield Lb/Ac	Alpha Lb/ac	Alpha %	Beta %	Alpha Ratio	CoH	HSI	6 Mo HSI	%A+B Remain	Oil mL/ 100g	Oil H/C	Oil H/F	Oil Myr (%)	Oil Hum (%)	Serial Number
21517	Hersb red stem	Bale	037:05-08	09/17/90	299	15	4.9	5.0	50	21	0.25	0.72	49	1.38	0.00	0.00	0.00	0.00	830
21517	Hersb red stem	Bale	218:06-10	09/17/90	1203	75	6.2	7.3	46	20	0.23	0.67	53	1.42	2.32	59.89	66.95	6.95	868
21518	Hersb alpha	Bale	038:05-08	09/14/90	331	16	4.7	5.1	48	16	0.25	0.73	51	0.97	0.00	0.00	0.00	0.00	846
21518	Hersb alpha	Bale	219:06-10	09/14/90	853	60	7.0	5.2	58	22	0.25	0.70	51	1.51	2.21	66.41	56.23	8.83	850
21519	Ap71/74-2a Yugo	Bale	039:05-08	09/14/90	128	9	6.7	2.2	75	24	0.33	0.00	0	1.21	0.00	0.00	0.00	0.00	844
21519	Ap71/74-2a Yugo	Bale	222:01-05	09/07/90	623	49	7.8	3.5	69	29	0.32	0.61	64	0.99	2.23	.93	51.37	13.47	451
21520	Ba 11/72-19A Yu	Bale	039:09-12	09/17/90	213	12	5.5	4.0	58	34	0.32	0.00	0	0.99	0.00	0.00	0.00	0.00	818
21520	Ba 11/72-19A Yu	Bale	228:01-05	09/07/90	960	34	3.6	3.2	53	36	0.35	0.78	51	0.31	0.53	.08	31.86	2.42	526
21521	Saazer-36	Bale	208:06-10	09/07/90	200	8	4.1	3.8	52	24	0.33	0.00	0	0.07	3.25	.97	57.25	10.81	431
21521	Saazer-36	Cone	208:06-10	09/07/90	200	11	5.3	4.6	54	22	0.34	0.55	62	0.00	0.00	0.00	0.00	0.00	369
21521/522	Saazer-36	Cone	221:06-10	09/07/90	200	8	4.0	3.9	51	23	0.30	0.57	61	0.00	0.00	0.00	0.00	0.00	382
21522	Saazer-38	Cone	209:06-10	09/07/90	100	5	5.2	4.7	52	34	0.31	0.54	63	0.00	0.00	0.00	0.00	0.00	371
21523	vf 21113	Bale	222:06-10	08/28/90	282	18	6.5	4.9	57	24	0.29	0.77	45	1.07	3.54	1.09	59.37	11.75	140
21524	vf 21114	Bale	223:06-10	08/28/90	69	3	5.0	4.5	53	24	0.28	0.00	0	0.89	3.66	1.17	64.89	9.25	145
21534	I4 Saazer	Cone	109:03-04	09/11/90	200	5	2.7	2.2	55	31	0.29	0.81	44	0.00	0.00	0.00	0.00	0.00	512
21536	7003-154	Bale	231:28-32	09/13/90	2256	245	10.9	8.9	55	15	0.24	0.63	56	1.98	0.27	5.16	55.60	.97	865
21537	7006-370	Cone	025:47-48	09/05/90	1200	109	9.1	8.3	52	23	0.25	0.51	66	0.00	0.00	0.00	0.00	0.00	261
21551	W Am Hum 491	Bale	022:41-44	09/18/90	437	15	3.5	3.2	53	62	0.27	0.36	87	0.22	0.00	0.00	0.00	0.00	874
21552	W Am Hum 492	Bale	006:39-40	09/18/90	640	32	5.0	2.5	67	62	0.31	0.57	66	0.19	0.00	0.00	0.00	0.00	879
21554	W Am Hum 494	Bale	023:41-44	09/18/90	246	6	2.5	2.4	51	58	0.33	0.47	82	0.17	0.00	0.00	0.00	0.00	883
21556	W Am Hum 497	Bale	024:41-44	09/18/90	704	16	2.3	1.7	58	61	0.36	0.54	76	0.11	0.00	0.00	0.00	0.00	875
21557	W Am Hum 498	Bale	009:39-40	09/18/90	640	24	3.7	2.4	61	59	0.31	0.38	89	0.11	0.00	0.00	0.00	0.00	871
21559	W Am Hum 500	Cone	025:41-44	09/17/90	200	2	0.9	2.2	28	53	0.39	0.43	74	0.00	0.00	0.00	0.00	0.00	775
21562	W Am Hum 504	Bale	012:39-40	09/18/90	853	12	1.4	1.4	50	64	0.38	0.77	52	0.20	0.06	3.93	50.23	.86	891
21563	W Am Hum 505	Bale	027:41-44	09/18/90	192	2	1.0	1.1	48	52	0.63	0.00	0	0.21	0.00	0.00	0.00	0.00	884
21564	W Am Hum 506	Bale	013;39-40	09/18/90	896	26	2.9	4.5	39	69	0.34	0.73	57	0.34	0.00	0.00	0.00	0.00	889
21565	W Am Hum 507	Cone	014:39-40	09/17/90	100	1	0.7	1.6	29	67	0.31	0.47	70	0.00	0.00	0.00	0.00	0.00	786
21566	W Am Hum 509	Bale	028:41-44	09/18/90	300	12	4.0	4.1	49	66	0.29	0.00	0	0.42	0.00	0.00	0.00	0.00	903
21567	W Am Hum 510	Cone	029:41-44	09/17/90	150	4	2.5	3.2	44	76	0.38	0.57	61	0.00	0.00	0.00	0.00	0.00	784
21568	W Am Hum 513	Bale	030:41-44	09/18/90	203	9	4.5	5.7	44	68	0.24	0.57	62	0.46	0.00	0.00	0.00	0.00	886
21576	W Am Hum 523	Cone	033:41-44	08/21/90	100	5	4.6	4.2	53	58	0.24	0.48	69	0.00	0.00	0.00	0.00	0.00	9
21578	W Am Hum 525	Cone	021:39-40	08/21/90	100	2	2.4	2.3	51	59	0.33	0.63	56	0.00	0.00	0.00	0.00	0.00	11
21579	W Am Hum 526	Cone	034:41-44	08/21/90	100	4	4.4	4.0	52	58	0.27	0.68	52	0.00	0.00	0.00	0.00	0.00	7
21581	W Am Hum 528	Cone	035:41-44	08/21/90	100	3	3.2	2.8	53	77	0.29	0.62	57	0.00	0.00	0.00	0.00	0.00	6
21583	W Am Hum 536	Cone	024:39-40	09/05/90	100	5	5.3	2.3	69	73	0.30	0.92	38	0.00	0.00	0.00	0.00	0.00	245
21586	W Am Hum 541	Cone	025:39-40	09/05/90	100	5	5.2	5.3	49	67	0.26	0.67	53	0.00	0.00	0.00	0.00	0.00	247
21590	W Am Hum 545	Cone	041:41-44	08/21/90	100	1	1.0	1.7	36	66	0.28	0.56	61	0.00	0.00	0.00	0.00	0.00	12
21591	W Am Hum 546	Cone	042:41-44	09/17/90	100	1	1.5	1.2	56	61	0.31	0.31	90	0.00	0.00	0.00	0.00	0.00	778
21592	W Am Hum 547	Cone	043:41-44	09/05/90	100	5	5.2	4.4	54	64	0.29	0.77	46	0.00	0.00	0.00	0.00	0.00	238
21594	W Am Hum 549	Cone	027:39-40	09/05/90	100	4	3.8	2.9	57	66	0.28	0.57	61	0.00	0.00	0.00	0.00	0.00	246
21594	W Am Hum 549	Cone	027:39-40	09/17/90	100	5	5.4	3.9	58	67	0.27	0.63	56	0.00	0.00	0.00	0.00	0.00	776
21596	W Am Hum 552	Bale	002:39-40	09/18/90	811	15	1.9	2.3	45	30	0.40	0.00	0	0.11	0.00	0.00	0.00	0.00	878
21599	W Am Hum 555	Bale	003:39-40	09/18/90	1386	36	2.6	2.8	49	76	0.40	0.78	57	0.16	0.00	0.00	0.00	0.00	880
21600	W Am Hum 556	Cone	004:39-40	09/17/90	0	0	1.7	1.4	55	79	0.37	0.59	59	0.00	0.00	0.00	0.00	0.00	785
21602	W Am Hum 570	Cone	030:39-40	09/05/90	100	5	4.7	4.6	50	67	0.27	0.78	45	0.00	0.00	0.00	0.00	0.00	244
21602	W Am Hum 570	Cone	030:39-40	09/17/90	100	4	3.9	3.9	50	67	0.28	0.60	58	0.00	0.00	0.00	0.00	0.00	777
21606	Wye 571	Cone	005:47-48	09/05/90	0	0	6.2	5.6	53	50	0.25	0.65	55	0.00	0.00	0.00	0.00	0.00	237
21607	Wye 572	Cone	007:47-48	09/05/90	0	0	12.5	7.5	62	65	0.29	0.38	81	0.00	0.00	0.00	0.00	0.00	232
48209	Fuggle H	Bale	010:01-04	08/20/90	1067	52	4.9	2.1	70	25	0.32	0.42	82	0.90	0.00	0.00	0.00	0.00	23
48209	Fuggle H	Bale	045:03-07	08/21/90	478	21	4.4	2.0	69	30	0.31	0.59	64	0.81	2.60	7.95	42.84	27.27	54

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1990 Bale and 5-Cone Analyses at 8% Moisture Content(Bale) or As Is Basis(5-Cone) as of November 7, 1991

Accession or Nursery Number	Identification	Type	Location	Harvest Date	Yield Lb/Ac	Alpha Lb/ac	Alpha %	Beta %	Alpha Ratio	CoH	HSI	6 Mo HSI	%A+B Remain	Oil mL/ 100g	Oil H/C	Oil H/F	Oil Myr (%)	Oil Hum (%)	Serial Number
50024	BB 301-2	Cone	011:49-50	09/06/90	1800	124	6.9	3.1	69	44	0.25	0.35	84	0.00	0.00	0.00	0.00	0.00	294
50040	BB 301-1	Bale	046:49-52	09/07/90	640	20	3.1	5.0	38	37	0.31	0.97	38	1.10	2.23	204.72	54.43	16.79	447
50075	BB 101-2	Cone	047:49-50	09/05/90	1000	63	6.3	4.3	59	42	0.26	0.71	50	0.00	0.00	0.00	0.00	0.00	250
52013	84-S BB 215-2	Cone	050:49-50	09/05/90	1600	81	5.1	4.1	55	35	0.24	0.40	78	0.00	0.00	0.00	0.00	0.00	253
54003	BB 504-2	Cone	031:51-52	09/07/90	2000	104	5.2	2.7	66	63	0.27	0.77	46	0.00	0.00	0.00	0.00	0.00	348
56001	Hallertauer	Bale	011:01-04	08/20/90	405	17	4.3	4.0	52	20	0.30	0.55	68	0.89	0.00	0.00	0.00	0.00	28
56002	Backa	Bale	012:01-04	08/29/90	608	20	3.2	4.8	40	25	0.31	0.55	70	0.47	0.00	0.00	0.00	0.00	170
56008	OB 826	Bale	013:49-50	08/24/90	1280	78	6.1	4.7	56	40	0.30	0.65	57	1.56	0.00	0.00	0.00	0.00	129
56012	73-S	Cone	014:49-50	09/06/90	2000	93	4.7	2.5	65	32	0.29	0.46	71	0.00	0.00	0.00	0.00	0.00	279
56013	Cascade	Bale	013:01-04	08/29/90	1061	65	6.1	5.1	55	38	0.32	0.89	42	1.32	0.00	0.00	0.00	0.00	172
58016	Utah 526-S	Bale	001:41-44	09/07/90	939	23	2.4	1.4	63	27	0.42	0.79	55	0.80	2.56	74.56	40.49	22.67	452
58016	Utah 526-S	Bale	010:49-50	09/07/90	107	4	3.4	1.6	68	26	0.35	0.00	0	0.30	2.46	46.11	33.51	28.64	520
58112	OB 835	Cone	019:49-50	09/06/90	1700	123	7.2	2.7	72	40	0.28	0.48	69	0.00	0.00	0.00	0.00	0.00	286
60015	Ariz 1-3	Bale	015:41-44	09/18/90	384	12	3.1	3.4	48	73	0.26	0.45	78	0.22	0.13	7.04	57.46	1.18	873
60016	NM 1-3	Cone	016:41-44	08/21/90	300	8	2.6	2.2	54	67	0.26	0.34	86	0.00	0.00	0.00	0.00	0.00	1
60020	NM 2-4	Cone	003:41-44	08/21/90	100	6	1.6	3.1	33	44	0.42	0.35	84	0.00	0.00	0.00	0.00	0.00	2
60020	NM 2-4	Cone	025:49-50	09/06/90	800	21	2.7	4.2	39	50	0.30	0.53	64	0.00	0.00	0.00	0.00	0.00	296
60021	NM 3-1	Cone	004:41-44	09/05/90	100	3	2.8	1.7	62	67	0.31	0.56	61	0.00	0.00	0.00	0.00	0.00	241
60024	Colo 1-2	COne	006:41-44	08/21/90	200	11	5.3	3.8	58	58	0.28	0.45	72	0.00	0.00	0.00	0.00	0.00	3
60024	Colo 1-2	Cone	027:49-50	09/06/90	400	24	5.9	4.3	58	57	0.26	0.56	61	0.00	0.00	0.00	0.00	0.00	287
60025	Colo 1-3	Cone	017:41-44	09/05/90	200	13	6.3	2.2	74	53	0.24	0.42	75	0.00	0.00	0.00	0.00	0.00	229
60027	Colo 2-2	Bale	008:41-44	09/07/90	565	7	1.3	2.6	33	65	0.37	0.92	43	0.16	1.45	23.92	30.11	4.88	524
60027	Colo 2-2	Bale	029:49-50	09/07/90	491	9	1.8	3.2	35	55	0.36	0.86	43	0.31	1.53	6.88	51.53	6.07	518
60029	Colo 3-1	Bale	010:41-44	09/18/90	100	4	3.8	3.0	55	65	0.34	0.00	0	0.60	1.14	106.27	76.29	2.34	902
60032	Colo 5-1	Bale	001:51-52	09/10/90	85	3	3.8	2.2	63	47	0.28	0.00	0	0.21	0.95	53.48	29.70	10.21	594
60032	Colo 5-1	Cone	011:41-44	08/21/90	600	14	2.4	1.7	58	47	0.28	0.38	80	0.00	0.00	0.00	0.00	0.00	8
60033	Colo 6-1	Cone	019:41-44	08/21/90	200	4	1.8	2.5	42	68	0.28	0.43	74	0.00	0.00	0.00	0.00	0.00	4
60035	Colo 7-2	Bale	020:41-44	09/18/90	200	10	4.9	6.9	42	50	0.28	0.00	0	1.56	2.60	445.91	62.12	14.72	885
60035	Colo 7-2	Cone	020:41-44	08/21/90	200	6	3.1	5.0	38	49	0.23	0.34	86	0.00	0.00	0.00	0.00	0.00	10
60037	Wyo 2-1	Bale	005:51-52	09/10/90	1109	70	6.3	4.2	60	46	0.26	0.42	82	0.69	2.16	186.50	61.32	10.82	602
60037	Wyo 2-1	Bale	012:41-44	09/07/90	1290	52	4.0	3.4	54	44	0.34	0.48	74	0.48	2.23	90.00	53.08	15.84	453
60038	Wyo 3-1	Bale	006:51-52	09/10/90	85	2	2.1	3.3	39	58	0.31	0.00	0	0.14	0.52	90.34	22.64	9.49	600
60038	Wyo 3-1	Bale	013:41-44	09/07/90	224	3	1.3	2.3	37	56	0.39	0.83	52	0.44	0.11	0.00	81.85	.58	529
60038	Wyo 3-1	Cone	013:41-44	08/21/90	224	4	1.6	3.0	35	60	0.32	0.59	59	0.00	0.00	0.00	0.00	0.00	5
60042	Shinshuwase	Cone	016:01-04	09/17/90	2200	85	3.9	2.9	57	57	0.26	0.59	59	0.00	0.00	0.00	0.00	0.00	726
61008	Pol C2/66	Bale	037:51-52	08/24/90	149	7	4.8	3.3	59	21	0.34	0.00	0	1.07	0.00	0.00	0.00	0.00	118
61011	Pol P/K1	Bale	038:51-52	08/24/90	213	9	4.1	3.1	57	23	0.30	0.78	46	0.86	0.00	0.00	0.00	0.00	125
61017	USSR N18	Bale	042:51-52	08/24/90	107	4	3.6	3.2	53	24	0.32	0.00	0	0.72	0.00	0.00	0.00	0.00	117
61019	Yugo Golding	Bale	017:01-04	08/20/90	569	23	4.0	2.1	66	25	0.35	0.49	77	0.50	0.00	0.00	0.00	0.00	16
61020	Sav Golding	Bale	018:01-04	08/20/90	1035	41	4.0	1.9	68	27	0.37	0.43	89	0.90	0.00	0.00	0.00	0.00	22
61021	Tettnanger	Bale	019:01-04	08/20/90	149	7	4.4	3.5	56	22	0.29	0.00	0	0.31	3.65	1.30	34.90	21.31	25
62013	Comet	Bale	020:01-04	09/14/90	1237	143	11.6	4.0	74	42	0.30	0.83	46	1.57	0.19	58.90	65.96	1.24	753
62052	Density	Cone	001:05-08	09/17/90	2000	87	4.4	2.2	67	40	0.26	0.43	75	0.00	0.00	0.00	0.00	0.00	720
62053	Defender	Bale	002:05-08	08/24/90	469	17	3.7	1.2	76	26	0.36	0.58	76	0.78	0.00	0.00	0.00	0.00	130
63008	N 48-8	Cone	011:51-52	09/06/90	1400	74	5.3	5.6	49	41	0.27	0.94	37	0.00	0.00	0.00	0.00	0.00	275
63018	N 47-35	Cone	012:51-52	09/06/90	1700	69	4.0	4.2	49	26	0.30	0.79	45	0.00	0.00	0.00	0.00	0.00	276
63019	N 47-40	Cone	013:51-52	09/06/90	1500	111	7.4	4.8	61	34	0.27	0.56	62	0.00	0.00	0.00	0.00	0.00	269
63020	N 47-42	Cone	014:51-52	09/06/90	1600	105	6.5	3.9	63	33	0.29	0.83	43	0.00	0.00	0.00	0.00	0.00	270
63021	N 48-1	Cone	015:51-52	09/07/90	1400	35	2.5	3.7	40	74	0.29	0.62	57	0.00	0.00	0.00	0.00	0.00	351
63027	B6 x 19040M	Cone	016:51-52	09/07/90	1600	88	5.5	6.1	48	19	0.24	0.71	50	0.00	0.00	0.00	0.00	0.00	349

*Agricultural Chemistry Department**Oregon State University**Agricultural Research Service**U S Dept Agriculture**Corvallis, Oregon*

1990 Bale and 5-Cone Analyses at 8% Moisture Content(Bale) or As Is Basis(5-Cone) as of November 7, 1991

Accession or Nursery Number	Identification	Type	Location	Harvest Date	Yield Lb/Ac	Alpha Lb/ac	Alpha %	Beta %	Alpha Ratio	CoH	HSI	6 Mo HSI	%A+B Remain	Oil mL/ 100g	Oil H/C	Oil H/F	Oil Myr (%)	Oil Hum (%)	Serial Number
63032	BG x 58015M	Cone	035:49-50	09/06/90	1200	106	8.9	4.3	68	62	0.26	0.80	45	0.00	0.00	0.00	0.00	0.00	290
64003	19105 x 19173M	Cone	018:51-52	09/07/90	2000	28	1.4	3.8	27	41	0.33	0.95	36	0.00	0.00	0.00	0.00	0.00	357
64007	19105 x 19058M	Cone	017:49-50	09/06/90	2200	91	4.1	8.1	34	31	0.24	0.66	54	0.00	0.00	0.00	0.00	0.00	280
64007	19105 x 19058M	Bale	232:01-05	09/14/90	1408	27	1.9	6.9	22	29	0.26	0.98	36	0.83	2.74	122.83	68.91	8.60	812
64008	Zattler 2L1180P	Bale	019:51-52	08/24/90	640	36	5.6	3.5	62	25	0.27	0.46	75	0.39	2.91	370.23	59.17	19.62	110
64009	Zattler 7K4910P	Cone	020:51-52	09/07/90	400	12	3.0	1.9	61	21	0.36	0.52	65	0.00	3.41	27.32	39.00	18.09	359
64010	Zattler 7K4910P	Bale	021:51-52	09/10/90	341	14	4.0	4.1	50	25	0.28	0.51	75	1.02	3.46	147.75	51.98	23.05	606
64020	Backa x 19062M	Bale	044:51-52	09/10/90	683	30	4.4	2.4	65	29	0.32	0.57	68	1.06	2.44	346.19	58.54	18.35	583
64026	BG x 19182M	Cone	045:51-52	09/07/90	1200	101	8.5	6.9	55	26	0.26	0.48	69	0.00	0.00	0.00	0.00	0.00	350
64100	Bullion	Bale	003:05-08	08/29/90	2581	205	8.0	4.1	66	46	0.30	1.01	36	1.96	1.49	197.13	64.38	10.25	176
64106	Wye 22/56/2	Bale	046:51-52	08/24/90	107	8	7.3	4.8	60	23	0.31	0.00	0	1.74	0.00	0.00	0.00	0.00	122
64107	Northern Brewer	Bale	004:05-08	08/20/90	437	34	7.8	3.0	72	24	0.31	0.42	85	0.77	0.00	0.00	0.00	0.00	15
65009	BG x 19058M	Cone	028:51-52	09/07/90	2000	226	11.3	7.5	60	35	0.24	1.00	34	0.00	0.00	0.00	0.00	0.00	355
65009	BG x 19058M	Bale	228:23-27	09/05/90	1553	166	10.7	7.8	58	42	0.24	1.29	19	2.78	0.00	0.00	0.00	0.00	430
65101	Talisman	Bale	005:05-08	09/14/90	757	40	5.3	2.6	67	54	0.31	0.66	61	0.57	0.00	0.00	0.00	0.00	838
65102	Cluster (L1)	Bale	006:05-08	09/14/90	569	35	6.2	3.9	61	44	0.27	0.37	81	0.61	0.00	0.00	0.00	0.00	754
65104	Cluster (L8)	Bale	033:09-12	09/17/90	1024	58	5.6	4.2	57	46	0.26	0.38	83	0.75	0.00	0.00	0.00	0.00	870
66050	Alliance	Bale	012:05-08	08/20/90	1081	66	6.1	1.9	76	30	0.30	0.41	83	0.81	0.00	0.00	0.00	0.00	30
66051	Progress	Bale	009:05-08	08/20/90	715	49	6.9	2.3	75	30	0.30	0.37	86	0.75	0.00	0.00	0.00	0.00	34
66052	Pride Ringwood	Bale	010:05-08	09/14/90	1088	91	8.4	6.2	57	34	0.28	0.62	56	1.52	0.00	0.00	0.00	0.00	774
66054	Calicross	Cone	014:05-08	09/17/90	2200	161	7.3	4.9	60	40	0.24	0.53	64	0.00	0.00	0.00	0.00	0.00	732
66055	First Choice	Cone	015:05-08	09/17/90	1700	132	7.8	7.8	50	40	0.30	0.58	60	0.00	0.00	0.00	0.00	0.00	723
66056	Smoothcone	Cone	016:05-08	09/17/90	2000	172	8.6	4.5	66	30	0.26	0.61	58	0.00	0.00	0.00	0.00	0.00	728
6751-103		Bale	103:07-08	08/22/90	1109	51	4.6	3.7	55	41	0.33	0.00	0	0.00	0.00	0.00	0.00	0.00	80
6751-143		Bale	106:07-08	08/22/90	1237	55	4.4	3.5	56	39	0.36	0.00	0	0.00	0.00	0.00	0.00	0.00	67
6763-010		Bale	110:05-06	08/21/90	2815	101	3.6	3.3	52	43	0.29	0.00	0	0.63	2.75	3.97	43.16	24.45	40
68052	Petham Golding	Bale	017:05-08	09/17/90	1098	72	6.6	2.2	75	31	0.29	0.85	44	1.37	1.88	24.72	61.55	13.62	829
8019-003		Bale	215:01-05	09/06/90	1271	65	5.1	3.9	57	37	0.40	0.94	45	1.06	0.00	0.00	0.00	0.00	470
8020-032		Bale	224:01-05	09/07/90	1869	119	6.4	2.7	70	42	0.40	0.74	58	0.80	0.00	0.00	0.00	0.00	454
8021-011		Cone	225:01-05	09/07/90	1400	66	4.7	2.1	70	24	0.30	0.00	0	0.00	0.00	0.00	0.00	0.00	374
8021-040		Bale	230:06-10	08/29/90	1348	80	5.9	3.7	62	34	0.35	0.51	78	0.45	0.00	0.00	0.00	0.00	160
8025-057		Bale	219:12-16	08/30/90	1361	85	6.2	2.1	75	25	0.33	0.70	57	1.23	0.00	0.00	0.00	0.00	322
8026-152		Bale	222:12-16	09/11/90	845	44	5.2	3.2	62	31	0.36	0.53	78	0.72	0.00	0.00	0.00	0.00	670
8031-002		Bale	222:17-21	08/31/90	1092	101	9.2	4.6	67	30	0.28	0.57	64	1.50	0.00	0.00	0.00	0.00	405
8033-034		Bale	216:23-27	09/12/90	913	54	5.9	4.2	59	29	0.33	0.50	78	1.17	0.00	0.00	0.00	0.00	676
8036-083		Bale	231:23-27	09/05/90	589	47	7.9	4.5	64	37	0.30	0.79	44	1.29	0.00	0.00	0.00	0.00	424
8036-084		Bale	232:23-27	09/05/90	1212	51	4.2	2.5	62	25	0.38	0.00	0	1.24	3.55	111.16	61.45	15.90	425
8154-212		Bale	111:29-30	09/04/90	491	27	5.4	2.5	68	20	0.32	0.00	0	1.33	2.26	296.27	55.89	19.55	386
8154-230		Bale	112:29-30	09/04/90	1728	115	6.7	4.0	62	16	0.32	0.00	0	0.00	0.00	0.00	0.00	0.00	343
8154-274		Bale	103:31-32	08/23/90	1856	139	7.5	3.9	66	22	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	103
8252-115		Bale	104:31-32	08/23/90	1066	64	6.0	4.2	59	23	0.30	0.00	0	0.00	0.00	0.00	0.00	0.00	99
8254-142		Bale	108:31-32	09/04/90	1173	33	2.8	6.5	30	24	0.29	0.00	0	1.06	3.53	527.00	55.98	23.19	385
8254-167		Bale	225:23-27	09/12/90	964	73	7.5	7.9	49	19	0.26	0.54	65	1.15	3.96	320.43	36.43	29.80	802
8254-244		Bale	227:23-27	09/07/90	495	27	5.5	7.7	42	23	0.25	0.00	0	1.07	3.58	10.00	41.61	28.35	434
8254-253		Bale	109:31-32	08/23/90	896	27	3.0	5.6	35	19	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	89
8254-267		Bale	110:31-32	08/23/90	938	36	3.8	5.9	40	20	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	86
8301-001		Bale	205:06-10	09/07/90	1638	69	4.2	4.7	48	33	0.42	0.93	46	0.91	0.00	0.00	0.00	0.00	528
8301-021		Bale	102:29-30	09/04/90	1557	109	7.0	4.4	61	23	0.33	0.00	0	0.00	0.00	0.00	0.00	0.00	305
8301-025		Bale	103:29-30	08/22/90	2176	126	5.8	4.2	58	29	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	60
8301-047		Bale	208:01-05	09/06/90	751	29	3.9	4.5	46	25	0.41	1.70	10	0.00	0.00	0.00	0.00	0.00	492

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1990 Bale and 5-Cone Analyses at 8% Moisture Content(Bale) or As Is Basis(5-Cone) as of November 7, 1991

Accession or Nursery Number	Identification	Type	Location	Harvest Date	Yield Lb/Ac	Alpha Lb/ac	Alpha %	Beta %	Alpha Ratio	CoH	HSI	6 Mo HSI	ZA+B Remain	Oil mL/ 100g	Oil H/C	Oil H/F	Oil Myr (%)	Oil Hum (%)	Serial Number
8301-057		Bale	211:06-10	09/14/90	1105	47	4.3	4.8	47	32	0.30	0.83	43	0.61	0.00	0.00	0.00	0.00	845
8303-017		Bale	217:01-05	09/06/90	742	28	3.7	3.4	53	26	0.36	1.16	30	1.02	0.00	0.00	0.00	0.00	487
8303-037		Cone	221:01-05	09/07/90	1000	39	3.9	4.8	45	19	0.31	0.00	0	0.00	0.00	0.00	0.00	0.00	370
8303-066		Bale	236:01-05	09/14/90	1152	39	3.4	4.3	44	26	0.31	1.43	17	0.70	3.34	509.08	72.20	12.22	840
8303-077		Cone	244:01-05	09/07/90	1000	48	4.8	3.1	61	27	0.33	0.00	0	0.00	0.00	0.00	0.00	0.00	368
8303-081		Bale	106:29-30	09/04/90	896	41	4.6	3.2	59	26	0.34	0.00	0	0.00	0.00	0.00	0.00	0.00	307
8303-088		Cone	246:01-05	09/07/90	200	5	2.6	3.9	40	22	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	373
8303-121		Cone	204:06-10	09/07/90	1000	31	3.1	3.9	44	22	0.32	0.00	0	0.00	0.00	0.00	0.00	0.00	372
8303-122		Cone	215:06-10	09/07/90	1400	78	5.6	3.0	65	23	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	379
8303-124		Bale	233:06-10	09/10/90	992	36	3.6	3.4	52	26	0.32	0.77	50	0.62	0.00	0.00	0.00	0.00	605
8303-142		Bale	235:06-10	09/10/90	864	69	8.0	5.5	59	30	0.33	1.06	23	1.49	0.00	0.00	0.00	0.00	601
8304-029		Cone	209:12-16	09/13/90	800	30	3.8	5.3	42	24	0.26	0.00	0	0.00	0.00	0.00	0.00	0.00	625
8304-067		Bale	241:06-10	09/10/90	843	34	4.0	5.8	41	27	0.32	1.53	15	1.75	0.00	0.00	0.00	0.00	596
8304-090		Bale	236:12-16	08/30/90	282	6	2.1	4.9	30	26	0.33	1.30	23	0.80	0.00	0.00	0.00	0.00	433
8304-120		Bale	237:12-16	08/30/90	555	16	2.8	5.4	34	24	0.32	1.33	21	1.03	0.00	0.00	0.00	0.00	313
8308-020		Cone	219:28-32	09/14/90	1000	72	7.2	3.8	66	26	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	683
8308-044		Bale	217:17-21	09/12/90	512	28	5.5	4.0	58	24	0.32	0.91	42	1.39	0.00	0.00	0.00	0.00	791
8308-046		Bale	219:17-21	08/31/90	614	41	6.7	4.5	60	28	0.28	0.64	59	1.38	0.00	0.00	0.00	0.00	214
8309-004		Bale	227:17-21	09/12/90	819	20	2.4	4.6	35	31	0.38	1.33	23	1.44	0.00	0.00	0.00	0.00	795
8309-005		Bale	227:28-32	08/29/90	1237	63	5.1	6.5	44	23	0.29	0.92	39	1.12	0.00	0.00	0.00	0.00	158
8309-005		Bale	232:17-21	08/31/90	1399	83	5.9	7.2	45	23	0.24	0.90	38	2.24	3.56	10.96	59.31	18.86	299
8309-007		Bale	235:17-21	09/04/90	512	37	7.1	5.9	55	26	0.28	1.18	25	1.57	0.00	0.00	0.00	0.00	338
8309-008		Bale	237:17-21	09/04/90	1092	77	7.1	6.1	54	24	0.32	0.00	0	1.72	0.00	0.00	0.00	0.00	344
8309-010		Bale	239:17-21	09/04/90	572	31	5.4	4.3	56	24	0.35	1.42	16	1.71	0.00	0.00	0.00	0.00	342
8309-022		Cone	222:28-32	09/14/90	600	19	3.2	4.0	45	24	0.30	0.00	0	0.00	0.00	0.00	0.00	0.00	687
8309-024		Bale	241:17-21	09/04/90	896	49	5.5	4.4	56	27	0.36	1.77	8	1.97	0.00	0.00	0.00	0.00	391
8309-034		Bale	209:23-27	09/04/90	606	31	5.1	4.3	54	26	0.34	1.33	21	1.46	0.00	0.00	0.00	0.00	335
8309-036		Cone	242:28-32	09/14/90	300	13	4.2	3.9	52	25	0.31	0.00	0	0.00	0.00	0.00	0.00	0.00	686
8401-004		Bale	205:01-05	09/06/90	1504	71	4.7	4.9	49	30	0.34	1.15	28	1.84	0.00	0.00	0.00	0.00	469
8401-041		Bale	212:01-05	09/14/90	1809	59	3.3	4.9	40	26	0.35	1.10	31	0.62	0.00	0.00	0.00	0.00	809
8401-068		Bale	230:01-05	09/07/90	1587	73	4.6	3.8	55	29	0.38	0.95	41	1.12	0.00	0.00	0.00	0.00	525
8401-070		Bale	233:01-05	09/07/90	1647	54	3.3	5.0	39	28	0.33	1.33	23	1.65	0.00	0.00	0.00	0.00	445
8401-076		Bale	243:01-05	09/07/90	1792	44	2.4	3.3	42	31	0.43	0.94	45	0.63	0.00	0.00	0.00	0.00	449
8401-132		Bale	202:06-10	09/07/90	1024	39	3.8	4.6	45	23	0.40	1.53	16	2.10	0.00	0.00	0.00	0.00	521
8401-145		Bale	210:06-10	09/14/90	793	44	5.5	4.6	55	30	0.32	0.78	51	1.17	0.00	0.00	0.00	0.00	837
8401-158		Cone	212:06-10	09/07/90	1200	57	4.8	3.0	61	27	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	381
8401-163		Cone	213:06-10	09/07/90	1200	34	2.8	2.0	59	27	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	377
8401-175		Bale	220:06-10	09/14/90	836	53	6.3	4.8	57	32	0.28	1.08	31	1.40	0.00	0.00	0.00	0.00	848
8401-192		Bale	224:06-10	08/29/90	1450	80	5.5	3.6	60	29	0.36	1.08	33	1.31	0.00	0.00	0.00	0.00	159
8401-196		Bale	225:06-10	08/29/90	1357	66	4.9	3.9	56	24	0.36	0.97	37	1.22	0.00	0.00	0.00	0.00	180
8402-036		Bale	102:15-16	08/22/90	853	39	4.6	3.2	59	25	0.31	0.00	0	0.00	0.00	0.00	0.00	0.00	81
8402-045		Bale	103:15-16	08/22/90	1173	55	4.7	2.6	64	28	0.31	0.00	0	0.00	0.00	0.00	0.00	0.00	82
8402-080		Bale	105:15-16	08/22/90	1322	50	3.7	2.4	61	22	0.34	0.00	0	0.00	0.00	0.00	0.00	0.00	65
8402-099		Bale	107:15-16	08/31/90	384	18	4.6	3.1	60	28	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	330
8402-106		Bale	108:15-16	08/31/90	1130	49	4.3	3.1	58	25	0.30	0.00	0	0.00	0.00	0.00	0.00	0.00	423
8403-003		Cone	110:15-16	09/11/90	1600	48	3.0	5.0	37	29	0.26	0.00	0	0.00	0.00	0.00	0.00	0.00	505
8403-007		Cone	111:15-16	09/11/90	1500	32	2.1	3.2	40	18	0.31	0.00	0	0.00	0.00	0.00	0.00	0.00	500
8403-041		Cone	112:15-16	09/11/90	1200	36	3.0	4.0	43	24	0.27	0.00	0	0.00	0.00	0.00	0.00	0.00	499
8403-086		Cone	102:17-18	09/11/90	1200	33	2.8	3.1	47	21	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	504
8403-111		Bale	103:17-18	08/31/90	1557	38	2.4	4.7	34	25	0.26	0.00	0	0.00	0.00	0.00	0.00	0.00	217

*Agricultural Chemistry Department**Oregon State University**Agricultural Research Service**U S Dept Agriculture**Corvallis, Oregon*

1990 Bale and 5-Cone Analyses at 8% Moisture Content(Bale) or As Is Basis(5-Cone) as of November 7, 1991

Accession or Nursery Number	Identification	Type	Location	Harvest Date	Yield Lb/Ac	Alpha Lb/ac	Alpha %	Beta %	Alpha Ratio	CoH	HSI	6 Mo HSI	%A+B Remain	Oil mL/ 100g	Oil H/C	Oil H/F	Oil Myr (%)	Oil Hum (%)	Serial Number
8403-112		Cone	104:17-18	09/11/90	1600	53	3.3	3.9	46	21	0.25	0.00	0	0.00	0.00	0.00	0.00	0.00	510
8403-129		Bale	105:17-18	08/31/90	875	26	3.0	3.4	47	21	0.27	0.00	0	0.00	0.00	0.00	0.00	0.00	316
8404-006		Bale	107:17-18	08/31/90	1642	50	3.1	3.7	46	22	0.31	0.00	0	0.00	0.00	0.00	0.00	0.00	432
8404-023		Cone	109:17-18	09/11/90	1600	34	2.1	2.9	42	21	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	498
8404-063		Cone	110:17-28	09/11/90	1800	64	3.5	4.0	47	20	0.26	0.00	0	0.00	0.00	0.00	0.00	0.00	493
8404-072		Cone	111:17-18	09/11/90	1800	51	2.8	4.0	41	18	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	503
8404-079		Bale	112:17-18	09/04/90	1600	33	2.1	2.7	43	20	0.35	0.00	0	0.00	0.00	0.00	0.00	0.00	312
8405-013		Bale	106:19-20	08/22/90	1149	60	5.2	3.5	60	25	0.27	0.00	0	0.00	0.00	0.00	0.00	0.00	69
8405-024		Bale	107:19-20	08/22/90	1045	42	4.0	2.7	60	24	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	74
8405-027		Bale	108:19-20	09/04/90	725	34	4.7	3.4	58	22	0.30	0.00	0	0.00	0.00	0.00	0.00	0.00	311
8405-038		Bale	228:06-10	09/10/90	503	26	5.1	3.6	58	26	0.35	1.03	37	1.94	0.00	0.00	0.00	0.00	591
8405-039		Bale	231:06-10	08/29/90	1058	68	6.4	4.1	61	29	0.31	0.00	0	1.49	0.00	0.00	0.00	0.00	179
8405-057		Bale	112:19-20	08/31/90	875	32	3.6	2.7	57	28	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	297
8405-084		Cone	236:06-10	09/13/90	600	37	6.2	3.6	63	24	0.26	0.00	0	0.00	0.00	0.00	0.00	0.00	634
8405-101		Bale	239:06-10	09/10/90	717	39	5.4	4.0	57	23	0.31	0.78	48	1.44	0.00	0.00	0.00	0.00	604
8405-104		Bale	101:21-22	08/31/90	640	27	4.3	4.4	49	26	0.25	0.00	0	0.00	0.00	0.00	0.00	0.00	332
8406-004		Bale	243:06-10	09/10/90	887	56	6.3	3.3	65	26	0.34	0.64	65	1.69	0.00	0.00	0.00	0.00	584
8406-016		Bale	102:21-22	08/22/90	1365	81	6.0	4.6	56	22	0.30	0.00	0	0.00	0.00	0.00	0.00	0.00	70
8406-026		Bale	103:21-22	08/31/90	896	45	5.0	3.3	60	28	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	317
8406-030		Bale	104:21-22	08/22/90	1706	104	6.1	3.4	64	29	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	75
8406-038		Bale	246:06-10	08/29/90	964	42	4.4	3.4	56	23	0.38	1.16	28	1.21	0.00	0.00	0.00	0.00	175
8406-045		Bale	106:21-22	08/31/90	1024	63	6.2	3.5	64	27	0.26	0.00	0	0.00	0.00	0.00	0.00	0.00	337
8406-049		Bale	107:21-22	08/31/90	938	54	5.8	2.7	68	24	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	334
8406-054		Bale	108:21-22	08/31/90	1386	40	2.9	4.5	39	26	0.28	0.00	0	0.53	3.67	11.81	38.17	32.51	218
8406-058		Bale	109:21-22	08/22/90	1365	42	3.1	3.1	49	23	0.37	0.00	0	0.00	0.00	0.00	0.00	0.00	83
8406-062		Bale	110:21-22	08/22/90	1493	107	7.2	3.9	65	22	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	72
8406-084		Bale	210:12-18	08/31/90	785	52	6.6	4.2	61	23	0.29	0.38	89	0.96	0.00	0.00	0.00	0.00	222
8406-088		Bale	211:12-16	08/31/90	435	27	6.3	5.3	54	23	0.27	0.00	0	1.37	3.68	12.31	57.47	18.73	220
8406-090		Bale	212:12-16	08/31/90	853	23	2.8	5.3	34	24	0.27	0.00	0	0.37	0.00	0.00	0.00	0.00	225
8407-001		Cone	102:23-24	09/11/90	1400	52	3.7	4.2	47	30	0.27	0.00	0	0.00	0.00	0.00	0.00	0.00	502
8407-006		Bale	213:12-16	08/30/90	1013	60	6.0	5.6	52	24	0.26	0.00	0	0.79	0.00	0.00	0.00	0.00	341
8407-008		Bale	103:23-24	09/04/90	832	34	4.1	4.3	48	30	0.26	0.00	0	0.00	0.00	0.00	0.00	0.00	310
8407-020		Bale	214:12-16	08/30/90	700	52	7.4	4.0	65	24	0.28	0.76	46	1.55	2.78	6.03	52.37	20.35	325
8407-023		Cone	106:23-24	09/11/90	1400	79	5.6	4.0	59	29	0.25	0.00	0	0.00	0.00	0.00	0.00	0.00	501
8407-026		Bale	216:12-16	09/11/90	597	40	6.7	4.3	61	32	0.29	0.85	43	1.55	0.00	0.00	0.00	0.00	593
8407-035		Cone	213:28-32	09/14/90	500	28	5.6	4.5	55	28	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	681
8407-035		Bale	217:12-16	09/11/90	597	44	7.3	4.3	63	27	0.27	0.89	41	1.75	0.00	0.00	0.00	0.00	612
8407-038		Bale	107:23-24	08/31/90	789	56	7.1	4.1	63	29	0.25	0.00	0	1.23	3.21	428.23	41.79	31.26	215
8407-042		Bale	108:23-24	08/31/90	704	47	6.7	3.2	68	27	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	315
8407-043		Cone	214:28-32	09/14/90	500	20	4.1	5.9	41	30	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	684
8407-043		Bale	228:12-16	08/31/90	631	33	5.2	5.3	49	27	0.27	0.72	47	1.12	0.00	0.00	0.00	0.00	228
8408-001		Bale	235:12-16	08/31/90	290	18	6.2	5.3	54	29	0.25	0.00	0	0.80	3.26	26.02	50.45	24.85	226
8408-006		Bale	109:23-24	08/31/90	1130	66	5.8	4.1	59	27	0.27	0.00	0	1.63	3.27	19.20	59.72	20.55	419
8408-006		Bale	110:23-24	08/31/90	1002	59	5.9	6.2	49	24	0.26	0.00	0	0.00	0.00	0.00	0.00	0.00	210
8408-012		Bale	111:23-24	08/22/90	1450	74	5.1	3.8	57	21	0.32	0.00	0	0.00	0.00	0.00	0.00	0.00	68
8408-018		Bale	112:23-24	08/22/90	1770	74	4.2	5.1	45	24	0.30	0.00	0	0.00	0.00	0.00	0.00	0.00	79
8408-030		Bale	102:25-26	08/22/90	2304	104	4.5	5.4	46	22	0.28	0.00	0	1.41	0.00	0.00	0.00	0.00	77
8408-031		Bale	103:25-26	08/31/90	1642	93	5.7	7.6	43	25	0.25	0.00	0	0.00	0.00	0.00	0.00	0.00	209
8408-046		Bale	104:25-26	08/31/90	1002	52	5.2	4.8	52	28	0.27	0.00	0	0.00	0.00	0.00	0.00	0.00	219
8408-051		Bale	106:25-26	08/31/90	1568	97	6.2	4.0	61	25	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	298

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1990 Bale and 5-Cone Analyses at 8% Moisture Content(Bale) or As Is Basis(5-Cone) as of November 7, 1991

Accession or Nursery Number	Identification	Type	Location	Harvest Date	Yield Lb/Ac	Alpha Lb/ac	Alpha %	Beta %	Alpha Ratio	CoH	HSI	6 Mo HSI	%A+B Remain	Oil mL/ 100g	Oil H/C	Oil H/F	Oil Myr (%)	Oil Hum (%)	Serial Number
8408-063		Bale	107:25-26	08/31/90	906	50	5.5	4.6	54	26	0.27	0.00	0	0.00	0.00	0.00	0.00	0.00	216
8408-066		Bale	206:17-21	08/31/90	444	28	6.3	6.7	48	23	0.25	0.00	0	1.54	0.00	0.00	0.00	0.00	205
8408-070		Bale	209:17-21	09/17/90	1374	66	4.8	5.6	46	32	0.31	1.09	31	1.68	0.00	0.00	0.00	0.00	827
8408-070		Cone	209:17-21	09/14/90	1374	29	2.1	2.2	49	30	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	699
8408-074		Cone	214:17-21	09/14/90	800	25	3.1	2.5	56	31	0.31	0.00	0	0.00	0.00	0.00	0.00	0.00	696
8408-074		Bale	228:28-32	09/14/90	614	30	4.9	3.9	56	28	0.37	1.43	18	1.04	0.00	0.00	0.00	0.00	851
8408-080		Bale	109:25-26	08/22/90	1706	80	4.7	5.0	48	22	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	76
8408-082		Bale	110:25-26	08/22/90	2090	107	5.1	3.4	60	23	0.34	0.00	0	0.00	0.00	0.00	0.00	0.00	78
8408-089		Bale	111:25-26	08/22/90	2133	102	4.8	4.3	52	23	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	73
8408-092		Cone	112:25-26	09/11/90	1400	94	6.7	3.3	67	21	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	517
8408-106		Bale	102:27-28	08/22/90	2026	67	3.3	6.2	35	27	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	62
8408-108		Bale	216:17-21	08/31/90	410	24	5.9	5.2	53	27	0.29	0.00	0	0.86	0.00	0.00	0.00	0.00	421
8408-114		Bale	103:27-28	08/22/90	1600	57	3.5	6.3	36	27	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	66
8408-115		Bale	104:27-28	08/31/90	1898	108	5.7	4.8	54	22	0.26	0.00	0	0.00	0.00	0.00	0.00	0.00	314
8408-119		Cone	105:27-28	09/11/90	1400	76	5.5	4.5	55	27	0.24	0.00	0	0.00	0.00	0.00	0.00	0.00	496
8408-125		Cone	106:27-28	09/11/90	1200	80	6.7	8.1	45	26	0.24	0.00	0	0.00	0.00	0.00	0.00	0.00	506
8408-126		Bale	221:17-21	09/12/90	1416	97	6.8	5.9	53	27	0.29	1.26	23	2.12	3.82	9.97	67.51	12.95	672
8409-018		Cone	224:17-21	09/14/90	1000	64	6.4	4.1	61	26	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	691
8410-052		Bale	109:27-28	08/31/90	938	19	2.1	5.2	29	28	0.27	0.00	0	0.00	0.00	0.00	0.00	0.00	333
8410-069		Cone	110:27-28	09/11/90	1400	30	2.2	4.5	33	30	0.27	0.00	0	0.00	0.00	0.00	0.00	0.00	495
8410-096		Cone	112:27-28	09/11/90	1200	39	3.3	4.3	43	28	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	497
8411-015		Bale	111:31-32	09/04/90	1621	138	8.5	3.7	70	26	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	394
8411-025		Bale	112:31-32	09/04/90	1344	96	7.1	3.0	70	25	0.30	0.00	0	0.00	0.00	0.00	0.00	0.00	306
8411-027		Bale	101:31-32	08/23/90	723	52	7.2	3.6	66	17	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	94
8411-027		Bale	101:33-34	08/23/90	1557	122	7.8	2.9	73	23	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	100
8411-029		Bale	102:33-34	09/04/90	1706	117	6.9	2.8	71	25	0.31	0.00	0	0.00	0.00	0.00	0.00	0.00	309
8411-040		Bale	103:33-34	09/04/90	1557	93	6.0	3.7	62	26	0.32	0.00	0	0.00	0.00	0.00	0.00	0.00	308
8411-042		Bale	104:33-34	08/23/90	2474	198	8.0	3.2	72	26	0.27	0.00	0	0.00	0.00	0.00	0.00	0.00	107
8411-049		Bale	105:33-34	08/23/90	1792	93	5.2	2.7	65	26	0.33	0.00	0	0.00	0.00	0.00	0.00	0.00	95
8411-064		Bale	106:33-34	09/04/90	1536	119	7.8	3.6	68	33	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	387
8411-075		Bale	107:33-34	09/04/90	811	52	6.4	3.1	67	24	0.31	0.00	0	1.75	2.80	73.29	68.42	13.34	390
8411-135		Bale	108:33-34	09/04/90	1856	115	6.2	3.9	61	27	0.31	0.00	0	1.61	2.39	154.25	67.54	13.11	388
8411-150		Bale	109:33-34	09/05/90	1642	108	6.6	4.1	62	28	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	443
8411-157		Bale	110:33-34	09/05/90	1493	71	4.7	3.3	59	27	0.35	0.00	0	0.00	0.00	0.00	0.00	0.00	410
8411-170		Bale	111:33-34	08/23/90	960	60	6.2	4.0	61	18	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	90
8411-204		Bale	101:35-36	09/05/90	1706	118	6.9	3.4	67	24	0.32	0.00	0	0.00	0.00	0.00	0.00	0.00	438
8411-229		Bale	102:35-36	08/23/90	2468	139	5.6	2.5	69	32	0.31	0.00	0	0.00	0.00	0.00	0.00	0.00	93
8411-262		Bale	103:35-36	09/05/90	1749	107	6.1	3.3	65	31	0.34	0.00	0	0.00	0.00	0.00	0.00	0.00	429
8412-002		Bale	104:35-36	09/05/90	1045	100	9.6	5.4	64	41	0.28	0.00	0	1.37	0.00	0.00	0.00	0.00	441
8412-010		Bale	105:35-36	09/05/90	1621	122	7.5	5.6	57	42	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	440
8412-012		Bale	106:35-36	09/05/90	1386	70	5.0	5.1	50	22	0.25	0.00	0	1.29	2.00	8.97	56.83	9.46	427
8412-016		Bale	107:35-36	09/05/90	2176	155	7.1	3.3	68	32	0.33	0.00	0	0.00	0.00	0.00	0.00	0.00	437
8412-019		Bale	108:35-36	09/05/90	1664	168	10.1	4.0	71	21	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	442
8412-022		Bale	109:35-26	09/05/90	1770	110	6.2	3.0	67	29	0.34	0.55	74	0.00	0.00	0.00	0.00	0.00	409
8412-025		Bale	110:35-36	09/05/90	1237	65	5.3	4.4	55	33	0.30	0.00	0	0.00	0.00	0.00	0.00	0.00	412
8412-034		Bale	111:35-36	09/05/90	1237	107	8.7	3.9	69	31	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	413
8412-046		Bale	112:35-36	09/05/90	747	62	8.4	3.0	73	23	0.31	0.00	0	0.00	0.00	0.00	0.00	0.00	414
8412-058		Cone	102:37-38	09/11/90	2000	213	10.6	5.5	66	25	0.24	0.00	0	0.00	0.00	0.00	0.00	0.00	514
8412-075		Bale	103:37-38	08/23/90	2100	172	8.2	3.5	70	22	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	98
8412-077		Cone	104:37-38	09/11/90	1800	77	4.3	3.2	57	20	0.27	0.00	0	0.00	0.00	0.00	0.00	0.00	494

*Agricultural Chemistry Department**Oregon State University**Agricultural Research Service**U S Dept Agriculture**Corvallis, Oregon*

1990 Bale and 5-Cone Analyses at 8% Moisture Content(Bale) or As Is Basis(5-Cone) as of November 7, 1991

Accession or Nursery Number	Identification	Type	Location	Harvest Date	Yield Lb/Ac	Alpha Lb/ac	Alpha %	Beta %	Alpha Ratio	CoH	HSI	6 Mo HSI	%A+B Remain	Oil mL/ 100g	Oil H/C	Oil H/F	Oil Myr (%)	Oil Hum (%)	Serial Number
8412-079		Bale	105:37-38	08/23/90	2560	182	7.1	5.8	55	32	0.26	0.00	0	0.00	0.00	0.00	0.00	0.00	106
8412-088		Bale	106:37-38	09/05/90	1600	131	8.2	3.2	72	23	0.30	0.00	0	0.00	0.00	0.00	0.00	0.00	411
8412-101		Bale	107:37-38	09/06/90	1792	161	9.0	4.7	66	22	0.30	0.00	0	0.00	0.00	0.00	0.00	0.00	488
8412-125		Bale	109:37-38	09/06/90	1856	126	6.8	5.2	57	29	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	480
8412-135		Bale	110:37-38	09/06/90	1877	96	5.1	4.4	54	46	0.31	0.00	0	0.00	0.00	0.00	0.00	0.00	482
8412-138		Bale	111:37-38	09/06/90	2304	238	10.3	4.6	69	25	0.30	0.00	0	0.00	0.00	0.00	0.00	0.00	485
8412-139		Bale	112:37-38	09/06/90	1408	126	9.0	4.5	66	27	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	484
8412-150		Bale	101:39-40	09/06/90	1856	73	3.9	4.8	45	36	0.31	0.00	0	0.00	0.00	0.00	0.00	0.00	490
8412-166		Bale	102:39-40	09/06/90	1728	104	6.0	5.3	53	23	0.38	0.00	0	0.00	0.00	0.00	0.00	0.00	479
8412-183		Bale	103:39-40	09/06/90	2411	224	9.3	4.2	69	28	0.30	0.00	0	0.00	0.00	0.00	0.00	0.00	473
8412-188		Bale	104:39-40	09/06/90	2368	208	8.8	5.4	62	31	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	489
8412-196		Bale	105:39-40	08/23/90	2005	171	8.5	4.2	67	32	0.33	0.00	0	0.00	0.00	0.00	0.00	0.00	97
8412-199		Bale	106:39-40	09/06/90	1685	138	8.2	4.7	64	28	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	471
8412-207		Bale	107:39-40	09/06/90	2410	202	8.4	3.2	73	24	0.30	0.00	0	0.00	0.00	0.00	0.00	0.00	483
8412-214		Bale	108:39-40	09/06/90	1856	154	8.3	3.8	68	25	0.29	0.76	52	0.00	0.00	0.00	0.00	0.00	486
8412-225		Bale	110:39-40	09/06/90	2048	150	7.3	3.9	65	26	0.33	0.00	0	0.00	0.00	0.00	0.00	0.00	156
8601-025		Cone	223:01-05	09/07/90	1000	86	8.6	3.7	70	25	0.26	0.00	0	0.00	0.00	0.00	0.00	0.00	376
8601-058		Cone	226:06-10	09/07/90	700	40	5.6	2.6	68	21	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	375
8602-035		Cone	231:06-10	09/13/90	600	48	8.0	3.0	72	28	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	635
8602-055		Cone	232:06-10	09/13/90	100	9	9.1	4.4	67	27	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	630
8602-119		Cone	238:06-10	09/13/90	100	3	2.7	2.1	57	30	0.33	0.00	0	0.00	0.00	0.00	0.00	0.00	633
8602-162		Cone	242:06-10	09/13/90	400	36	8.9	3.9	69	27	0.27	0.00	0	0.00	0.00	0.00	0.00	0.00	628
8602-189		Cone	203:12-16	09/14/90	360	36	9.9	3.7	73	21	0.25	0.00	0	0.00	0.00	0.00	0.00	0.00	701
8602-207		Cone	204:12-16	09/14/90	400	25	6.3	7.9	44	27	0.26	0.00	0	0.00	0.00	0.00	0.00	0.00	698
8602-274		Cone	207:12-16	09/14/90	400	49	12.3	3.6	77	39	0.25	0.00	0	0.00	0.00	0.00	0.00	0.00	704
8602-278		Cone	208:12-16	09/13/90	1200	123	10.3	3.8	73	28	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	621
8602-300		Cone	226:12-16	09/13/90	600	47	7.8	4.2	65	31	0.26	0.00	0	0.00	0.00	0.00	0.00	0.00	631
8602-305		Cone	227:12-16	09/13/90	600	54	9.1	3.4	73	23	0.30	0.00	0	0.00	0.00	0.00	0.00	0.00	622
8602-411		Cone	231:12-16	09/13/90	400	29	7.2	5.3	58	31	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	620
8602-578		Cone	232:12-16	09/13/90	400	26	6.6	3.7	64	33	0.30	0.00	0	0.00	0.00	0.00	0.00	0.00	619
8603-073		Cone	239:12-16	09/13/90	600	37	6.2	5.3	54	31	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	623
8603-077		Cone	240:12-16	09/13/90	600	33	5.5	5.8	49	26	0.26	0.00	0	0.00	0.00	0.00	0.00	0.00	624
8603-097		Cone	242:12-16	09/13/90	300	15	4.8	3.9	55	29	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	627
8603-232		Cone	243:12-16	09/13/90	200	14	6.9	5.3	57	28	0.30	0.00	0	0.00	0.00	0.00	0.00	0.00	626
8603-288		Cone	202:17-21	09/14/90	200	5	2.6	4.6	37	23	0.25	0.00	0	0.00	0.00	0.00	0.00	0.00	697
8603-314		Cone	204:17-21	09/14/90	200	12	6.0	5.3	53	23	0.24	0.00	0	0.00	0.00	0.00	0.00	0.00	702
8603-346		Cone	208:17-21	09/14/90	300	37	12.3	3.5	78	22	0.25	0.00	0	0.00	0.00	0.00	0.00	0.00	695
8603-481		Cone	228:17-21	09/14/90	1400	107	7.6	4.2	64	24	0.22	0.00	0	0.00	0.00	0.00	0.00	0.00	700
8603-564		Cone	238:17-21	09/14/90	700	75	10.7	3.2	77	25	0.24	0.00	0	0.00	0.00	0.00	0.00	0.00	688
8801-006		Bale	136:06	08/24/90	1237	71	5.7	3.9	59	28	0.30	0.56	65	1.18	3.59	1.89	57.23	15.56	126
8802-002		Cone	007:17-20	09/17/90	300	28	9.4	5.9	62	23	0.23	0.59	59	0.00	0.00	0.00	0.00	0.00	711
8802-002		Bale	136:16	08/24/90	3370	227	6.7	4.9	58	23	0.31	0.80	18	1.32	3.56	479.06	41.79	29.70	109
8802-004		Cone	001:21-24	09/17/90	100	5	5.3	4.1	56	30	0.23	0.49	68	0.00	0.00	0.00	0.00	0.00	706
8802-006		Cone	011:17-20	09/17/90	100	5	5.0	3.1	62	29	0.27	0.46	71	0.00	0.00	0.00	0.00	0.00	712
8802-011		Cone	016:17-20	09/17/90	300	22	7.3	4.9	60	29	0.24	0.54	63	0.00	0.00	0.00	0.00	0.00	719
8802-011		Bale	136:25	08/24/90	1706	95	5.6	4.9	53	29	0.27	0.73	53	1.67	3.58	27.60	49.18	25.39	127
8802-012		Cone	017:17-20	09/17/90	200	16	8.0	4.3	65	23	0.23	0.48	69	0.00	0.00	0.00	0.00	0.00	708
8802-012		Bale	136:26	08/27/90	2133	128	6.0	4.1	60	26	0.27	0.69	55	1.67	3.44	166.99	46.65	28.56	197
8802-015		Cone	020:17-20	09/17/90	200	16	8.2	4.5	65	23	0.24	0.50	67	0.00	0.00	0.00	0.00	0.00	714
8802-015		Bale	136:29	08/27/90	981	77	7.8	4.7	63	23	0.25	0.78	47	1.72	0.00	0.00	0.00	0.00	194

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1990 Bale and 5-Cone Analyses at 8% Moisture Content(Bale) or As Is Basis(5-Cone) as of November 7, 1991

Accession or Nursery Number	Identification	Type	Location	Harvest Date	Yield Lb/Ac	Alpha Lb/ac	Alpha %	Beta %	Alpha Ratio	CoH	HSI	6 Mo HSI	%A+B Remain	Oil mL/ 100g	Oil H/C	Oil H/F	Oil Myr (%)	Oil Hum (%)	Serial Number
8802-018		Cone	023:17-20	09/17/90	300	20	6.7	5.9	53	25	0.22	0.76	47	0.00	0.00	0.00	0.00	0.00	725
8802-018		Bale	136:32	08/27/90	2432	198	8.2	5.4	60	22	0.26	1.02	34	1.50	3.53	1.47	58.30	11.56	184
8802-019		Cone	024:17-20	09/17/90	300	15	4.9	4.0	55	23	0.29	0.57	60	0.00	0.00	0.00	0.00	0.00	713
8802-019		Bale	136:33	08/27/90	1749	97	5.6	4.2	57	23	0.29	0.88	40	1.22	3.36	2.57	48.88	21.22	201
8802-021		Cone	026:17-20	09/17/90	200	13	6.4	4.8	57	28	0.25	0.48	69	0.00	0.00	0.00	0.00	0.00	716
8802-021		Bale	136:35	08/27/90	1152	57	4.9	6.4	43	24	0.26	1.22	22	1.11	3.47	408.07	66.40	15.30	204
8802-022		Cone	027:17-20	09/17/90	100	9	8.7	5.4	61	24	0.24	0.45	72	0.00	0.00	0.00	0.00	0.00	718
8802-024		Cone	028:17-20	09/17/90	200	14	6.9	7.5	48	23	0.23	0.54	63	0.00	0.00	0.00	0.00	0.00	717
8802-024		Bale	136:38	08/31/90	1706	135	7.9	6.6	55	21	0.24	0.00	0	1.75	3.52	1.85	44.41	20.29	406
8802-026		Cone	030:17-20	09/17/90	200	23	11.6	5.9	66	28	0.26	0.51	66	0.00	0.00	0.00	0.00	0.00	721
8802-026		Bale	136:40	08/27/90	938	78	8.4	4.6	65	26	0.25	0.61	58	1.34	3.42	147.19	49.09	25.02	193
8802-027		Cone	031:17-20	09/17/90	200	15	7.7	4.9	61	26	0.23	0.46	70	0.00	0.00	0.00	0.00	0.00	715
8802-027		Bale	136:41	08/27/90	2602	173	6.6	3.9	63	24	0.28	0.96	36	1.45	3.20	2.25	43.56	22.36	182
8802-029		Bale	136:43	08/27/90	1920	140	7.3	4.4	63	27	0.28	0.82	42	1.51	3.36	90.23	28.90	32.03	185
8802-030		Bale	136:44	08/31/90	725	68	9.3	5.5	63	25	0.23	0.00	0	1.26	3.09	378.62	58.23	20.07	404
8802-035		Cone	109:07-08	09/11/90	200	7	3.5	3.0	54	24	0.30	0.66	53	0.00	0.00	0.00	0.00	0.00	513
8802-035		Cone	136:49	09/12/90	300	13	4.4	3.5	56	28	0.31	0.74	48	0.00	0.00	0.00	0.00	0.00	537
8802-037		Bale	136:51	08/27/90	1749	146	8.3	4.9	63	25	0.26	0.00	0	1.99	3.49	2.00	59.29	15.15	186
8802-039		Cone	110:07-08	09/11/90	200	10	4.8	2.3	67	25	0.28	0.71	50	0.00	0.00	0.00	0.00	0.00	516
8802-041		Bale	137:03	08/31/90	853	46	5.4	4.5	55	26	0.26	0.82	44	0.00	0.00	0.00	0.00	0.00	418
8802-042		Bale	137:04	08/27/90	2474	215	8.7	4.8	64	23	0.27	0.00	0	1.68	3.34	2.70	40.20	24.86	190
8802-044		Cone	003:21-24	09/17/90	200	12	6.1	6.0	51	29	0.26	0.58	60	0.00	0.00	0.00	0.00	0.00	707
8802-045		Bale	137:07	08/27/90	1536	127	8.3	5.2	61	23	0.27	0.89	37	1.35	3.62	1.74	43.92	19.15	183
8802-046		Cone	005:21-24	09/17/90	300	22	7.4	4.3	63	22	0.25	0.67	53	0.00	0.00	0.00	0.00	0.00	710
8802-046		Bale	137:08	08/27/90	1322	80	6.0	4.4	58	24	0.28	1.07	30	1.71	3.15	126.09	52.85	20.17	188
8802-048		Cone	007:21-24	09/17/90	400	35	8.8	5.8	60	26	0.22	0.58	60	0.00	0.00	0.00	0.00	0.00	709
8802-048		Bale	137:10	08/27/90	2688	256	9.5	5.4	64	26	0.26	0.89	36	1.48	3.49	1.71	49.64	17.29	187
8802-054		Cone	013:21-24	09/17/90	100	10	9.8	4.5	69	28	0.23	0.57	61	0.00	0.00	0.00	0.00	0.00	705
8802-057		Cone	016:21-24	09/17/90	200	11	5.7	6.8	46	26	0.24	0.62	57	0.00	0.00	0.00	0.00	0.00	745
8802-057		Bale	137:19	08/31/90	1365	94	6.9	6.3	52	23	0.24	1.04	27	1.81	3.26	46.77	54.51	20.63	422
8802-059		Cone	018:21-24	09/17/90	400	29	7.3	4.6	62	24	0.25	0.52	65	0.00	0.00	0.00	0.00	0.00	748
8802-059		Bale	137:21	08/27/90	1024	92	9.0	5.9	61	22	0.26	0.89	38	1.70	3.11	2.46	52.67	18.10	191
8802-061		Cone	020:21-24	09/17/90	400	14	3.4	7.9	30	22	0.29	0.36	83	0.00	0.00	0.00	0.00	0.00	749
8802-061		Bale	137:23	08/31/90	981	91	9.3	3.1	75	24	0.25	0.46	70	1.36	3.47	2.08	28.16	28.55	300
8802-064		Bale	137:26	08/31/90	2218	124	5.6	3.8	59	26	0.27	1.04	30	1.37	3.27	1.70	54.32	17.16	301
8802-068		Cone	025:21-24	09/17/90	300	17	5.7	6.0	49	24	0.24	0.57	60	0.00	0.00	0.00	0.00	0.00	747
8802-068		Bale	137:30	08/27/90	1664	135	8.1	5.3	60	22	0.25	0.83	42	1.56	3.34	1.82	25.32	26.05	181
8804-002		Bale	137:32	08/31/90	725	32	4.4	4.3	50	31	0.29	1.04	32	0.00	0.00	0.00	0.00	0.00	420
8804-003		Bale	137:33	09/07/90	1322	80	6.0	2.9	67	26	0.27	0.54	65	0.65	3.60	1.14	38.26	21.13	408
8804-004		Bale	137:34	08/27/90	469	17	3.7	2.9	56	28	0.36	0.00	0	0.00	0.00	0.00	0.00	0.00	192
8804-005		Bale	137:35	08/27/90	1152	58	5.0	3.0	62	31	0.31	1.00	37	0.48	3.52	1.48	33.28	21.41	196
8804-012		Bale	137:42	08/31/90	1834	62	3.4	2.5	58	26	0.31	0.00	0	0.81	3.64	4.24	56.18	19.06	407
8804-014		Bale	137:44	08/31/90	341	20	6.0	2.3	72	20	0.28	0.00	0	0.00	0.00	0.00	0.00	0.00	426
8804-022		Bale	137:52	09/06/90	1322	47	3.6	3.0	54	23	0.31	0.99	35	0.55	3.56	1.30	44.16	20.60	467
8804-025		Bale	138:03	08/27/90	683	31	4.6	2.2	68	25	0.33	0.57	74	0.00	0.00	0.00	0.00	0.00	200
8804-026		Bale	138:04	08/27/90	768	47	6.1	2.8	68	21	0.30	0.00	0	1.04	2.62	1.74	44.58	19.11	198
8805-006		Cone	033:21-24	09/17/90	200	12	5.8	4.2	58	26	0.23	0.52	65	0.00	0.00	0.00	0.00	0.00	744
8805-006		Bale	138:11	08/31/90	2218	133	6.0	5.1	54	24	0.24	0.85	37	1.35	3.31	2.17	42.67	23.81	208
8805-007		Bale	138:12	08/31/90	1877	117	6.2	2.6	71	25	0.27	0.61	63	1.11	3.36	292.33	44.11	31.86	213
8805-011		Cone	034:21-24	09/17/90	100	9	9.1	5.5	62	29	0.23	0.46	70	0.00	0.00	0.00	0.00	0.00	741

*Agricultural Chemistry Department**Oregon State University**Agricultural Research Service**U S Dept Agriculture**Corvallis, Oregon*

1990 Bale and 5-Cone Analyses at 8% Moisture Content(Bale) or As Is Basis(5-Cone) as of November 7, 1991

Accession or Nursery Number	Identification	Type	Location	Harvest Date	Yield Lb/Ac	Yield Lb/ac	Alpha %	Beta %	Alpha Ratio	CoH	HSI	6 Mo HSI	%A+B Remain	Oil mL/ 100g	Oil H/C	Oil H/F	Oil Myr (%)	Oil Hum (%)	Serial Number
8805-011		Bale	138:16	08/27/90	2815	225	8.0	4.8	63	25	0.26	0.76	46	1.54	3.35	163.08	41.52	31.72	202
8805-013		Cone	035:21-24	09/17/90	200	15	7.6	4.9	61	21	0.26	0.52	65	0.00	0.00	0.00	0.00	0.00	750
8805-013		Bale	138:18	08/27/90	2730	266	9.8	5.6	64	22	0.27	0.88	37	1.41	3.57	1.71	41.25	19.62	195
8805-015		Cone	036:21-24	09/17/90	100	5	5.0	5.2	49	23	0.24	0.55	62	0.00	0.00	0.00	0.00	0.00	746
8805-015		Bale	138:20	08/27/90	2432	162	6.7	5.3	56	21	0.27	0.81	44	1.35	3.27	84.13	41.85	26.49	203
8805-016		Bale	138:21	08/27/90	1237	59	4.7	3.0	61	19	0.29	0.00	0	0.80	3.57	3.99	39.02	29.57	199
8805-018		Cone	038:21-24	09/17/90	100	8	7.7	4.3	64	26	0.25	0.48	69	0.00	0.00	0.00	0.00	0.00	742
8805-018		Bale	138:23	08/27/90	2432	133	5.5	9.4	37	24	0.29	1.20	25	1.49	3.47	163.77	61.69	16.71	189
8805-022		Bale	138:27	08/31/90	384	14	3.6	2.6	58	29	0.36	0.00	0	0.00	0.00	0.00	0.00	0.00	206
8805-023		Bale	138:28	08/28/90	1194	36	3.0	2.6	54	26	0.33	0.75	49	0.43	3.34	1.54	38.15	22.39	139
8805-025		Bale	138:30	08/28/90	256	14	5.6	2.2	72	21	0.31	0.00	0	0.00	0.00	0.00	0.00	0.00	141
8805-026		Bale	138:31	08/28/90	341	22	6.5	6.6	49	22	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	151
8805-027		Bale	138:32	08/28/90	256	10	3.8	3.7	51	20	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	153
8805-031		Cone	002:25-28	09/17/90	100	4	3.9	6.3	38	24	0.24	0.48	69	0.00	0.00	0.00	0.00	0.00	787
8805-038		Bale	138:44	08/28/90	640	46	7.2	3.7	66	24	0.29	0.66	58	0.00	0.00	0.00	0.00	0.00	155
8805-039		Cone	008:25-28	09/17/90	200	14	7.1	4.0	64	26	0.26	0.53	64	0.00	0.00	0.00	0.00	0.00	789
8805-040		Bale	138:45	08/28/90	2090	196	9.4	4.8	66	21	0.25	0.84	38	0.83	3.42	1.92	57.64	15.20	149
8805-045		Cone	013:25-28	09/17/90	100	5	5.2	3.7	59	31	0.26	0.44	73	0.00	0.00	0.00	0.00	0.00	788
8806-001		Cone	014:25-28	09/17/90	100	7	7.4	5.0	60	28	0.25	0.65	54	0.00	0.00	0.00	0.00	0.00	782
8806-002		Cone	015:25-28	09/17/90	400	21	5.1	5.5	48	29	0.26	0.49	68	0.00	0.00	0.00	0.00	0.00	780
8806-002		Bale	138:52	08/28/90	1109	78	7.1	4.3	62	21	0.25	0.55	64	1.05	3.59	178.42	44.65	27.83	147
8806-010		Bale	139:08	08/28/90	725	40	5.6	6.4	47	22	0.31	0.70	52	0.00	0.00	0.00	0.00	0.00	146
8806-011		Cone	023:25-28	09/17/90	100	5	5.4	3.8	58	26	0.25	0.59	59	0.00	0.00	0.00	0.00	0.00	781
8806-011		Bale	139:09	08/28/90	1237	66	5.3	4.9	52	24	0.26	1.05	32	1.65	3.51	58.93	63.05	17.62	152
8806-012		Cone	024:25-28	09/17/90	300	20	6.7	6.3	52	26	0.25	0.55	62	0.00	0.00	0.00	0.00	0.00	783
8806-012		Bale	139:10	08/28/90	1792	126	7.0	5.9	54	20	0.28	0.83	43	0.89	3.64	1.26	46.12	14.61	134
8806-013		Cone	025:25-28	09/17/90	200	13	6.5	4.6	59	24	0.25	0.59	59	0.00	0.00	0.00	0.00	0.00	779
8806-013		Bale	139:11	08/28/90	1578	120	7.6	4.8	61	21	0.25	0.78	45	0.49	3.53	2.18	59.52	12.18	154
8806-017		Cone	029:25-28	09/17/90	200	10	5.2	5.0	51	25	0.25	0.48	69	0.00	0.00	0.00	0.00	0.00	743
8806-017		Bale	139:15	08/28/90	1834	88	4.8	5.6	46	20	0.27	0.86	41	1.11	3.58	1.66	55.36	15.28	136
8806-018		Bale	139:16	08/28/90	427	30	7.1	7.6	48	23	0.29	0.00	0	2.10	0.00	0.00	0.00	0.00	138
8806-021		Cone	033:25-28	09/17/90	100	7	7.2	6.0	54	28	0.24	0.58	60	0.00	0.00	0.00	0.00	0.00	737
8806-022		Cone	034:25-28	09/17/90	100	7	7.2	6.0	55	27	0.23	0.48	69	0.00	0.00	0.00	0.00	0.00	738
8806-025		Cone	036:25-28	09/17/90	100	8	7.9	5.5	59	31	0.24	0.46	71	0.00	0.00	0.00	0.00	0.00	739
8806-025		Bale	139:23	08/28/90	725	49	6.8	7.3	48	22	0.27	1.51	13	0.00	0.00	0.00	0.00	0.00	148
8806-031		Cone	139:29	09/12/90	800	75	9.4	3.9	70	28	0.27	0.50	67	0.00	0.00	0.00	0.00	0.00	530
8806-040		Bale	139:19	08/28/90	725	53	7.4	5.9	56	25	0.27	0.82	45	0.00	0.00	0.00	0.00	0.00	150
8806-062		Cone	021:21-24	09/17/90	200	15	7.4	3.3	69	26	0.26	0.52	65	0.00	0.00	0.00	0.00	0.00	740
8808-003		Bale	139:32	09/07/90	1280	18	1.4	8.2	15	42	0.29	1.05	31	0.96	0.62	16.03	55.96	1.81	397
8808-005		Bale	139:34	09/07/90	811	4	0.5	5.0	9	49	0.33	1.47	16	0.53	0.00	0.00	0.00	0.00	463
8808-007		Bale	139:36	08/31/90	1109	8	0.7	5.7	11	57	0.35	1.34	19	0.83	1.85	80.67	45.95	18.77	212
8808-008		Bale	139:37	09/07/90	1408	17	1.2	4.6	20	26	0.29	0.91	40	0.84	2.00	205.12	43.52	21.54	466
8808-009		Bale	139:38	09/07/90	1408	6	0.5	8.1	5	53	0.27	1.63	12	0.99	0.55	18.01	56.88	1.71	399
8808-011		Bale	139:40	09/07/90	1792	6	0.3	7.6	4	27	0.33	1.49	16	0.88	1.67	292.53	38.30	14.92	458
8808-014		Bale	139:43	09/07/90	1280	6	0.5	6.8	7	32	0.28	0.95	35	0.41	0.79	18.56	16.81	4.18	465
8808-015		Bale	139:44	09/07/90	512	9	1.8	5.0	26	36	0.32	0.00	0	0.46	0.00	0.00	0.00	0.00	401
8808-016		Bale	139:45	09/07/90	1834	118	6.4	4.6	58	34	0.27	0.58	65	1.06	2.05	40.99	45.86	9.63	457
8808-017		Bale	139:46	09/07/90	1450	15	1.0	4.9	17	41	0.36	1.02	37	0.76	0.79	19.16	54.39	2.30	398
8808-018		Cone	139:47	09/12/90	2000	8	0.4	6.2	6	55	0.28	1.10	29	0.00	0.00	0.00	0.00	0.00	533
8808-020		Bale	139:49	09/07/90	1792	52	2.9	6.3	32	35	0.27	1.31	20	0.95	3.21	305.35	65.80	10.38	392

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1990 Bale and 5-Cone Analyses at 8% Moisture Content(Bale) or As Is Basis(5-Cone) as of November 7, 1991

Accession or Nursery Number	Identification	Type	Location	Harvest Date	Yield Lb/Ac	Alpha Lb/ac	Alpha %	Beta %	Alpha Ratio	CoH	HSI	6 Mo HSI	%A+B Remain	Oil mL/ 100g	Oil H/C	Oil H/F	Oil Myr (%)	Oil Hum (%)	Serial Number
8808-021		Bale	139:50	09/07/90	1493	117	7.9	3.6	68	43	0.29	1.81	4	0.81	0.98	21.30	50.70	3.11	394
8808-022		Bale	139:51	09/07/90	1792	7	0.4	7.5	5	50	0.34	1.55	15	0.71	1.82	74.80	38.22	12.57	168
8808-023		Bale	139:52	09/07/90	1664	6	0.4	6.2	5	53	0.31	1.24	23	0.49	1.01	19.32	52.98	3.77	403
8808-025		Bale	140:02	09/07/90	2858	85	3.0	8.9	25	31	0.32	1.48	15	1.93	0.99	6.78	74.68	.79	155
8808-026		Cone	140:03	09/12/90	1400	15	1.1	3.8	22	64	0.33	0.84	42	0.00	0.00	0.00	0.00	0.00	555
8808-028		Cone	140:05	09/12/90	1200	15	1.3	3.3	28	30	0.32	0.61	58	0.00	0.00	0.00	0.00	0.00	539
8808-030		Bale	140:07	09/07/90	427	3	0.6	3.6	15	43	0.32	0.00	0	0.00	0.00	0.00	0.00	0.00	400
8808-031		Bale	140:08	09/07/90	1109	10	0.9	5.7	14	44	0.30	1.53	16	0.81	0.00	0.00	0.00	0.00	396
8808-032		Bale	140:09	09/07/90	1749	28	1.6	5.0	24	34	0.30	0.93	42	0.93	1.42	137.34	41.93	14.70	393
8808-033		Bale	140:10	09/07/90	1280	35	2.7	6.4	30	35	0.34	1.06	36	0.91	2.01	78.47	45.32	16.16	402
8808-034		Bale	140:11	09/07/90	1962	12	0.6	7.7	7	49	0.35	2.07	8	0.97	0.16	6.80	72.50	.97	461
8808-038		Bale	140:15	09/07/90	1152	12	1.1	5.0	18	33	0.32	1.54	15	0.95	1.88	178.47	10.15	21.60	395
8808-039		Bale	140:16	09/07/90	938	7	0.7	5.7	11	51	0.27	1.48	15	0.89	0.00	0.00	0.00	0.00	462
8808-040		Cone	140:17	09/12/90	1000	10	1.0	4.8	17	33	0.32	0.91	38	0.00	0.00	0.00	0.00	0.00	550
8808-042		Bale	140:19	09/07/90	811	4	0.5	6.5	7	42	0.25	1.51	14	0.97	0.00	0.00	0.00	0.00	461
8808-043		Cone	140:20	09/12/90	1200	17	1.4	3.9	27	53	0.29	1.05	31	0.00	0.00	0.00	0.00	0.00	540
8808-045		Bale	140:22	09/07/90	1450	17	1.2	6.2	16	43	0.34	1.81	9	1.13	0.00	0.00	0.00	0.00	459
8808-046		Bale	140:23	09/11/90	1194	0	0.0	8.8	0	41	0.37	1.93	10	1.39	0.00	0.00	0.00	0.00	664
8808-047		Bale	140:24	09/11/90	811	12	1.5	6.7	18	44	0.28	1.15	25	0.45	0.00	0.00	0.00	0.00	668
8808-049		Bale	140:26	09/11/90	2048	5	0.2	5.7	4	64	0.42	1.80	9	0.91	1.79	31.74	67.45	2.92	667
8808-053		Bale	140:30	09/11/90	1706	91	5.3	3.7	59	56	0.27	1.24	20	0.73	1.71	189.48	44.84	12.13	663
8808-054		Bale	140:31	09/11/90	1066	8	0.7	5.3	12	87	0.35	1.26	26	0.42	0.00	0.00	0.00	0.00	671
8808-055		Bale	140:32	09/11/90	1066	18	1.7	7.6	18	38	0.30	1.54	13	0.97	1.17	44.78	50.26	3.27	617
8808-056		Bale	140:33	09/11/90	1237	4	0.3	6.4	5	52	0.32	1.67	14	1.50	1.54	235.06	54.63	7.29	609
8808-057		Bale	140:34	09/11/90	1536	7	0.4	6.1	7	52	0.42	1.85	11	0.99	0.00	0.00	0.00	0.00	666
8808-058		Cone	140:35	09/12/90	1200	6	0.5	5.8	8	47	0.27	0.73	49	0.00	0.00	0.00	0.00	0.00	543
8808-059		Cone	140:36	09/12/90	1400	3	0.2	3.5	6	40	0.35	0.91	38	0.00	0.00	0.00	0.00	0.00	554
8808-060		Bale	140:37	09/11/90	1557	12	0.7	5.5	12	38	0.29	1.15	28	0.86	0.00	0.00	0.00	0.00	662
8808-062		Bale	140:39	09/11/90	1706	30	1.8	5.4	25	32	0.31	1.24	26	1.15	0.77	46.00	46.59	2.39	618
8808-063		Cone	140:40	09/12/90	1400	16	1.1	4.5	20	37	0.31	1.10	29	0.00	0.00	0.00	0.00	0.00	542
8808-065		Bale	140:42	09/10/90	2560	30	1.2	8.7	12	38	0.32	1.70	11	1.70	1.75	86.24	33.23	5.35	608
8808-067		Cone	140:44	09/12/90	1600	8	0.5	7.0	7	52	0.31	1.75	7	0.00	0.00	0.00	0.00	0.00	551
8808-068		Cone	140:45	09/12/90	800	1	0.1	4.4	3	40	0.27	1.22	24	0.00	0.00	0.00	0.00	0.00	552
8808-070		Bale	140:47	09/11/90	1450	19	1.3	5.9	18	18	0.30	1.20	27	0.93	0.00	0.00	0.00	0.00	592
8808-072		Bale	140:49	09/11/90	1109	22	2.0	6.6	23	37	0.31	1.20	26	1.02	0.00	0.00	0.00	0.00	616
8808-074		Bale	140:51	09/11/90	1109	5	0.5	7.7	6	57	0.32	1.94	9	0.83	2.41	54.76	66.51	6.96	665
8808-075		Cone	140:52	09/12/90	800	8	1.0	5.3	16	35	0.29	0.54	63	0.00	0.00	0.00	0.00	0.00	534
8808-076		Bale	141:01	09/12/90	1877	18	1.0	5.6	15	71	0.32	1.34	22	1.12	0.77	39.28	68.09	1.81	675
8808-079		Bale	141:04	09/12/90	683	8	1.1	2.9	28	49	0.40	1.17	36	0.75	0.00	0.00	0.00	0.00	796
8808-080		Bale	141:05	09/12/90	1706	13	0.8	6.9	10	44	0.33	1.48	17	1.31	0.00	0.00	0.00	0.00	679
8808-081		Bale	141:06	09/12/90	1280	28	2.2	7.3	23	28	0.28	1.11	29	0.91	0.00	0.00	0.00	0.00	790
8808-084		Bale	141:09	09/12/90	1493	97	6.5	4.1	61	41	0.30	0.48	72	0.61	2.06	268.00	77.10	5.63	799
8808-086		Cone	141:11	09/12/90	1200	9	0.8	3.4	18	40	0.37	0.89	40	0.00	0.82	3.65	49.95	1.07	547
8808-088		Bale	141:13	09/12/90	1450	1	0.1	6.5	1	53	0.47	1.67	13	0.80	0.00	0.00	0.00	0.00	803
8808-089		Cone	141:14	09/12/90	1200	6	0.5	5.5	9	55	0.30	0.75	47	0.00	0.00	0.00	0.00	0.00	541
8808-091		Bale	141:16	09/12/90	1365	30	2.2	4.7	32	34	0.34	1.25	27	1.41	0.00	0.00	0.00	0.00	677
8808-095		Cone	141:20	09/12/90	1400	4	0.3	3.1	8	41	0.37	0.96	36	0.00	0.00	0.00	0.00	0.00	545
8808-096		Bale	141:21	09/12/90	1621	8	0.5	5.9	8	48	0.44	1.96	11	0.94	2.45	78.10	61.69	6.95	800
8808-099		Cone	141:24	09/12/90	1600	27	1.7	5.7	22	18	0.27	0.75	48	0.00	0.00	0.00	0.00	0.00	531
8808-100		Bale	141:25	09/13/90	896	6	0.6	5.5	10	58	0.40	1.65	12	0.67	0.00	0.00	0.00	0.00	859

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8808-103		Cone	141:28	09/12/90	1200	1	0.1	2.4	4	55	0.37	0.97	35	0.00	0.55	1.81	38.88	.78	553
8808-104		Cone	141:29	09/12/90	700	4	0.6	5.0	11	38	0.37	0.57	60	0.00	0.00	0.00	0.00	0.00	546
8808-109		Cone	141:34	09/12/90	1200	5	0.4	6.2	7	51	0.32	0.52	65	0.00	0.00	0.00	0.00	0.00	548
8808-113		Bale	141:38	09/13/90	1792	5	0.3	6.0	5	57	0.57	1.85	9	0.49	0.00	0.00	0.00	0.00	814
8808-115		Cone	141:40	09/12/90	1200	18	1.5	5.9	20	29	0.30	1.10	29	0.00	0.00	0.00	0.00	0.00	544
8808-116		Cone	141:41	09/12/90	1600	23	1.4	6.0	19	41	0.26	0.75	48	0.00	0.00	0.00	0.00	0.00	532
8808-120		Cone	141:45	09/12/90	120		0.3	6.3	5	53	0.28	1.35	19	0.00	0.00	0.00	0.00	0.00	549
8808-121		Cone	141:46	09/12/90	1200	2	0.1	4.4	3	51	0.36	0.89	39	0.00	0.00	0.00	0.00	0.00	536
8808-125		Cone	141:50	09/12/90	1800	12	0.6	5.7	10	48	0.35	1.29	22	0.00	0.00	0.00	0.00	0.00	535
8808-128		Bale	142:01	09/13/90	1706	7	0.4	3.9	10	55	0.48	1.63	15	0.34	0.00	0.00	0.00	0.00	836
8808-130		Cone	142:03	09/12/90	1200	21	1.8	7.6	19	40	0.26	0.84	42	0.00	0.00	0.00	0.00	0.00	576
8808-134		Bale	142:07	09/13/90	1621	2	0.1	6.3	2	41	0.57	1.91	9	0.50	0.00	0.00	0.00	0.00	831
8808-136		Cone	142:09	09/12/90	1200	11	0.9	7.5	11	37	0.29	1.14	27	0.00	0.00	0.00	0.00	0.00	565
8808-138		Cone	142:11	09/12/90	1600	14	0.9	5.8	13	38	0.26	0.63	56	0.00	0.00	0.00	0.00	0.00	574
8808-142		Cone	142:15	09/12/90	1400	6	0.4	9.7	4	43	0.24	1.44	16	0.00	1.23	2.40	25.23	.39	579
8808-145		Cone	142:18	09/12/90	1200	0	0.0	3.5	0	58	0.52	1.15	27	0.00	0.00	0.00	0.00	0.00	571
8808-146		Cone	142:19	09/12/90	1000	11	1.1	6.3	15	45	0.28	1.63	10	0.00	0.00	0.00	0.00	0.00	578
8808-147		Cone	142:20	09/12/90	1100	21	1.5	4.6	25	28	0.30	0.81	44	0.00	0.00	0.00	0.00	0.00	580
8808-150		Cone	142:23	09/12/90	1400	18	1.3	5.5	19	39	0.28	0.62	56	0.00	0.00	0.00	0.00	0.00	577
8808-151		Bale	142:24	09/13/90	1193	8	0.6	6.4	8	48	0.40	1.64	13	0.42	0.00	0.00	0.00	0.00	808
8808-153		Cone	142:26	09/12/90	1200	25	2.1	7.1	23	28	0.25	1.09	29	0.00	0.00	0.00	0.00	0.00	564
8808-154		Cone	142:27	09/12/90	1000	8	0.8	3.3	20	50	0.37	1.22	24	0.00	0.00	0.00	0.00	0.00	557
8808-155		Cone	142:28	09/12/90	1000	0	0.0	3.5	0	60	0.48	1.14	28	0.00	0.00	0.00	0.00	0.00	575
8808-157		Cone	142:30	09/12/90	1300	6	0.5	4.6	9	57	0.30	0.98	35	0.00	0.00	0.00	0.00	0.00	568
8808-160		Bale	142:33	09/13/90	1493	7	0.4	5.7	7	33	0.40	1.69	10	0.49	1.92	186.85	45.02	6.35	841
8809-003		Bale	142:36	09/13/90	853	19	2.2	3.8	37	31	0.38	0.00	0	0.73	0.00	0.00	0.00	0.00	898
8809-004		Bale	142:37	09/13/90	1194	14	1.1	4.3	21	58	0.55	1.68	13	0.51	1.30	0.00	45.15	1.08	864
8809-008		Bale	142:41	09/13/90	981	18	1.8	5.5	25	28	0.37	1.21	29	0.52	0.00	0.00	0.00	0.00	894
8809-009		Bale	142:42	09/13/90	917	18	1.9	4.7	29	28	0.36	1.12	34	1.33	0.00	0.00	0.00	0.00	862
8809-010		Cone	142:43	09/12/90	1800	19	1.1	3.4	24	18	0.36	0.98	35	0.00	0.00	0.00	0.00	0.00	573
8809-011		Bale	142:44	09/13/90	683	2	0.3	4.6	7	34	0.61	1.93	15	0.41	0.00	0.00	0.00	0.00	896
8809-018		Bale	142:51	09/13/90	1322	6	0.5	3.0	13	51	0.83	1.99	10	0.59	0.00	0.00	0.00	0.00	854
8809-022		Bale	143:03	09/13/90	1706	25	1.5	7.3	17	35	0.35	1.15	29	0.84	2.45	.80	33.47	9.43	852
8809-026		Cone	143:07	09/12/90	845	53	6.3	6.0	51	43	0.26	0.62	57	0.00	0.00	0.00	0.00	0.00	570
8809-027		Bale	143:08	09/13/90	1664	12	0.7	4.5	14	67	0.45	1.75	10	0.95	1.03	17.79	45.51	2.76	866
8809-028		Cone	143:09	09/12/90	1000	3	0.3	6.7	4	57	0.29	0.97	35	0.00	0.26	0.00	14.09	.36	559
8809-034		Bale	143:15	09/13/90	1706	67	3.9	7.8	33	25	0.28	0.77	51	0.24	3.47	54.72	73.93	7.06	861
8809-035		Cone	143:16	09/12/90	1000	23	2.3	7.0	25	27	0.24	0.86	41	0.00	1.81	28.47	27.61	8.43	572
8809-036		Bale	143:17	09/13/90	384	7	1.9	6.5	22	28	0.37	0.00	0	0.00	0.00	0.00	0.00	0.00	897
8809-038		Bale	143:19	09/13/90	1365	3	0.2	4.1	5	44	0.63	1.85	14	0.83	1.58	31.22	32.40	3.18	895
8809-043		Bale	143:24	09/13/90	981	19	1.9	3.2	38	25	0.36	0.85	47	0.62	0.00	0.00	0.00	0.00	856
8809-044		Cone	143:25	09/12/90	1200	12	1.0	4.3	18	48	0.43	1.64	10	0.00	0.00	0.00	0.00	0.00	560
8809-047		Bale	143:28	09/13/90	811	50	6.2	4.9	56	30	0.43	1.36	24	0.86	0.00	0.00	0.00	0.00	900
8809-051		Bale	143:32	09/13/90	938	11	1.2	4.6	21	49	0.33	1.27	25	0.67	0.00	0.00	0.00	0.00	853
8809-052		Cone	143:33	09/12/90	1000	46	4.6	2.7	63	50	0.31	0.68	52	0.00	0.00	0.00	0.00	0.00	562
8809-056		Bale	143:37	09/13/90	1024	4	0.4	7.5	5	35	0.43	1.85	10	1.21	0.00	0.00	0.00	0.00	807
8809-057		Bale	143:38	09/13/90	1024	2	0.1	5.0	3	48	0.47	1.67	15	0.45	0.00	0.00	0.00	0.00	839
8809-058		Bale	143:39	09/13/90	896	4	0.5	4.9	9	48	0.44	1.67	15	1.02	0.00	0.00	0.00	0.00	813
8809-060		Bale	143:41	09/13/90	1007	7	0.7	5.0	12	39	0.38	1.44	20	0.57	0.00	0.00	0.00	0.00	835
8809-061		Cone	143:42	09/12/90	1000	2	0.2	5.6	3	33	0.42	1.27	22	0.00	0.00	0.00	0.00	0.00	563

*Agricultural Chemistry Department**Oregon State University**Agricultural Research Service**U S Dept Agriculture**Corvallis, Oregon*

1990 Bale and 5-Cone Analyses at 8% Moisture Content(Bale) or As Is Basis(5-Cone) as of November 7, 1991

Accession or Nursery Number	Identification	Type	Location	Harvest Date	Yield Lb/Ac	Alpha Lb/ac	Alpha %	Beta %	Alpha Ratio	CoH	HSI	6 Mo HSI	%A+B Remain	Oil mL/ 100g	Oil H/C	Oil H/F	Myr (%)	Hum (%)	Serial Number
8809-063		Cone	143:44	09/13/90	1300	10	0.8	7.1	10	53	0.31	1.66	10	0.00	0.00	0.00	0.00	0.00	661
8809-066		Bale	143:47	09/13/90	1365	70	5.1	3.6	58	29	0.31	0.58	68	1.40	2.13	168.87	47.13	19.76	811
8809-068		Cone	143:49	09/12/90	1600	51	3.2	3.1	50	33	0.30	0.56	62	0.00	0.00	0.00	0.00	0.00	567
8809-071		Cone	143:52	09/12/90	1200	2	0.1	6.9	2	52	0.28	1.41	17	0.00	1.40	6.93	55.70	3.25	569
8809-073		Bale	144:02	09/13/90	1152	70	6.1	4.9	55	39	0.32	1.27	23	1.24	3.51	404.41	63.88	10.92	810
8809-078		Cone	144:07	09/12/90	1600	2	0.1	3.8	3	59	0.32	1.15	27	0.00	0.00	0.00	0.00	0.00	556
8809-079		Bale	144:08	09/13/90	896	22	2.5	4.2	37	33	0.34	0.65	65	0.68	0.00	0.00	0.00	0.00	806
8809-080		Cone	144:09	09/12/90	1600	9	0.6	2.2	21	58	0.39	0.85	41	0.00	0.00	0.00	0.00	0.00	558
8809-081		Cone	144:10	09/12/90	1200	51	4.2	2.0	68	32	0.29	0.67	53	0.00	0.00	0.00	0.00	0.00	566
8809-084		Bale	144:13	09/14/90	2560	85	3.3	3.0	52	41	0.34	0.51	82	0.61	0.00	0.00	0.00	0.00	766
8809-086		Cone	144:15	09/12/90	1200	61	5.1	3.9	57	27	0.28	0.53	65	0.00	0.00	0.00	0.00	0.00	561
8809-092		Cone	144:21	09/13/90	1200	25	2.1	8.0	21	32	0.24	0.51	66	0.00	2.95	51.11	35.94	5.21	656
8809-094		Cone	144:23	09/13/90	1800	58	3.2	7.1	31	23	0.28	0.54	64	0.00	0.00	0.00	0.00	0.00	654
8809-095		Bale	144:24	09/14/90	1024	6	0.6	3.4	14	44	0.46	1.51	18	0.19	0.00	0.00	0.00	0.00	765
8809-096		Cone	144:25	09/13/90	1200	27	2.3	6.5	26	38	0.40	0.67	53	0.00	0.00	0.00	0.00	0.00	655
8809-098		Cone	144:27	09/13/90	1200	41	3.4	5.5	38	41	0.30	0.63	56	0.00	0.00	0.00	0.00	0.00	651
8809-099		Bale	144:28	09/14/90	1706	18	1.0	5.7	16	48	0.35	0.84	49	0.74	0.00	0.00	0.00	0.00	761
8809-100		Cone	144:29	09/13/90	1100	39	2.8	3.2	47	40	0.34	0.54	63	0.00	0.00	0.00	0.00	0.00	653
8809-105		Cone	144:34	09/13/90	1200	0	0.0	8.9	0	43	0.26	1.28	22	0.00	1.55	9.86	31.77	2.26	658
8809-108		Bale	144:37	09/14/90	981	50	5.1	3.5	59	49	0.35	1.17	29	1.38	0.00	0.00	0.00	0.00	771
8809-111		Cone	144:40	09/13/90	1000	33	3.3	8.4	28	34	0.23	0.60	58	0.00	0.00	0.00	0.00	0.00	659
8809-115		Cone	144:44	09/13/90	1200	19	1.6	8.3	16	39	0.22	0.59	59	0.00	3.14	0.00	52.58	6.44	657
8809-121		Cone	144:50	09/13/90	1000	6	0.6	5.8	10	35	0.32	1.19	26	0.00	0.00	0.00	0.00	0.00	660
8809-126		Bale	145:03	09/14/90	1365	24	1.8	5.9	23	34	0.36	0.86	49	0.78	0.00	0.00	0.00	0.00	842
8809-127		Bale	145:04	09/14/90	469	2	0.4	6.2	6	53	0.42	0.00	0	0.00	0.00	0.00	0.00	0.00	760
8809-130		Bale	145:07	09/14/90	1493	5	0.4	4.5	7	15	0.66	1.89	15	0.70	2.26	137.53	57.49	6.19	767
8809-132		Cone	145:09	09/13/90	1300	3	0.3	8.0	3	53	0.26	1.25	23	0.00	1.42	8.41	38.81	3.33	648
8809-145		Bale	145:22	09/14/90	981	3	0.3	3.5	8	51	0.59	1.90	11	0.72	0.00	0.00	0.00	0.00	759
8809-146		Cone	145:23	09/13/90	1000	3	0.3	8.6	3	45	0.30	1.13	28	0.00	0.00	0.00	0.00	0.00	647
8809-147		Bale	145:24	09/14/90	512	7	1.4	5.4	21	34	0.38	0.00	0	0.76	0.00	0.00	0.00	0.00	762
8809-150		Cone	145:27	09/13/90	1400	1	0.1	5.6	2	40	0.26	0.96	36	0.00	0.00	0.00	0.00	0.00	643
8809-162		Bale	145:39	09/14/90	1194	12	1.0	2.6	28	41	0.42	0.96	47	0.63	0.00	0.00	0.00	0.00	756
8810-001		Bale	145:46	09/14/90	1322	13	1.0	3.3	23	35	0.37	1.17	32	0.67	0.00	0.00	0.00	0.00	751
8810-002		Cone	145:47	09/13/90	1200	16	1.3	5.0	21	37	0.32	0.85	42	0.00	0.00	0.00	0.00	0.00	649
8810-006		Cone	145:51	09/13/90	1600	23	1.5	5.5	21	36	0.29	0.68	52	0.00	0.00	0.00	0.00	0.00	652
8810-011		Cone	146:04	09/13/90	1400	17	1.2	4.0	23	12	0.34	0.93	37	0.00	0.00	0.00	0.00	0.00	640
8810-012		Cone	146:05	09/13/90	1300	15	1.1	3.1	27	54	0.34	0.70	51	0.00	0.00	0.00	0.00	0.00	642
8810-015		Cone	146:08	09/13/90	1300	11	0.8	3.4	20	52	0.36	0.66	53	0.00	0.00	0.00	0.00	0.00	638
8810-016		Bale	146:09	09/14/90	1322	14	1.0	5.0	17	37	0.46	1.60	14	0.74	0.00	0.00	0.00	0.00	757
8810-018		Cone	146:11	09/13/90	1400	12	0.8	4.0	17	55	0.30	0.67	53	0.00	0.00	0.00	0.00	0.00	639
8810-019		Cone	146:12	09/13/90	1400	16	1.1	5.4	17	71	0.34	0.76	47	0.00	0.00	0.00	0.00	0.00	650
8810-022		Cone	146:15	09/13/90	1400	15	1.0	3.5	23	31	0.28	0.57	60	0.00	0.00	0.00	0.00	0.00	644
8810-028		Cone	146:21	09/13/90	1600	67	4.2	4.5	48	24	0.27	0.64	55	0.00	0.00	0.00	0.00	0.00	637
8810-029		Bale	146:22	09/14/90	2346	30	1.3	6.6	16	41	0.33	1.65	14	1.30	1.96	252.14	69.59	5.30	752
8810-034		Cone	146:27	09/13/90	1200	13	1.1	3.0	26	37	0.29	0.44	73	0.00	0.00	0.00	0.00	0.00	645
8810-041		Cone	146:34	09/13/90	1600	26	1.6	5.4	23	23	0.29	0.63	56	0.00	0.00	0.00	0.00	0.00	641
8811-005		Bale	146:39	09/14/90	1280	36	2.8	8.2	25	36	0.27	1.18	27	1.62	1.83	685.00	65.27	13.02	763
8811-006		Bale	146:40	09/14/90	1280	76	6.0	4.3	58	40	0.30	0.70	57	0.79	1.42	148.73	51.30	11.75	832
8811-010		Bale	146:44	09/14/90	1578	29	1.9	4.0	32	40	0.35	0.93	43	0.80	1.76	137.89	51.87	8.41	755
8811-013		Bale	146:47	09/14/90	1877	31	1.6	5.0	25	32	0.37	1.05	37	0.96	0.00	0.00	0.00	0.00	833
8811-014		Cone	146:48	09/13/90	1400	56	4.0	3.5	53	38	0.31	0.71	50	0.00	0.00	0.00	0.00	0.00	646
8811-016		Cone	146:50	09/13/90	1300	66	5.1	3.2	62	28	0.32	0.84	42	0.00	0.00	0.00	0.00	0.00	636

1990 Samples with AlphaRatio < 40 and Yield >1000 lb/ac

1990 Bale and S-Cone Analyses at 8% Moisture Content (Bale) or As Is Basis (S-Cone) as of January 25, 1991 (n = 52)

Accession or Nursery Number	Identification	Type	Location	Harvest Date	Yield Lb/Ac	Alpha Lb/Ac	Alpha %	Beta %	Alpha Ratio	CoH	HSI	6 Mo HSI	%A+B Remain	Oil mL/100g	Oil H/C	Oil H/F	Oil Myr (%)	Oil Hum (%)	Serial Number
21470	8301-018	Bale	238:23-27	09/12/90	1007	28	2.7	6.3	31	29	0.27	0.00	0	1.11	2.43	0.00	47.61	25.43	792
21490	8309-037	Bale	229;28-32	09/13/90	1322	62	4.7	7.4	39	24	0.25	0.00	0	0.77	3.55	0.00	72.90	10.71	857
21503	7504-137	Bale	234:12-16	09/11/90	1681	94	5.6	8.7	39	32	0.24	0.00	0	1.16	2.32	3.20	73.23	6.15	669
21515	Hersbrucker-8	Bale	216:01-05	09/06/90	1237	45	3.6	6.0	38	20	0.28	0.00	0	1.51	2.02	49.26	62.88	7.19	476
21387	7013-003	Bale	104:03-04	08/21/90	1152	17	1.4	5.2	22	36	0.33	0.00	0	0.83	0.00	0.00	0.00	0.00	37
64007	19105 x 19058M	Bale	232:01-05	09/14/90	1408	27	1.9	6.9	22	29	0.26	0.00	0	0.83	2.74	0.00	68.91	8.60	812
8401-070		Bale	233:01-05	09/07/90	1647	54	3.3	5.0	39	28	0.33	0.00	0	0.00	0.00	0.00	0.00	0.00	445
8406-054		Bale	108:21-22	08/31/90	1386	40	2.9	4.5	39	26	0.28	0.00	0	0.53	3.67	11.81	38.17	32.51	218
8805-018		Bale	138:23	08/27/90	2432	133	5.5	9.4	37	24	0.29	0.00	0	1.49	3.47	0.00	61.69	16.71	189
8808-003		Bale	139:32	09/07/90	1280	18	1.4	8.2	15	42	0.29	0.00	0	0.96	0.62	16.03	55.96	1.81	397
8808-007		Bale	139:36	08/31/90	1109	8	0.7	5.7	11	57	0.35	0.00	0	0.83	1.85	80.67	45.95	18.77	212
8808-008		Bale	139:37	09/07/90	1408	17	1.2	4.6	20	26	0.29	0.00	0	0.84	2.00	0.00	43.52	21.54	466
8808-009		Bale	139:38	09/07/90	1408	6	0.5	8.1	5	53	0.27	0.00	0	0.99	0.55	18.01	56.88	1.71	399
8808-011		Bale	139:40	09/07/90	1792	6	0.3	7.6	4	27	0.33	0.00	0	0.88	1.67	0.00	38.30	14.92	458
8808-014		Bale	139:43	09/07/90	1280	6	0.5	6.8	7	32	0.28	0.00	0	0.41	0.79	18.56	16.81	4.18	465
8808-017		Bale	139:46	09/07/90	1450	15	1.0	4.9	17	41	0.36	0.00	0	0.76	0.79	19.16	54.39	2.30	398
8808-020		Bale	139:49	09/07/90	1792	52	2.9	6.3	32	35	0.27	0.00	0	0.95	3.21	0.00	65.80	10.38	392
8808-022		Bale	139:51	09/07/90	1792	7	0.4	7.5	5	50	0.34	0.00	0	0.71	1.82	74.80	38.22	12.57	468
8808-023		Bale	139:52	09/07/90	1664	6	0.4	6.2	5	53	0.31	0.00	0	0.49	1.01	19.32	52.98	3.77	403
8808-025		Bale	140:02	09/07/90	2858	85	3.0	8.9	25	31	0.32	0.00	0	1.93	0.99	6.78	74.68	.79	455
8808-031		Bale	140:08	09/07/90	1109	10	0.9	5.7	14	44	0.30	0.00	0	0.00	0.00	0.00	0.00	0.00	396
8808-032		Bale	140:09	09/07/90	1749	28	1.6	5.0	24	34	0.30	0.00	0	0.93	1.42	0.00	41.93	14.70	393
8808-034		Bale	140:11	09/07/90	1962	12	0.6	7.7	7	49	0.35	0.00	0	0.97	0.16	6.80	72.50	.97	464
8808-038		Bale	140:15	09/07/90	1152	12	1.1	5.0	18	33	0.32	0.00	0	0.95	1.88	0.00	40.15	21.60	395
8808-045		Bale	140:22	09/07/90	1450	17	1.2	6.2	16	43	0.34	0.00	0	0.00	0.00	0.00	0.00	0.00	459
8808-049		Bale	140:26	09/11/90	2048	5	0.2	5.7	4	64	0.42	0.00	0	0.91	1.79	31.74	67.45	2.92	667
8808-054		Bale	140:31	09/11/90	1066	8	0.7	5.3	12	87	0.35	0.00	0	0.00	0.00	0.00	0.00	0.00	671
8808-055		Bale	140:32	09/11/90	1066	18	1.7	7.6	18	38	0.30	0.00	0	0.97	1.17	44.78	50.26	3.27	617
8808-056		Bale	140:33	09/11/90	1237	4	0.3	6.4	5	52	0.32	0.00	0	1.50	1.54	0.00	54.63	7.29	609
8808-060		Bale	140:37	09/11/90	1557	12	0.7	5.5	12	38	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	662
8808-062		Bale	140:39	09/11/90	1706	30	1.8	5.4	25	32	0.31	0.00	0	1.15	0.77	46.00	46.59	2.39	618
8808-065		Bale	140:42	09/10/90	2560	30	1.2	8.7	12	38	0.32	0.00	0	1.70	1.75	86.24	33.23	5.35	608
8808-072		Bale	140:49	09/11/90	1109	22	2.0	6.6	23	37	0.31	0.00	0	1.02	0.00	0.00	0.00	0.00	616
8808-074		Bale	140:51	09/11/90	1109	5	0.5	7.7	6	57	0.32	0.00	0	0.83	2.41	54.76	66.51	6.96	665
8808-076		Bale	141:01	09/12/90	1877	18	1.0	5.6	15	71	0.32	0.00	0	1.12	0.77	39.28	68.09	1.81	675
8808-091		Bale	141:16	09/12/90	1365	30	2.2	4.7	32	34	0.34	0.00	0	0.00	0.00	0.00	0.00	0.00	677
8808-096		Bale	141:21	09/12/90	1621	8	0.5	5.9	8	48	0.44	0.00	0	0.94	2.45	78.10	61.69	6.95	800
8809-004		Bale	142:37	09/13/90	1194	14	1.1	4.3	21	58	0.55	0.00	0	0.00	0.00	0.00	0.00	0.00	864
8809-022		Bale	143:03	09/13/90	1706	25	1.5	7.3	17	35	0.35	0.00	0	0.84	2.45	.80	33.47	9.43	852
8809-027		Bale	143:08	09/13/90	1664	12	0.7	4.5	14	67	0.45	0.00	0	0.95	1.03	17.79	45.51	2.76	866
8809-034		Bale	143:15	09/13/90	1706	67	3.9	7.8	33	25	0.28	0.00	0	0.24	3.47	54.72	73.93	7.06	861
8809-038		Bale	143:19	09/13/90	1365	3	0.2	4.1	5	44	0.63	0.00	0	0.83	1.58	31.22	32.40	3.18	895
8810-001		Bale	145:46	09/14/90	1322	13	1.0	3.3	23	35	0.37	0.00	0	0.00	0.00	0.00	0.00	0.00	751
8810-029		Bale	146:22	09/14/90	2346	30	1.3	6.6	16	41	0.33	0.00	0	1.30	1.96	0.00	69.59	5.30	752
8811-005		Bale	146:39	09/14/90	1280	36	2.8	8.2	25	36	0.27	0.00	0	1.62	1.83	0.00	65.27	13.02	763
8811-010		Bale	146:44	09/14/90	1578	29	1.9	4.0	32	40	0.35	0.00	0	0.80	1.76	0.00	51.87	8.41	755
8254-142		Bale	108:31-32	09/04/90	1173	33	2.8	6.5	30	24	0.29	0.00	0	1.06	3.53	0.00	55.98	23.19	385
8403-111		Bale	103:17-18	08/31/90	1557	38	2.4	4.7	34	25	0.26	0.00	0	0.00	0.00	0.00	0.00	0.00	217
8408-114		Bale	103:27-28	08/22/90	1600	57	3.5	6.3	36	27	0.29	0.00	0	0.00	0.00	0.00	0.00	0.00	66
8808-151		Bale	142:24	09/13/90	1493	8	0.6	6.4	8	48	0.40	0.00	0	0.00	0.00	0.00	0.00	0.00	808
8808-160		Bale	142:33	09/13/90	1493	7	0.4	5.7	7	33	0.40	0.00	0	0.49	1.92	0.00	45.02	6.35	841
8809-130		Bale	145:07	09/14/90	1493	5	0.4	4.5	7	15	0.66	0.00	0	0.70	2.26	0.00	57.49	6.19	767

if: H/C > H/F = Saazer, TetH type with good α, low CoH low M,

Possible Tettnanger Types, Farnesene>Caryophyllene

also: look for high H, low M

1990 Bale and 5-Cone Analyses at 8% Moisture Content (Bale) or As Is Basis (5-Cone) as of November 14, 1990 (n = 30)

Accession or Nursery Number	Identification	Type	Location	Harvest Date	Yield Lb/Ac	Alpha Lb/Ac	Alpha %	Beta %	Alpha Ratio	CoH	HSI	6 Mo HSI	%A+B Remain	Oil mL/100g	H/C	H/F	Myr (%)	Hum (%)	Serial Number	F	C
19027	Fu x Fu-S	Bale	033:49-50	09/07/90	0	0	1.3	2.9	30	39	0.33	0.00	0	0.48	3.04	2.87	39.46	24.00	522 ✓		
21050	Ahil, Yugo	Bale	001:09-12	08/30/90	0	0	10.8	4.3	72	24	0.27	0.00	0	2.62	2.14	.78	67.19	7.32	329 —		
21092	Cascade VF	Bale	014:09-12	08/30/90	0	0	7.6	5.7	57	38	0.24	0.00	0	1.79	2.54	2.39	70.84	7.51 ✓	327 ✓		
21114	Naduislanska	Bale	019:09-12	08/21/90	0	0	0.0	0.0	0	0	0.00	0.00	0	0.00	3.16	2.40	26.45	28.69	57 —		
21368	Yugo 88/150	Bale	201:01-05	09/05/90	1527	183	12.0	4.4	73	37	0.25	0.00	0	0.00	2.26	.93	65.43	7.83 —	428		
21369	Yugo 88/187	Bale	202:01-05	09/06/90	1288	123	9.6	4.9	66	33	0.29	0.00	0	0.00	2.60	1.42	69.79	8.09 —	474		
21370	Yugo 88/201	Bale	204:01-05	09/06/90	1220	129	10.6	3.6	74	34	0.28	0.00	0	0.00	3.11	.84	70.32	6.53 —	472		
21403	Sticklebract	Bale	229:01-05	09/14/90	2483	249	10.0	5.3	65	47	0.29	0.00	0	1.21	2.39	2.24	76.37	4.11 —	843		
21500	7504-026	Bale	205:12-16	09/10/90	1817	199	10.9	6.4	63	29	0.25	0.00	0	2.01	1.45	1.36	69.79	4.93 —	585 —		
21513	7504-004	Bale	202:12-16	09/10/90	2261	270	12.0	5.8	67	32	0.25	0.00	0	0.77	2.82	2.44	82.65	2.20 —	587		
21521	Saazer-36	Bale	208:06-10	09/07/90	200	8	4.4	3.8	52	24	0.33	0.00	0	0.07	3.25	.95	57.25	10.81 —	131 ✓	1.47	3.33
8802-018		Bale	136:32	08/27/90	2432	198	8.2	5.4	60	22	0.26	0.00	0	1.50	3.53	1.47	58.30	11.56	184 —	7.86	3.27
8802-019		Bale	136:33	08/27/90	1749	97	5.6	4.2	57	23	0.29	0.00	0	1.22	3.36	2.57	48.88	21.22	201 —	8.25	6.32
8802-024		Bale	136:38	08/31/90	1706	135	7.9	6.6	55	21	0.24	0.00	0	1.75	3.52	1.85	44.41	20.29	406 —	10.96	5.76
8802-027		Bale	136:41	08/27/90	2602	173	6.6	3.9	63	24	0.28	0.00	0	1.45	3.20	2.25	43.56	22.36 —	182 —	9.94	6.99
8802-037		Bale	136:51	08/27/90	1749	146	8.3	4.9	63	25	0.26	0.00	0	1.99	3.49	2.00	59.29	15.15 —	186	7.58	4.34
8802-042		Bale	137:04	08/27/90	2474	215	8.7	4.8	64	23	0.27	0.00	0	1.68	3.34	2.70	40.20	24.86 —	190	9.21	7.44
8802-045		Bale	137:07	08/27/90	1536	127	8.3	5.2	61	23	0.27	0.00	0	1.35	3.62	1.74	43.82	19.15 —	183 —	11.01	5.29
8802-048		Bale	137:10	08/27/90	2688	256	9.5	5.4	64	26	0.26	0.00	0	1.48	3.49	1.71	49.64	17.29 —	187	10.11	4.95
8802-059		Bale	137:21	08/27/90	1024	92	9.0	5.9	61	22	0.26	0.00	0	1.70	3.11	2.46	52.67	18.40 —	191	7.48	5.92
8802-061		Bale	137:23	08/31/90	981	0	9.3	39	75	29	0.00	0.00	0	0.00	3.47	2.08	28.16	28.55 —	300	13.72	8.23
8802-064		Bale	137:26	08/31/90	2218	124	5.6	3.8	59	26	0.27	0.00	0	1.37	3.27	1.70	54.32	17.16 —	301	10.09	4.55
8802-068		Bale	137:30	08/27/90	1664	135	8.1	5.3	60	22	0.25	0.00	0	1.56	3.34	1.82	25.32	26.05 —	181	14.31	7.80
8804-003		Bale	137:33	09/07/90	1322	80	6.0	2.9	67	26	0.27	0.00	0	0.65	3.60	1.14	38.26	21.13 —	408	18.54	5.67
8804-005		Bale	137:35	08/27/90	1152	58	5.0	3.0	62	31	0.31	0.00	0	0.00	3.52	1.48	33.28	21.41 —	196	14.47	6.08
8804-022		Bale	137:52	09/06/90	1322	47	3.6	3.0	54	23	0.31	0.00	0	0.55	3.56	1.30	44.16	20.60 —	467	15.85	5.79
8804-026		Bale	138:04	08/27/90	768	47	6.1	2.8	68	21	0.30	0.00	0	1.04	2.62	1.74	44.58	19.11 —	198	10.98	7.29
8805-006		Bale	138:11	08/31/90	2218	133	6.0	5.1	54	24	0.24	0.00	0	0.00	3.31	2.17	42.67	23.81 —	208	10.97	7.19
8805-013		Bale	138:18	08/27/90	2730	266	9.8	5.6	64	22	0.27	0.00	0	1.41	3.57	1.71	41.25	19.62 —	195	11.47	5.50
8805-040		Bale	138:45	08/28/90	2090	196	9.4	4.8	66	21	0.25	0.00	0	0.83	3.92	1.92	57.64	15.20 —	149	7.92	4.44
							4.0	4.8	45	25				0.57	3.35	1.05	43.60	16.80	1640		5.0
							3.7	4.2	47	21				0.52	2.85	1.68	44.2	20.30	12.1		7.10

Tet B commercial

Tet A commercial

not analyzed yet

$\frac{H}{F} = 1.47$; $H = 11.56$ ∴ $F = \frac{H}{1.47} = \frac{11.56}{1.47} = 7.86$

$\frac{H}{C} = 3.53$; $H = 11.56$ ∴ $C = \frac{H}{3.53} = 3.27$

*Agricultural Chemistry Department**Oregon State University**Agricultural Research Service**U S Dept Agriculture**Corvallis, Oregon*

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1990 Lupulin Summary as of November 7, 1991

Accession or Nursery No	Identification	Location	Harvest Date	% Alpha	% Beta	% Alpha + Beta	Alpha Ratio	CoH	HSI	Crush (3 hr)	Safe Period	Permeability	Calculated HSI6mo	Remain	H/C	Serial Number
19005M	LC x OP	001:53-54	07/24/90	7.5	62.1	69.6	11	31	0.20	0.52	0.00	0.00	0.00	0	0.00	227
19006M	Hybrid 3 or 4	002;53-54	07/31/90	20.2	50.2	70.4	29	38	0.22	0.00	0.00	0.00	0.00	0	0.00	328
19007M	Br Fav x OP	003:53-54	07/17/90	12.8	41.5	54.3	24	12	0.26	0.00	0.00	0.00	0.00	0	0.00	175
19008M	Semsch x OP	004:53-54	07/27/90	38.0	20.5	58.4	65	25	0.24	0.00	0.00	0.00	0.00	0	0.00	249
19009M	Fu x Fu-S	005:53-54	07/17/90	19.5	55.2	74.7	26	28	0.22	0.00	0.00	0.00	0.00	0	0.00	177
19010M	RedV x Fu-S	006:53-54	07/31/90	50.7	25.9	76.5	66	36	0.24	0.00	0.00	0.00	0.00	0	0.00	325
19036M	LC x Fu-S	007:53-54	07/24/90	23.5	53.7	77.2	30	23	0.20	0.00	0.00	0.00	0.00	0	0.00	228
19037M	Fu-S x RedV-S	008:53-54	07/12/90	17.9	55.3	73.2	25	25	0.21	0.00	0.00	0.00	0.00	0	0.00	92
19039M	Fu-S x RedV-S	009:53-54	07/26/90	41.8	31.9	73.7	57	25	0.24	0.00	0.00	0.00	0.00	0	0.00	245
19040M	Fu-S x Fu-S	010:53-54	07/23/90	32.8	32.8	65.7	50	22	0.24	0.00	0.00	0.00	0.00	0	0.00	210
19041M	EGr x OP	011:53-54	07/23/90	17.8	58.1	75.9	23	50	0.20	0.00	0.00	0.00	0.00	0	0.00	206
19043M	BelgBur x Fu-S	012:53-54	07/17/90	26.6	43.2	69.8	38	17	0.26	0.00	0.00	0.00	0.00	0	0.00	174
19044M	Fu x Fu-S	013:53-54	07/23/90	39.0	34.5	73.5	53	15	0.24	0.00	0.00	0.00	0.00	0	0.00	209
19046M	LC-S x Fu-S	014:53-54	07/13/90	11.0	62.9	73.9	15	41	0.19	0.86	0.00	0.00	0.00	0	0.00	125
19047M	Elsasser x Fu-S	015:53-54	07/23/90	39.5	34.5	74.0	53	44	0.24	0.00	0.00	0.00	0.00	0	0.00	205
19048M	Fu-S x RedV-S	016:53-54	07/27/90	37.3	26.9	64.2	58	26	0.25	0.00	0.00	0.00	0.00	0	0.00	251
19058M	Ea Gr x OP	018;53-54	07/31/90	26.2	45.3	71.4	37	20	0.21	0.28	3.40	0.00	0.00	0	0.00	329
19060M	EKG x Bav-S	019:53-54	07/13/90	33.5	47.3	80.9	41	23	0.21	0.00	0.00	0.00	0.00	0	0.00	110
19060M	EKG x Bav-S	019:53-54	07/17/90	33.1	42.4	75.5	44	32	0.22	0.00	0.00	0.00	0.00	0	0.00	170
19061M	LGp x Fu-S	020:53-54	07/27/90	22.1	55.8	77.9	28	22	0.20	0.00	0.00	0.00	0.00	0	0.00	254
19062M	EKG x Bav-S	021:53-54	07/27/90	38.4	28.1	66.5	58	22	0.24	0.00	0.00	0.00	0.00	0	0.00	258
19085M	Land x(GCxFu-S)	022:53-54	07/16/90	32.3	49.0	81.4	40	26	0.20	0.00	0.00	0.00	0.00	0	0.00	157
19170M	OP x 54-17	023:53-54	07/13/90	33.4	45.9	79.4	42	31	0.21	0.33	4.00	0.00	0.00	0	0.00	129
19172M	CatsTailx19009M	024:53-54	07/13/90	37.2	30.0	67.2	55	23	0.25	0.34	4.50	0.00	0.00	0	0.00	111
19173M	Striessx73-28	025:53-54	07/13/90	31.3	48.9	80.2	39	19	0.20	0.31	4.40	0.00	0.00	0	0.00	109
19183M	Fu x 118	027:53-54	07/12/90	42.8	36.3	79.1	54	23	0.23	0.00	0.00	0.00	0.00	0	0.00	88
21009M	6735-002M	028:53-54	07/17/90	45.8	25.5	71.3	64	19	0.27	0.00	0.00	0.00	0.00	0	0.00	164
21017M	6220-009M	029:53-54	07/16/90	36.7	31.3	68.0	54	38	0.26	0.00	0.00	0.00	0.00	0	0.00	150
21018M	6321-001M	030:53-54	07/31/90	25.7	47.3	73.0	35	21	0.22	0.00	0.00	0.00	0.00	0	0.00	323
21058M	6305-008M	011:57-58	07/26/90	32.5	44.4	76.9	42	25	0.20	0.00	0.00	0.00	0.00	0	0.00	243
21059M	6321-010M	012:57-58	07/23/90	18.8	61.6	80.4	23	15	0.19	0.30	3.40	0.00	0.00	0	0.00	215
21060M	6321-011M	013:57-58	07/23/90	16.9	52.5	69.4	24	21	0.20	1.01	0.00	0.00	0.00	0	0.00	218
21061M	6322-010M	014:57-58	07/31/90	10.5	58.7	69.3	15	27	0.20	1.20	0.00	0.00	0.00	0	0.00	321
21064M	6611-002M	023:57-58	07/16/90	22.4	55.2	77.6	29	14	0.22	0.00	0.00	0.00	0.00	0	0.00	143
21065M	6616-043M	042:57-58	07/30/90	56.7	19.3	76.0	75	34	0.26	0.34	9.99	0.00	0.00	0	0.00	308
21067M	6616-054M	010:57-58	07/31/90	30.9	32.6	63.5	49	21	0.26	0.00	0.00	0.00	0.00	0	0.00	326
21069M	6618-037M	046:57-58	07/27/90	47.9	21.3	69.2	69	19	0.31	0.40	0.00	0.00	0.00	0	0.00	275
21072M	6620-028M	049:57-58	07/16/90	37.9	36.6	74.5	51	43	0.25	0.00	0.00	0.00	0.00	0	0.00	161
21076M	6806-115M	020:57-58	07/24/90	46.1	29.8	75.9	61	34	0.24	0.00	0.00	0.00	0.00	0	0.00	225
21087M	Yugo 3/3	015:57-58	07/16/90	47.3	21.2	68.4	69	16	0.27	0.32	9.99	0.00	0.00	0	0.00	144
21088M	Yugo 5/9	016:57-58	07/26/90	37.2	27.2	64.4	58	14	0.28	0.80	0.00	0.00	0.00	0	2.78	242
21089M	Yugo 5/10	017:57-58	07/26/90	44.6	25.2	69.9	64	14	0.25	0.35	0.00	0.00	0.00	0	0.00	244
21090M	Yugo 12/17	018:57-58	07/31/90	38.5	33.5	72.0	53	11	0.25	0.34	5.50	0.00	0.00	0	2.26	319
21108M	7006-030M	017:53-54	07/26/90	47.9	28.5	76.4	63	19	0.25	0.34	6.50	0.00	0.00	0	1.35	240
21109M	7006-094M	008:55-56	07/24/90	50.8	21.3	72.1	70	15	0.26	0.34	9.99	0.00	0.00	0	1.22	220
21110M	7007-018M	010:55-56	07/13/90	46.6	29.1	75.7	62	23	0.25	0.00	0.00	0.00	0.00	0	2.50	124
21111M	7007-356M	012:55-56	07/12/90	27.4	42.0	69.4	39	20	0.24	0.00	0.00	0.00	0.00	0	2.76	97
21117M	Nat Wisconsin	014:41-44	07/25/90	29.9	36.3	66.2	45	32	0.25	0.37	0.00	0.00	0.00	0	0.00	231
21117M	Nat Wisconsin	014:41-44	07/27/90	30.3	32.1	62.4	49	32	0.26	0.41	0.00	0.00	0.00	0	0.00	250
21117M	Nat Wisconsin	019:57-58	07/24/90	35.0	40.8	75.8	46	29	0.24	0.33	7.25	0.00	0.00	0	0.05	222

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1990 Lupulin Summary as of November 7, 1991

Accession or Nursery No	Identification	Location	Harvest Date	% Alpha	% Beta	% Alpha + Beta	Alpha Ratio	CoH	HSI	Crush (3 hr)	Safe Period	Permea-bility	Calculated HSI6mo	Remain	H/C	Serial Number
21118M	6667-025M	020:55-56	07/26/90	36.2	31.9	68.1	53	18	0.26	0.38	0.00	0.00	0.00	0	0.00	246
21119M	7001-050M	021:57-58	07/26/90	3.4	68.9	72.3	5	95	0.18	0.00	0.00	0.00	0.00	0	0.00	247
21129M	6803-090M	022:57-58	07/30/90	38.1	33.5	71.5	53	36	0.25	0.00	0.00	0.00	0.00	0	0.00	316
21130M	6903-021M	030:57-58	07/16/90	20.2	58.5	78.7	26	15	0.26	0.00	0.00	0.00	0.00	0	0.00	154
21132M	6903-234M	032:57-58	07/30/90	27.4	42.3	69.7	39	27	0.22	0.00	0.00	0.00	0.00	0	0.00	312
21133M	6906-098M	045:57-58	08/01/90	49.9	28.1	78.0	64	41	0.23	0.00	0.00	0.00	0.00	0	0.00	351
21134M	7005-121M	013:55-56	07/30/90	46.2	19.2	65.4	71	23	0.25	0.31	9.99	0.00	0.00	0	0.00	317
21135M	7006-430M	039:57-58	07/13/90	39.3	36.0	75.2	52	20	0.26	0.00	0.00	0.00	0.00	0	0.00	121
21136M	7006-323M	041:57-58	07/16/90	33.3	39.5	72.8	46	17	0.25	0.00	0.00	0.00	0.00	0	0.00	149
21137M	7006-340M	043:57-58	07/13/90	32.2	45.1	77.3	42	19	0.22	0.50	0.00	0.00	0.00	0	0.00	107
21137M	7006-340M	043:57-58	07/18/90	30.7	46.7	77.4	40	17	0.22	0.00	0.00	0.00	0.00	0	0.00	179
21141M	6222-001H	044:57-58	07/30/90	27.1	44.4	71.6	38	27	0.23	0.00	0.00	0.00	0.00	0	0.00	313
21141M	6222-001H	044;57-58	07/31/90	27.5	43.5	71.0	39	29	0.23	0.00	0.00	0.00	0.00	0	0.00	318
21178M	7009-057M	104:13-14	07/10/90	41.4	40.2	81.6	51	20	0.23	0.00	0.00	0.00	0.00	0	0.00	58
21184M	Male Comet?	016:55-56	07/16/90	48.4	29.7	78.1	62	33	0.25	0.31	9.99	0.00	0.00	0	2.55	142
21189M	7008-006M	105:11-12	07/10/90	38.1	32.7	70.8	54	28	0.26	0.00	0.00	0.00	0.00	0	0.00	57
21190M	7008-017M	107:11-12	07/10/90	46.4	31.0	77.4	60	45	0.22	0.00	0.00	0.00	0.00	0	0.00	52
21234M	S. Afr. MP2/55	026:57-58	08/06/90	36.8	36.5	73.3	50	18	0.24	0.36	0.00	0.00	0.00	0	0.00	359
21236M	S Af PH 2/155	028:57-58	08/01/90	24.2	35.8	60.0	40	15	0.26	0.47	0.00	0.00	0.00	0	0.00	350
21262M	7302-095M	038:53-54	07/30/90	59.2	15.7	74.8	79	27	0.28	0.45	0.00	0.00	0.00	0	0.00	309
21263M	7302-105M	039:53-54	07/18/90	52.6	20.7	73.3	72	27	0.25	0.40	0.00	0.00	0.00	0	0.00	178
21264M	7302-188M	051:53-54	07/27/90	50.1	15.3	65.4	77	22	0.26	0.45	0.00	0.00	0.00	0	0.00	255
21265M	7303-105M	031:55-56	07/13/90	57.4	21.1	78.5	73	29	0.25	0.35	7.50	0.00	0.00	0	0.00	130
21266M	7303-135M	032:55-56	07/17/90	56.7	21.4	78.1	73	29	0.27	0.35	9.99	0.00	0.00	0	0.00	165
21267M	7303-138M	033:55-56	07/27/90	58.6	15.8	74.4	79	26	0.26	0.35	0.00	0.00	0.00	0	0.00	257
21268M	7306-013M	048:55-56	07/16/90	54.8	19.4	74.2	74	19	0.26	0.00	0.00	0.00	0.00	0	0.00	137
21269M	7307-024M	051:55-56	07/27/90	40.8	13.7	54.5	75	16	0.27	0.36	0.00	0.00	0.00	0	0.00	256
21270M	7307-035M	052:55-56	07/31/90	45.5	19.9	65.3	70	13	0.27	0.38	0.00	0.00	0.00	0	0.00	330
21271M	7308-009M	053:55-56	07/30/90	46.4	15.8	62.1	75	20	0.30	0.00	0.00	0.00	0.00	0	0.00	315
21272M	7308-037M	002:59-60	07/27/90	51.4	22.4	73.8	70	19	0.25	0.32	0.00	0.00	0.00	0	0.00	266
21273M	7311-122M	013:59-60	07/30/90	60.6	15.2	75.8	80	29	0.26	0.00	0.00	0.00	0.00	0	0.00	307
21274M	7311-141M	015:59-60	07/17/90	54.3	20.4	74.7	73	31	0.25	0.00	0.00	0.00	0.00	0	0.00	169
21275M	7313-047M	028:59-60	07/27/90	47.5	15.1	62.5	76	25	0.30	0.40	0.00	0.00	0.00	0	0.00	270
21300M	7006-084M	115:13-14	07/10/90	41.4	36.5	77.9	53	15	0.23	0.35	0.00	0.00	0.00	0	0.00	47
21302M	7006-187M	117:13-14	07/05/90	40.2	30.1	70.2	57	21	0.24	0.72	0.00	0.00	0.00	0	0.00	11
21303M	7007-021M	118:13-14	07/12/90	31.5	43.8	75.3	42	17	0.23	0.00	0.00	0.00	0.00	0	0.00	102
21304M	7007-252M	119:13-14	07/05/90	38.8	31.5	70.3	55	22	0.23	0.41	0.00	0.00	0.00	0	0.00	5
21305M	7007-278M	121:13-14	07/23/90	40.9	34.7	75.6	54	16	0.23	0.00	0.00	0.00	0.00	0	0.00	216
21306M	7613-025M	118:15-16	07/19/90	53.0	17.6	70.5	75	29	0.27	0.45	0.00	0.00	0.00	0	0.00	195
21307M	7613-042M	119:15-16	07/19/90	49.5	19.1	68.6	72	23	0.30	0.44	0.00	0.00	0.00	0	0.00	194
21308M	7613-014M	123:15-16	07/19/90	33.0	9.3	42.3	78	17	0.27	0.38	0.00	0.00	0.00	0	0.00	193
21309M	7613-105M	124:15-16	07/31/90	48.9	21.7	70.6	69	19	0.28	0.41	0.00	0.00	0.00	0	0.00	349
21311M	7614-108M	118:17-18	07/10/90	53.4	24.0	77.5	69	28	0.25	0.44	0.00	0.00	0.00	0	0.00	40
21311M	7614-108M	118:17-18	07/11/90	42.4	14.7	57.1	74	28	0.27	0.00	0.00	0.00	0.00	0	0.00	60
21313M	7302-036M	034:53-54	07/16/90	58.2	20.8	79.0	74	23	0.25	0.40	0.00	0.00	0.00	0	0.00	155
21314M	7302-063M	036:53-54	07/18/90	59.5	22.5	82.0	73	20	0.24	0.43	0.00	0.00	0.00	0	0.00	185
21315M	7302-125M	040:53-54	07/13/90	51.8	24.5	76.3	68	30	0.25	0.36	0.00	0.00	0.00	0	0.00	108
21316M	7302-127M	041:53-54	07/13/90	46.5	26.8	73.3	63	25	0.28	0.43	0.00	0.00	0.00	0	0.00	115
21317M	7302-153M	043:53-54	07/17/90	52.2	20.0	72.2	72	26	0.27	0.00	0.00	0.00	0.00	0	0.00	176
21318M	7302-155M	044:53-54	07/16/90	57.6	21.4	79.0	73	27	0.26	0.00	0.00	0.00	0.00	0	0.00	133

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21319M	7302-166M	045:53-54	07/16/90	58.6	19.8	78.5	75	28	0.26	0.00	0.00	0.00	0.00	0	0.00	158
21320M	7302-171M	046:53-54	07/27/90	43.7	12.3	56.0	78	25	0.28	0.00	0.00	0.00	0.00	0	0.00	260
21321M	7302-174M	047:53-54	07/30/90	53.8	23.5	77.3	70	28	0.25	0.00	0.00	0.00	0.00	0	0.00	311
21323M	7302-184M	049:53-54	07/17/90	49.6	25.7	75.3	66	17	0.25	0.00	0.00	0.00	0.00	0	0.00	166
21324M	7302-186M	050:53-54	07/27/90	44.3	17.2	61.4	72	22	0.31	0.00	0.00	0.00	0.00	0	0.00	252
21325M	7303-009M	052:53-54	07/13/90	49.6	22.7	72.4	69	22	0.28	0.00	0.00	0.00	0.00	0	0.00	118
21326M	7303-149M	034:55-56	07/27/90	43.3	12.4	55.7	78	20	0.28	0.39	0.00	0.00	0.00	0	0.00	259
21327M	7303-159M	036:55-56	07/13/90	58.1	18.9	77.0	76	32	0.25	0.35	0.00	0.00	0.00	0	0.00	123
21328M	7303-165M	037:55-56	07/13/90	55.2	25.2	80.4	69	30	0.24	0.32	0.00	0.00	0.00	0	0.00	120
21329M	7304-085M	038:55-56	07/16/90	53.6	20.5	74.1	72	20	0.25	0.63	0.00	0.00	0.00	0	0.00	134
21330M	7304-105M	040:55-56	07/13/90	55.0	22.5	77.6	71	28	0.25	0.35	0.00	0.00	0.00	0	0.00	117
21331M	7304-123M	041:55-56	07/16/90	48.4	22.3	70.7	68	23	0.28	0.74	0.00	0.00	0.00	0	0.00	148
21332M	7304-118M	042:55-56	07/18/90	50.4	22.5	72.8	69	23	0.25	0.43	0.00	0.00	0.00	0	0.00	103
21333M	7304-197M	046:55-56	07/13/90	48.0	21.9	69.9	69	27	0.26	0.39	0.00	0.00	0.00	0	0.00	126
21335M	7308-023M	055:55-56	07/13/90	54.3	23.5	77.7	70	23	0.23	0.35	0.00	0.00	0.00	0	0.00	119
21336M	7309-004M	003:59-60	07/12/90	57.8	20.9	78.8	73	23	0.26	0.00	0.00	0.00	0.00	0	0.00	101
21337M	7309-034M	004:59-60	07/13/90	50.7	21.1	71.8	71	23	0.27	0.43	0.00	0.00	0.00	0	0.00	116
21337M	7309-034M	004:59-60	07/13/90	54.5	26.0	80.5	68	16	0.23	0.00	0.00	0.00	0.00	0	0.00	132
21339M	7311-012M	008:59-60	07/13/90	46.0	24.1	70.1	66	30	0.29	0.00	0.00	0.00	0.00	0	0.00	114
21340M	7311-020M	009:59-60	07/23/90	60.2	19.0	79.3	76	29	0.26	0.38	0.00	0.00	0.00	0	0.00	212
21341M	7311-046M	010:59-60	07/27/90	38.9	12.9	51.8	75	26	0.28	0.00	0.00	0.00	0.00	0	0.00	268
21342M	7311-114M	012:59-60	07/23/90	45.5	18.5	64.0	71	20	0.31	0.00	0.00	0.00	0.00	0	0.00	219
21343M	7311-135M	014:59-60	07/27/90	43.7	13.5	57.3	76	32	0.28	0.00	0.00	0.00	0.00	0	0.00	265
21344M	7311-142M	016:59-60	07/16/90	47.1	24.1	71.1	66	24	0.28	0.00	0.00	0.00	0.00	0	0.00	160
21345M	7312-017M	017:59-60	07/27/90	48.3	17.5	65.8	73	18	0.29	0.00	0.00	0.00	0.00	0	0.00	272
21347M	7312-033M	020:59-60	07/12/90	44.5	26.0	70.5	63	25	0.28	0.00	0.00	0.00	0.00	0	0.00	89
21348M	7312-043M	021:59-60	07/16/90	52.2	25.1	77.3	68	29	0.25	0.37	0.00	0.00	0.00	0	0.00	159
21349M	7312-079M	022:59-60	07/27/90	53.9	14.4	68.3	79	25	0.27	0.43	0.00	0.00	0.00	0	0.00	263
21350M	7312-088M	023:59-60	07/16/90	46.4	19.2	65.6	71	22	0.29	0.00	0.00	0.00	0.00	0	0.00	156
21351M	7313-015M	026:59-60	07/17/90	48.6	26.3	74.9	65	28	0.28	0.00	0.00	0.00	0.00	0	0.00	172
21352M	7314-004M	030:59-60	07/16/90	47.8	20.9	68.7	70	24	0.28	0.00	0.00	0.00	0.00	0	0.00	145
21352M	7314-004M	030:59-60	07/16/90	50.5	18.9	69.4	73	27	0.28	0.00	0.00	0.00	0.00	0	0.00	153
21352M	7314-004M	030:59-60	07/18/90	49.0	24.4	73.3	67	24	0.27	0.00	0.00	0.00	0.00	0	0.00	180
21354M	7314-023M	032:59-60	07/16/90	51.9	24.9	76.8	68	26	0.25	0.00	0.00	0.00	0.00	0	0.00	138
21354M	7314-023M	032:59-60	07/17/90	48.8	23.8	72.6	67	27	0.28	0.00	0.00	0.00	0.00	0	0.00	171
21355M	7314-048M	033:59-60	07/18/90	48.5	22.9	71.4	68	26	0.27	0.00	0.00	0.00	0.00	0	0.00	181
21356M	7314-086M	034:59-60	07/17/90	53.7	22.3	76.0	71	32	0.26	0.00	0.00	0.00	0.00	0	0.00	168
21357M	7314-109M	036:59-60	07/13/90	53.7	20.9	74.6	72	33	0.25	0.00	0.00	0.00	0.00	0	0.00	128
21358M	7315-031M	037:59-60	07/27/90	38.0	20.2	58.1	65	29	0.35	0.00	0.00	0.00	0.00	0	0.00	278
21359M	7315-051M	038:59-60	07/27/90	56.1	18.7	74.8	75	30	0.29	0.37	0.00	0.00	0.00	0	0.00	269
21360M	7506-085M	044:59-60	07/18/90	48.4	32.5	80.9	60	14	0.22	0.00	0.00	0.00	0.00	0	0.00	186
21361M	7506-207M	050:59-60	07/26/90	45.2	24.5	69.7	65	13	0.26	0.38	0.00	0.00	0.00	0	0.00	237
21362M	7506-235M	051:59-60	07/17/90	34.9	34.2	69.2	50	19	0.25	0.38	0.00	0.00	0.00	0	0.00	163
21363M	7507-107M	052:59-60	07/26/90	50.6	26.6	77.2	66	24	0.23	0.31	0.00	0.00	0.00	0	0.00	234
21364M	7507-117M	018:59-60	07/27/90	46.5	17.9	64.5	72	26	0.27	0.00	0.00	0.00	0.00	0	0.00	264
21364M	7507-117M	053:59-60	07/13/90	35.0	48.8	83.7	42	20	0.20	0.00	0.00	0.00	0.00	0	0.00	104
21375M	7504-040M	050:57-58	07/30/90	33.3	43.1	76.4	44	22	0.21	0.00	0.00	0.00	0.00	0	0.00	310
21376M	7504-104M	052:57-58	07/27/90	25.7	43.8	69.4	37	21	0.25	0.00	0.00	0.00	0.00	0	0.00	271
21377M	7504-124M	053:57-58	07/27/90	18.9	23.3	42.2	45	21	0.29	0.00	0.00	0.00	0.00	0	0.00	276
21378M	7506-014M	055:57-58	07/27/90	61.0	14.7	75.7	81	26	0.26	0.37	0.00	0.00	0.00	0	0.00	279

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21379M	7506-057M	041:59-60	07/16/90	29.8	33.5	63.3	47	23	0.24	0.00	0.00	0.00	0.00	0	0.00	135
21380M	7506-100M	046:59-60	07/27/90	47.2	24.1	71.4	66	16	0.26	0.38	0.00	0.00	0.00	0	0.00	267
21381M	7506-182M	049:59-60	07/16/90	25.4	51.3	76.7	33	13	0.21	0.34	0.00	0.00	0.00	0	0.00	162
21392M	6751-098M	109:05-06	07/10/90	39.9	25.9	65.7	61	39	0.25	0.00	0.00	0.00	0.00	0	0.00	55
21398M	Yugo 01P04	024;57-58	07/31/90	12.8	54.3	67.0	19	34	0.20	0.00	0.00	0.00	0.00	0	0.09	324
21399M	Yugo 07P14	025:57-58	07/27/90	37.6	15.6	53.2	71	13	0.28	0.00	0.00	0.00	0.00	0	2.56	277
21400M	Yugo 20P09	035:57-58	07/31/90	39.0	35.2	74.2	53	17	0.24	0.36	0.00	0.00	0.00	0	0.31	331
21401M	Yugo 35P01	036:57-58	07/31/90	32.3	28.5	60.8	53	43	0.27	0.38	0.00	0.00	0.00	0	0.31	332
21402M	Yugo 40P15	051:57-58	08/06/90	44.2	24.1	68.2	65	19	0.27	0.10	0.00	0.00	0.00	0	0.80	355
21415M	7003-068M	113:13-14	07/10/90	49.0	29.3	78.4	63	21	0.24	0.33	0.00	0.00	0.00	0	0.00	44
21416M	7007-275M	120:13-14	07/11/90	33.2	41.5	74.7	44	20	0.22	0.00	0.00	0.00	0.00	0	0.00	62
21417M	7610-112M	113:15-16	07/10/90	57.3	20.5	77.8	74	35	0.25	0.34	0.00	0.00	0.00	0	0.00	41
21419M	7613-004M	117:15-16	07/31/90	52.5	20.4	72.9	72	25	0.26	0.35	0.00	0.00	0.00	0	0.00	344
21420M	7614-026M	114:17-18	07/12/90	51.6	25.8	77.3	67	29	0.26	0.34	0.00	0.00	0.00	0	0.00	84
21421M	7614-047M	115:17-18	07/19/90	43.9	18.7	62.5	70	21	0.29	0.42	0.00	0.00	0.00	0	0.00	201
21422M	7614-052M	116:17-18	07/10/90	58.3	18.7	77.0	76	29	0.24	0.31	0.00	0.00	0.00	0	0.00	51
21423M	7615-154M	122:17-18	07/31/90	46.2	24.0	70.2	66	23	0.26	0.39	0.00	0.00	0.00	0	0.00	347
21424M	7701-032M	113:19-20	07/09/90	31.6	38.9	70.5	45	32	0.23	0.00	0.00	0.00	0.00	0	0.00	12
21424M	7701-032M	113:19-20	07/12/90	34.2	40.4	74.6	46	33	0.23	0.00	0.00	0.00	0.00	0	0.00	83
21425M	7702-009M	114:19-20	07/19/90	20.5	52.3	72.7	28	12	0.23	0.31	0.00	0.00	0.00	0	0.00	197
21426M	7703-031M	120:19-20	07/09/90	41.2	37.1	78.3	53	18	0.22	0.31	0.00	0.00	0.00	0	0.00	25
21427M	7704-012M	122:19-20	07/05/90	13.4	13.2	26.6	50	21	0.29	1.92	0.00	0.00	0.00	0	0.00	10
21428M	7706-040M	115:21-22	07/10/90	38.9	38.9	77.8	50	31	0.23	0.00	0.00	0.00	0.00	0	0.00	37
21429M	7710-033M	119:21-22	07/10/90	27.7	55.0	82.7	33	19	0.20	0.00	0.00	0.00	0.00	0	0.00	39
21432M	7715-015M	115:23-24	07/19/90	28.9	44.1	73.0	40	21	0.22	0.32	0.00	0.00	0.00	0	0.00	353
21433M	7717-019M	117:23-24	07/10/90	42.2	32.2	74.4	57	23	0.24	0.34	0.00	0.00	0.00	0	0.00	48
21434M	7717-022M	118:23-24	07/10/90	37.5	40.7	78.2	48	17	0.22	0.27	0.00	0.00	0.00	0	0.00	34
21435M	7721-049M	123:23-24	07/05/90	51.8	29.2	80.9	64	45	0.23	0.30	0.00	0.00	0.00	0	0.00	9
21436M	7722-019M	113:25-26	07/09/90	52.8	24.5	77.3	68	44	0.24	0.00	0.00	0.00	0.00	0	0.00	13
21437M	7727-004M	115:25-26	07/09/90	49.5	28.1	77.6	64	31	0.24	0.00	0.00	0.00	0.00	0	0.00	14
21438M	7727-036M	117:25-26	07/09/90	42.0	24.8	66.8	63	23	0.24	0.36	0.00	0.00	0.00	0	0.00	17
21444M	7302-016M	033:53-54	07/13/90	51.5	24.6	76.1	68	27	0.25	0.33	0.00	0.00	0.00	0	0.00	105
21446M	7310-007M	007:59-60	07/12/90	45.7	26.9	72.5	63	29	0.25	0.00	0.00	0.00	0.00	0	0.00	100
21447M	7313-098M	029:59-60	07/16/90	57.0	23.7	80.7	71	28	0.23	0.41	0.00	0.00	0.00	0	0.00	147
21448M	7506-081M	043:59-60	07/18/90	49.2	32.5	81.7	60	23	0.23	0.00	0.00	0.00	0.00	0	0.00	182
21449M	7506-096M	045:59-60	07/16/90	44.0	32.0	76.0	58	26	0.23	0.00	0.00	0.00	0.00	0	0.00	140
21461M	7613-089M	122:15-16	07/05/90	48.1	24.0	72.1	67	44	0.27	0.00	0.00	0.00	0.00	0	0.00	4
21462M	7703-005M	118:19-20	07/10/90	45.7	33.9	79.5	57	30	0.23	0.00	0.00	0.00	0.00	0	0.00	45
21463M	7717-007M	116:23-24	07/12/90	47.4	31.1	78.5	60	22	0.24	0.31	0.00	0.00	0.00	0	0.00	85
21464M	7727-033M	116:25-26	07/09/90	22.9	54.6	77.5	30	14	0.19	0.00	0.00	0.00	0.00	0	0.00	16
21465M	7301-181M	032:53-54	07/31/90	53.1	21.3	74.4	71	25	0.25	0.36	0.00	0.00	0.00	0	0.00	322
21466M	7302-052M	035:53-54	07/18/90	53.3	23.8	77.1	69	20	0.25	0.33	0.00	0.00	0.00	0	0.00	187
21467M	7302-114M	042:53-54	07/27/90	33.2	13.8	47.0	71	25	0.30	0.00	0.00	0.00	0.00	0	0.00	253
21468M	7302-028M	053:53-54	07/13/90	52.8	26.5	79.3	67	30	0.26	0.00	0.00	0.00	0.00	0	0.00	106
21487M	7711-032M	124:21-22	07/09/90	35.1	34.9	69.9	50	24	0.23	0.00	0.00	0.00	0.00	0	0.00	26
21488M	7506-161M	047:59-60	07/27/90	41.8	31.4	73.2	57	18	0.26	0.00	0.00	0.00	0.00	0	0.00	273
21489M	7611-108M	054:59-60	07/27/90	39.6	23.3	63.0	63	19	0.27	0.00	0.00	0.00	0.00	0	0.00	274
21539M	8303-018M	123:01-02	07/27/90	33.4	28.3	61.7	54	17	0.27	0.00	0.00	0.00	0.00	0	0.00	291
21540M	8303-106M	114:03-04	07/27/90	30.3	22.5	52.8	57	14	0.29	0.00	0.00	0.00	0.00	0	0.00	290
21541M	8308-027M	120:05-06	07/11/90	32.3	31.1	63.4	51	25	0.26	0.00	0.00	0.00	0.00	0	0.00	103

*Agricultural Chemistry Department**Oregon State University**Agricultural Research Service**U S Dept Agriculture**Corvallis, Oregon*

1990 Lupulin Summary as of November 7, 1991

Accession or Nursery No	Identification	Location	Harvest Date	% Alpha	% Beta	% Alpha + Beta	Alpha Ratio	CoH	HSI	Crush (3 hr)	Safe Period	Permea-bility	Calculated HSI6mo	Remain	H/C	Serial Number
21542M	8308-041M	122:05-06	07/11/90	22.3	28.0	50.3	44	19	0.27	0.00	0.00	0.00	0.00	0	0.00	77
21543M	8308-047M	123:05-06	07/19/90	37.8	27.9	65.7	58	18	0.28	0.00	0.00	0.00	0.00	0	0.00	204
21544M	8308-057M	125:05-06	07/09/90	33.7	31.4	65.1	52	23	0.25	0.00	0.00	0.00	0.00	0	0.00	18
21545M	8308-067M	126:05-06	07/12/90	37.2	27.9	65.1	57	19	0.26	0.00	0.00	0.00	0.00	0	0.00	99
21546M	8309-003M	114:09-10	07/05/90	20.7	46.5	67.2	31	15	0.22	0.00	0.00	0.00	0.00	0	0.00	8
21547M	8309-004M	115:09-10	07/05/90	17.5	44.4	62.0	28	15	0.24	0.00	0.00	0.00	0.00	0	0.00	6
21548M	8309-018M	116:09-10	07/10/90	27.6	44.7	72.3	38	21	0.22	0.00	0.00	0.00	0.00	0	0.00	49
21549M	W Am Hum. 489	021:41-44	08/23/90	33.5	45.8	79.4	42	53	0.22	0.00	0.00	0.00	0.00	0	0.05	367
21555M	W Am Hum 496	008:39-40	08/20/90	32.7	36.0	68.8	48	53	0.24	0.00	0.00	0.00	0.00	0	0.19	363
21558M	W Am Hum 499	010:39-40	08/23/90	37.8	39.6	77.3	49	51	0.24	0.00	0.00	0.00	0.00	0	0.02	365
21560M	W Am Hum 501	026:41-44	08/23/90	34.5	48.0	82.5	42	47	0.22	0.00	0.00	0.00	0.00	0	1.22	369
21561M	W Am Hum 503	011:39-40	08/20/90	23.5	54.7	78.2	30	61	0.21	0.00	0.00	0.00	0.00	0	0.02	364
21569M	W Am Hum 514	015:39-40	08/15/90	40.9	36.7	77.6	53	43	0.24	0.00	0.00	0.00	0.00	0	0.59	360
21571M	W Am Hum 516	031:41-44	07/27/90	39.5	28.5	68.0	58	43	0.26	0.00	0.00	0.00	0.00	0	0.06	261
21573M	W Am Hum 518	018:39-40	08/15/90	42.1	37.7	79.8	53	41	0.25	0.00	0.00	0.00	0.00	0	0.02	361
21582M	W Am Hum 534	023:39-40	08/23/90	32.4	48.9	81.3	40	46	0.23	0.00	0.00	0.00	0.00	0	0.00	368
21587M	W Am Hum 542	038:41-44	08/23/90	30.5	44.9	75.4	40	49	0.23	0.00	0.00	0.00	0.00	0	0.05	366
21588M	W Am Hum 543	039:41-44	07/31/90	24.3	53.9	78.2	31	44	0.22	0.00	0.00	0.00	0.00	0	0.09	333
21589M	W Am Hum 544	040;41-44	07/31/90	25.7	49.3	75.0	34	42	0.24	0.00	0.00	0.00	0.00	0	0.00	334
21595M	W Am Hum 550	001:39-40	08/06/90	26.8	36.7	63.4	42	48	0.25	0.00	0.00	0.00	0.00	0	0.00	356
21601M	W Am Hum 569	029:39-40	08/20/90	35.3	38.2	73.5	48	47	0.26	0.00	0.00	0.00	0.00	0	0.11	362
21603M	7702-023M	116:19-20	07/09/90	37.3	38.3	75.6	49	30	0.23	0.00	0.00	0.00	0.00	0	0.00	15
21604M	7722-014M	124:23-24	07/09/90	34.2	39.2	73.3	47	34	0.23	0.00	0.00	0.00	0.00	0	0.00	27
21615M	7303-052M	055:53-54	07/13/90	51.2	23.4	74.6	69	32	0.26	0.00	0.00	0.00	0.00	0	0.00	122
51060M	219-5	002:55-56	07/24/90	10.0	63.3	73.3	14	31	0.20	0.00	0.00	0.00	0.00	0	0.00	223
51060M	219-5	003:55-56	07/24/90	30.7	49.5	80.2	38	21	0.20	0.00	0.00	0.00	0.00	0	0.00	226
51101M	221-2	004:55-56	08/01/90	13.5	61.1	74.5	18	28	0.20	0.00	0.00	0.00	0.00	0	0.00	352
51114M	221-1	005:55-56	07/13/90	22.0	49.9	71.9	31	18	0.23	0.00	0.00	0.00	0.00	0	0.00	127
52040M	19160 x OP	006:55-56	07/30/90	7.6	70.1	77.7	10	36	0.18	0.00	0.00	0.00	0.00	0	0.00	314
52042M	19022 x 19045M	007:55-56	07/16/90	19.1	31.1	50.1	38	20	0.25	0.00	0.00	0.00	0.00	0	0.00	151
52045M	19063 x OP	009:55-56	07/23/90	11.1	50.7	61.8	18	17	0.26	0.00	0.00	0.00	0.00	0	0.00	213
52047M	19127 x 19173M	011:55-56	07/13/90	32.5	44.7	77.2	42	29	0.22	0.00	0.00	0.00	0.00	0	0.00	112
58111M	BB 321-4,5	014:55-56	07/23/90	21.1	55.5	76.6	28	24	0.20	0.30	0.00	0.00	0.00	0	0.00	217
60013M	Ariz 1-2	002:41-44	07/25/90	38.5	22.8	61.3	63	58	0.31	0.00	0.00	0.00	0.00	0	0.28	230
60013M	Ariz 1-2	015:55-56	07/26/90	48.1	23.8	71.9	67	58	0.29	0.37	0.00	0.00	0.00	0	0.00	236
60023M	Colo 1-1	005:41-44	07/11/90	26.5	40.1	66.6	40	38	0.26	0.00	0.00	0.00	0.00	0	0.30	78
60023M	Colo 1-1	017:55-56	07/12/90	26.2	32.2	58.4	45	43	0.28	0.00	0.00	0.00	0.00	0	0.00	82
60026M	Colo 2-1	007:41-44	06/25/90	27.1	40.3	67.4	40	57	0.25	0.00	0.00	0.00	0.00	0	0.00	3
60026M	Colo 2-1	007:41-44	07/11/90	21.5	21.2	42.8	50	58	0.28	0.00	0.00	0.00	0.00	0	1.30	79
60026M	Colo 2-1	018:55-56	06/25/90	29.7	40.9	70.6	42	56	0.24	0.00	0.00	0.00	0.00	0	0.00	2
60028M	Colo 2-3	009:41-44	06/25/90	25.8	37.9	63.7	41	48	0.26	0.00	0.00	0.00	0.00	0	0.00	1
60028M	Colo 2-3	009:41-44	07/11/90	39.8	30.3	70.1	57	49	0.26	0.00	0.00	0.00	0.00	0	0.49	80
60028M	Colo 2-3	019:55-56	07/12/90	39.9	29.1	69.0	58	48	0.26	0.00	0.00	0.00	0.00	0	0.00	86
60031M	Colo 4-1	018:41-44	08/06/90	35.7	42.5	78.2	46	36	0.23	0.00	0.00	0.00	0.00	0	0.00	357
63011M	19012 x 19041M	022:55-56	07/16/90	25.0	19.0	74.0	34	16	0.22	0.00	0.00	0.00	0.00	0	0.00	146
63012M	BG x 58015M	023:55-56	07/16/90	50.5	20.5	71.0	71	50	0.27	0.00	0.00	0.00	0.00	0	0.00	139
63013M	BG x 58015M	024:55-56	07/17/90	44.3	31.7	76.0	58	45	0.25	0.00	0.00	0.00	0.00	0	0.00	173
63014M	BG x 58015M	025:55-56	07/13/90	42.8	31.1	73.9	58	45	0.24	0.00	0.00	0.00	0.00	0	0.00	131
63015M	BG(BG x 19062M)	026:55-56	07/26/90	58.8	21.2	80.0	73	20	0.25	0.30	0.00	0.00	0.00	0	0.00	241
63016M	BG x 58015M	027:55-56	07/12/90	46.0	22.4	68.4	67	53	0.27	0.00	0.00	0.00	0.00	0	0.00	98

*Agricultural Chemistry Department**Oregon State University**Agricultural Research Service**U S Dept Agriculture**Corvallis, Oregon*

1990 Lupulin Summary as of November 7, 1991

Accession or Nursery No	Identification	Location	Harvest Date	% Alpha	% Beta	% Alpha + Beta	Alpha Ratio	CoH	HSI	Crush (3 hr)	Safe Period	Permea-bility	Calculated HSI6mo	Remain	H/C	Serial Number
63017M	BG(BG x 19062M)	028:55-56	07/12/90	37.0	29.0	66.0	56	22	0.27	0.36	0.00	0.00	0.00	0	0.00	81
64027M	BG(BG x 19062M)	033:57-58	07/16/90	54.8	14.3	69.1	79	36	0.28	0.00	0.00	0.00	0.00	0	0.00	152
64027M	BG(BG x 19062M)	033:57-58	07/18/90	45.2	27.8	73.0	62	35	0.25	0.00	0.00	0.00	0.00	0	0.00	184
64028M	BG(BG x 19062M)	034:57-58	07/16/90	34.7	22.0	56.6	61	20	0.28	0.00	0.00	0.00	0.00	0	0.00	136
64031M	BG(BG x 19062M)	037:57-58	07/26/90	45.0	33.7	78.7	57	24	0.25	0.00	0.00	0.00	0.00	0	0.00	235
64032M	Zattler 2L1180P	029:55-56	07/26/90	7.6	23.7	31.3	24	33	0.38	0.00	0.00	0.00	0.00	0	0.00	232
64033M	Zattler 2L1180P	030:55-56	07/26/90	23.5	44.1	67.6	35	21	0.22	0.38	0.00	0.00	0.00	0	2.96	238
64034M	Zattler 2L1180P	001:57-58	07/26/90	34.3	21.9	56.2	61	16	0.31	0.00	0.00	0.00	0.00	0	0.00	233
64035M	Zattler 7K4910P	002:57-58	07/24/90	39.3	32.2	71.6	55	17	0.23	0.00	0.00	0.00	0.00	0	3.19	229
64036M	Zattler 7K4910P	003:57-58	07/26/90	22.0	53.1	75.2	29	21	0.19	1.48	0.00	0.00	0.00	0	2.83	248
64037M	Zattler 7K4910P	004:57-58	07/24/90	27.1	47.9	74.9	36	23	0.21	1.20	0.00	0.00	0.00	0	3.24	224
64101M	Wye No. 15	005:57-58	07/24/90	40.7	22.4	63.1	64	13	0.26	0.41	0.00	0.00	0.00	0	3.19	221
64102M	Wye No. 321	006:57-58	07/13/90	39.1	32.7	71.8	54	40	0.24	0.00	0.00	0.00	0.00	0	1.85	113
64103M	Wye OB 79	007:57-58	07/12/90	36.3	38.5	74.8	48	41	0.22	0.00	0.00	0.00	0.00	0	2.34	93
64104M	Wye 14/56/288	008:57-58	07/31/90	34.4	19.2	53.6	64	26	0.31	0.00	0.00	0.00	0.00	0	2.53	327
64105M	Wye 15/56/148	009:57-58	07/16/90	38.5	34.4	72.8	53	46	0.23	0.00	0.00	0.00	0.00	0	2.11	141
64105M	Wye 15/56/118	009:57-58	07/17/90	39.7	35.4	75.0	53	47	0.23	0.00	0.00	0.00	0.00	0	0.00	167
65034M	Ha(Ha x 19040M)	038:57-58	07/26/90	14.1	35.6	49.7	28	22	0.28	0.87	0.00	0.00	0.00	0	0.00	239
65037M	Ha(Ha x 19010M)	040;57-58	08/06/90	27.8	44.6	72.5	38	22	0.26	0.32	0.00	0.00	0.00	0	0.00	354
6752-070M		107:07-08	07/10/90	44.6	15.7	60.3	74	31	0.27	0.00	0.00	0.00	0.00	0	0.00	53
6755-015M		108:07-08	07/10/90	31.7	37.2	68.9	16	19	0.23	0.00	0.00	0.00	0.00	0	0.00	56
7314-106M		035;59-60	07/31/90	43.5	21.3	64.8	67	19	0.29	0.00	0.00	0.00	0.00	0	0.00	320
8301-014M		113:01-02	08/06/90	31.2	50.5	81.7	38	20	0.20	0.00	0.00	0.00	0.00	0	0.00	358
8301-031M		118;07-08	07/31/90	35.9	43.3	79.2	45	17	0.22	0.00	0.00	0.00	0.00	0	0.00	340
8301-073M		116:01-02	07/27/90	29.0	37.3	66.3	44	17	0.23	0.00	0.00	0.00	0.00	0	0.00	294
8302-003M		118:01-02	07/27/90	16.3	36.3	52.6	31	22	0.25	0.00	0.00	0.00	0.00	0	0.00	298
8302-007M		119:07-08	07/31/90	21.3	43.8	65.1	33	25	0.24	0.00	0.00	0.00	0.00	0	0.00	338
8302-009M		119:01-02	07/27/90	27.8	31.4	59.2	47	18	0.25	0.00	0.00	0.00	0.00	0	0.00	288
8302-017M		120:01-02	07/19/90	18.5	44.6	63.1	29	14	0.25	0.00	0.00	0.00	0.00	0	0.00	198
8303-002M		121:01-02	07/19/90	25.4	45.6	71.0	36	13	0.22	0.00	0.00	0.00	0.00	0	0.00	189
8303-014M		122:01-02	07/27/90	24.7	30.2	54.9	45	17	0.27	0.00	0.00	0.00	0.00	0	0.00	296
8303-024M		124:01-02	07/27/90	23.7	41.2	64.9	37	17	0.25	0.00	0.00	0.00	0.00	0	0.00	297
8303-031M		125:01-02	07/19/90	25.3	45.4	70.7	36	15	0.23	0.00	0.00	0.00	0.00	0	0.00	190
8303-048M		121:07-08	07/19/90	31.0	27.5	58.5	53	14	0.27	0.00	0.00	0.00	0.00	0	0.00	203
8303-079M		128:01-02	07/27/90	33.9	25.3	59.2	57	20	0.29	0.00	0.00	0.00	0.00	0	0.00	295
8303-080M		113:03-04	07/27/90	26.5	20.4	46.9	56	20	0.32	0.00	0.00	0.00	0.00	0	0.00	282
8304-001M		115:03-04	07/11/90	20.8	40.8	61.6	34	17	0.26	0.00	0.00	0.00	0.00	0	0.00	70
8304-010M		116:03-04	07/27/90	27.8	26.7	54.5	51	20	0.30	0.00	0.00	0.00	0.00	0	0.00	281
8304-013M		117:03-04	07/27/90	17.9	39.8	57.7	31	23	0.26	0.00	0.00	0.00	0.00	0	0.00	293
8304-024M		119:03-04	07/27/90	24.1	39.5	63.6	38	17	0.25	0.00	0.00	0.00	0.00	0	0.00	292
8304-033M		120:03-04	07/31/90	30.8	38.3	69.2	45	15	0.24	0.00	0.00	0.00	0.00	0	0.00	335
8304-036M		121:03-04	07/31/90	35.8	36.7	72.5	49	16	0.25	0.00	0.00	0.00	0.00	0	0.00	336
8304-076M		123:03-04	07/11/90	25.5	33.8	59.3	43	19	0.28	0.00	0.00	0.00	0.00	0	0.00	71
8304-088M		124:07-08	07/12/90	23.8	33.4	57.2	42	18	0.26	0.00	0.00	0.00	0.00	0	0.00	95
8305-006M		124:03-04	07/27/90	37.7	42.4	80.1	47	17	0.27	0.00	0.00	0.00	0.00	0	0.00	287
8306-005M		126:07-08	07/11/90	29.3	30.2	59.5	49	19	0.28	0.00	0.00	0.00	0.00	0	0.00	59
8307-002M		114:05-06	07/12/90	31.9	35.0	66.9	48	16	0.26	0.00	0.00	0.00	0.00	0	0.00	90
8307-004M		115:05-06	07/19/90	38.6	27.1	65.7	59	13	0.27	0.00	0.00	0.00	0.00	0	0.00	199
8308-010M		117:05-06	07/27/90	41.7	23.1	64.8	64	16	0.29	0.00	0.00	0.00	0.00	0	0.00	303
8308-011M		118:05-06	07/27/90	31.8	26.3	58.0	55	20	0.31	0.00	0.00	0.00	0.00	0	0.00	302

*Agricultural Chemistry Department**Oregon State University**Agricultural Research Service**U S Dept Agriculture**Corvallis, Oregon*

1990 Lupulin Summary as of November 7, 1991

Accession or Nursery No	Identification	Location	Harvest Date	% Alpha	% Beta	% Alpha + Beta	Alpha Ratio	CoH	HSI	Crush (3 hr)	Safe Period	Permea-bility	Calculated HSI6mo	Remain	H/C	Serial Number
8308-014M		119:05-06	07/11/90	28.6	29.1	57.8	50	23	0.26	0.00	0.00	0.00	0.00	0	0.00	67
8308-051M		127:07-08	07/11/90	30.1	31.6	61.8	49	23	0.24	0.00	0.00	0.00	0.00	0	0.00	65
8308-054M		128:07-08	07/11/90	33.3	30.4	63.7	52	19	0.24	0.00	0.00	0.00	0.00	0	0.00	74
8308-054M		128:07-08	07/27/90	39.2	32.0	71.2	55	19	0.25	0.00	0.00	0.00	0.00	0	0.00	306
8308-056M		124;05-06	07/31/90	38.4	28.2	66.6	58	14	0.27	0.00	0.00	0.00	0.00	0	0.00	337
8308-068M		127:05-06	07/27/90	37.7	30.2	67.9	55	18	0.26	0.00	0.00	0.00	0.00	0	0.00	301
8309-020M		113:07-08	07/12/90	28.1	25.7	53.8	52	18	0.27	0.00	0.00	0.00	0.00	0	0.00	96
8309-025M		114:07-08	07/27/90	20.5	25.1	45.6	45	16	0.29	0.00	0.00	0.00	0.00	0	0.00	300
8309-026M		105:03-04	07/10/90	19.5	35.6	55.1	35	20	0.26	0.00	0.00	0.00	0.00	0	0.00	54
8309-026M		115:07-08	07/05/90	24.0	42.0	66.1	36	21	0.25	0.00	0.00	0.00	0.00	0	0.00	7
8309-028M		116:07-08	07/10/90	18.6	32.0	50.7	37	19	0.25	0.00	0.00	0.00	0.00	0	0.00	50
8309-032M		117:07-08	07/11/90	27.8	42.3	70.1	40	23	0.23	0.00	0.00	0.00	0.00	0	0.00	64
8401-037M		117;09-10	07/31/90	25.0	42.0	67.0	37	15	0.25	0.00	0.00	0.00	0.00	0	0.00	346
8401-093M		118:09-10	07/10/90	16.9	39.8	56.7	30	17	0.23	0.00	0.00	0.00	0.00	0	0.00	43
8401-105M		119:09-10	07/31/90	28.7	35.0	63.7	45	17	0.29	0.00	0.00	0.00	0.00	0	0.00	343
8401-190M		120:09-10	07/19/90	28.6	33.8	62.3	46	16	0.25	0.00	0.00	0.00	0.00	0	0.00	202
8402-089M		121:09-10	07/19/90	40.0	27.6	67.6	59	16	0.26	0.00	0.00	0.00	0.00	0	0.00	192
8402-102M		123:09-10	07/31/90	44.1	25.7	69.7	63	16	0.27	0.00	0.00	0.00	0.00	0	0.00	339
8402-124M		124:09-10	07/23/90	40.1	31.3	71.3	56	18	0.27	0.00	0.00	0.00	0.00	0	0.00	208
8402-172M		125:09-10	07/23/90	38.8	25.0	63.8	61	18	0.27	0.00	0.00	0.00	0.00	0	0.00	214
8403-015M		126:09-10	07/31/90	36.9	31.4	68.3	54	12	0.26	0.00	0.00	0.00	0.00	0	0.00	341
8403-027M		127:09-10	07/23/90	33.5	39.5	73.1	46	13	0.24	0.00	0.00	0.00	0.00	0	0.00	207
8403-028M		128:09-10	07/27/90	37.7	34.3	72.0	52	16	0.25	0.00	0.00	0.00	0.00	0	0.00	304
8403-072M		113:11-12	07/19/90	38.3	33.4	71.7	53	15	0.27	0.00	0.00	0.00	0.00	0	0.00	198
8403-115M		114:11-12	07/31/90	30.3	27.4	57.7	53	16	0.30	0.00	0.00	0.00	0.00	0	0.00	342
8404-033M		115:11-12	07/19/90	37.6	28.6	66.2	57	15	0.26	0.00	0.00	0.00	0.00	0	0.00	200
8404-047M		116:11-12	07/27/90	19.4	34.7	54.1	36	19	0.24	0.00	0.00	0.00	0.00	0	0.00	285
8404-075M		117:11-12	07/19/90	25.9	39.4	65.4	40	15	0.26	0.00	0.00	0.00	0.00	0	0.00	191
8404-092M		118:11-12	07/19/90	21.3	13.4	64.6	33	11	0.22	0.00	0.00	0.00	0.00	0	0.00	196
8404-128M		119:11-12	07/12/90	26.1	25.8	51.9	50	15	0.31	0.00	0.00	0.00	0.00	0	0.00	91
8405-009M		123:11-12	07/27/90	36.4	28.8	65.2	56	19	0.28	0.00	0.00	0.00	0.00	0	0.00	284
8405-043M		120:11-12	07/10/90	32.1	35.0	67.1	48	20	0.26	0.00	0.00	0.00	0.00	0	0.00	46
8405-062M		121:11-12	07/23/90	38.8	31.3	70.2	55	15	0.28	0.00	0.00	0.00	0.00	0	0.00	211
8406-006M		122:11-12	07/11/90	41.6	28.9	70.5	59	20	0.24	0.00	0.00	0.00	0.00	0	0.00	69
8406-009M		123:11-12	07/31/90	38.1	28.3	66.3	57	18	0.26	0.00	0.00	0.00	0.00	0	0.00	345
8406-023M		124:11-12	07/27/90	36.8	23.4	60.2	61	17	0.27	0.00	0.00	0.00	0.00	0	0.00	286
8406-032M		125:11-12	07/27/90	36.1	22.9	59.0	61	18	0.32	0.00	0.00	0.00	0.00	0	0.00	283
8406-037M		126:11-12	07/12/90	36.1	27.4	63.6	57	18	0.25	0.00	0.00	0.00	0.00	0	0.00	94
8406-060M		127:11-12	07/12/90	23.3	35.8	59.1	39	13	0.25	0.00	0.00	0.00	0.00	0	0.00	87
8406-073M		128:11-12	07/11/90	37.6	34.2	71.8	52	18	0.24	0.00	0.00	0.00	0.00	0	0.00	66
8408-035M		125:13-14	07/11/90	33.1	35.3	68.3	48	20	0.24	0.00	0.00	0.00	0.00	0	0.00	72
8408-054M		126:13-14	07/11/90	26.3	34.4	60.7	43	18	0.25	0.00	0.00	0.00	0.00	0	0.00	63
8408-110M		127:13-14	07/11/90	33.9	28.3	62.2	55	19	0.26	0.00	0.00	0.00	0.00	0	0.00	61
8408-129M		128:13-14	07/31/90	26.5	36.7	63.2	42	17	0.27	0.00	0.00	0.00	0.00	0	0.00	348
8409-014M		125:15-16	07/27/90	23.5	38.1	61.7	38	19	0.26	0.00	0.00	0.00	0.00	0	0.00	289
8409-017M		126:15-16	07/27/90	24.3	36.1	60.4	40	18	0.27	0.00	0.00	0.00	0.00	0	0.00	280
8409-064M		127;15-16	07/27/90	32.9	23.4	56.3	58	16	0.27	0.00	0.00	0.00	0.00	0	0.00	299
8410-090M		126:17-18	07/11/90	16.5	39.0	55.6	30	18	0.27	0.00	0.00	0.00	0.00	0	0.00	68
8411-004M		128:17-18	07/09/90	36.4	10.6	77.1	47	27	0.23	0.00	0.00	0.00	0.00	0	0.00	28
8411-021M		125:19-20	07/09/90	20.9	52.3	73.2	29	14	0.21	0.00	0.00	0.00	0.00	0	0.00	19

*Agricultural Chemistry Department**Oregon State University**Agricultural Research Service**U S Dept Agriculture**Corvallis, Oregon*

1990 Lupulin Summary as of November 7, 1991

Accession or Nursery No	Identification	Location	Harvest Date	% Alpha	% Beta	% Alpha + Beta	Alpha Ratio	CoH	HSI	Crush (3 hr)	Safe Period	Permea-bility	Calculated HSI6mo	Remain	H/C	Serial Number
8411-069M		126:19-20	07/09/90	39.9	35.5	75.5	53	19	0.24	0.00	0.00	0.00	0.00	0	0.00	22
8411-086M		127:19-20	07/11/90	33.9	40.9	74.8	45	18	0.22	0.00	0.00	0.00	0.00	0	0.00	75
8411-093M		128:19-20	07/11/90	38.8	43.2	82.0	47	20	0.21	0.00	0.00	0.00	0.00	0	0.00	73
8411-099M		125:21-22	07/09/90	37.5	34.7	72.3	52	22	0.24	0.36	0.00	0.00	0.00	0	0.00	20
8411-104M		126:21-22	07/09/90	41.2	36.2	77.4	53	22	0.24	0.00	0.00	0.00	0.00	0	0.00	23
8411-174M		127:21-22	07/27/90	37.8	29.0	66.8	57	18	0.30	0.39	0.00	0.00	0.00	0	0.00	305
8411-203M		128:21-22	07/09/90	44.2	30.6	74.7	59	19	0.24	0.00	0.00	0.00	0.00	0	0.00	31
8411-215M		125:23-24	07/09/90	42.3	37.3	79.6	53	21	0.22	0.39	0.00	0.00	0.00	0	0.00	21
8411-217M		126:23-24	07/09/90	49.2	31.8	80.9	61	27	0.23	0.29	0.00	0.00	0.00	0	0.00	24
8411-236M		127:23-24	07/09/90	40.5	39.6	80.1	51	21	0.22	0.40	0.00	0.00	0.00	0	0.00	30
8411-260M		128:23-24	07/11/90	42.0	34.7	76.7	55	18	0.24	0.33	0.00	0.00	0.00	0	0.00	76
8411-263M		118:25-26	07/10/90	42.2	34.8	77.0	55	17	0.22	0.34	0.00	0.00	0.00	0	0.00	42
8412-007M		119:25-26	07/10/90	31.0	29.8	60.8	51	24	0.25	0.40	0.00	0.00	0.00	0	0.00	33
8412-014M		120:25-26	07/10/90	38.2	40.1	78.3	49	22	0.22	0.00	0.00	0.00	0.00	0	0.00	32
8412-057M		121:25-26	07/10/90	38.3	41.2	79.6	48	17	0.22	0.30	0.00	0.00	0.00	0	0.00	36
8412-118M		122:25-26	07/10/90	31.2	43.6	74.8	42	26	0.22	0.00	0.00	0.00	0.00	0	0.00	38
8412-119M		123:25-26	07/10/90	29.3	43.9	73.2	40	20	0.22	0.00	0.00	0.00	0.00	0	0.00	35
8412-198M		124:25-26	07/09/90	36.0	40.5	76.5	47	18	0.23	0.33	0.00	0.00	0.00	0	0.00	29

Haunold

 03/05/91

ANNUAL RESEARCH PROGRESS REPORT
Report of Progress (AD-421)

Accession: 0141065 Year: 90 Project Number: 5358-22000-001-00-D
Mode Code: 5358-05-00 STP Codes: 2.2.04.1.n 100%

Title: IMPROVED HOP GERMPLASM, VARIETIES, AND PRODUCTION PRACTICES

by: Alfred Haunold
Res. Geneticist and proj.leader
Corvallis,OR.97331

Period Covered From: 01/90 To: 12/90

Progress Report

The Hallertauer-type triploid aroma selection USDA 21456 was eliminated from commercial testing because of disappointing trial brewing results. Trial brews were satisfactory for Mt. Hood (USDA 21455), 21457, and 21459. All 5 remaining triploid selections (21457, 21459, 21490, 21491, and the recently planted 21484) were harvested. Commercial brewing trials are planned for early 1991. Ten early flowering triploid hop pollinators with Hallertauer background were released as yield stimulators. The special aroma hop USDA 21120 was harvested from a 2-acre commercial plot. An additional 4 acres of USDA 21120 was planted near St. Paul, OR. Single plants from the "89-Nursery" (diploid x tetraploid Tettnanger-type crosses) and low alpha/high beta genotypes (backup for 21120) were harvested. Tettnanger A and B (21496, 21497) had disappointing yields in commercial Oregon plots. Crosses between tetraploid or diploid Saazer, respectively, and selected males were made. Native North American hops collected since 1983 were evaluated for agronomic and quality traits. A new nursery of 328 Wild (native) American seedlings from 1989 collection trip to North Dakota and Saskatchewan and Manitoba, Canada was established. Over 700 females, 350 males, and 140 essential oil samples were analyzed to support the hop breeding and genetics program.

Publications:

01. HAUNOLD, A. and NICKERSON, G.B. 1990. Registration of Mt. Hood hop. Crop Science 30:423.

02. HAUNOLD, A. and NICKERSON, G.B. 1990. Mt. Hood, a new American noble aroma hop. Journal American Society of Brewing Chemists 48:115-118.

03. HAUNOLD, A. 1990. Development of hop varieties. Zymurgy 13:15-23.

Approved: W. RALPH NAVE Date: 02/91
Title: ASSISTANT AREA DIRECTOR

U.S. DEPARTMENT OF AGRICULTURE
RESEARCH WORK UNIT/PROJECT DESCRIPTION • PROGRESS REPORT
U.S. DEPT. OF AGRICULTURE, STATE AGRICULTURAL EXPERIMENT STATIONS AND OTHER INSTITUTIONS

DATE (Day, Mo., Yr.): 03 OCT 90

1. ACCESSION NO.	AGENCY IDENTIFICATION NO.			5. WORK UNIT/PROJECT NO.	22-23. REGIONAL PROJECT NO.	TYPE/GRANT NO.
0025152	2. CSRS	3. ORE	4. 0000	ORE00036		HATCH

State CRIS report (Oregon)

7. TITLE
BREEDING, GENETICS, PATHOLOGY, CHEMISTRY AND CULTURE OF HOPS

8. PERFORMING ORGANIZATION
CROP SCIENCE
AGRICULTURAL EXPER. STATION
OREGON STATE UNIV
CORVALLIS
OREGON 97331

12. INVESTIGATOR NAME(S)
1. HAUNOLD A
2. NICKERSON G B
3.
4.
5.
6.

6. STATUS TERMINATED	30. ESTIMATED TERMINATION DATE	84. PERIOD COVERED (No., Yr.) FROM	THRU:
E ☐	30 JUN 92	01 90	12 90

85. PROGRESS REPORT

USDA 21456, a Hallertauer-type triploid selection was discarded. The remaining 5 triploid selections (21457, 21459, 21490, 21491 and the recently planted 21484) were harvested. All except 21491 produced very good yields. Commercial brewing trials are scheduled. Ten early flowering triploid hop pollinators with Hallertauer background were released as yield stimulators. The special aroma hop USDA 21120 was harvested from a 2-acre plot. Another 4-acre plot of 21120 was established near St. Paul, OR. Single plants from the '89-Nursery (diploid x tetraploid Tettnanger-type crosses) and low alpha/high beta genotypes (backup for 21120) were harvested. Tettnanger A and B (21496, 21497) had disappointing yields in commercial Oregon plots. Crosses between tetraploid or diploid Saazer, respectively, and selected males were made. Native North American hops collected since 1983 were evaluated for agronomic and quality traits. A new nursery of 328 Wild (native) American seedlings from a 1989 collection trip to North Dakota and Saskatchewan and Manitoba, Canada was established. Over 700 females, 350 males and 140 essential oil samples were analyzed to support the hop breeding and genetics program.

87. PUBLICATIONS

HAUNOLD, A., and G. B. NICKERSON. 1990. Registration of Mt.Hood Hop. Crop Science 30: 423

HAUNOLD, A., and G. B. Nickerson. 1990. Mt.Hood, a new American noble aroma hop. Journal American Society of Brewing Chemists 48: 115 - 118.

HAUNOLD, A. 1990. Development of hop varieties. Zymurgy 13: 15 - 23.

APPROVED (Signature)	TITLE	DATE
	Director Agricultural Experiment Station	

Al Haunold AUG 17 1990 Route

Posted: Thu, Aug 16, 1990 12:47 PM PDT Msg: KGJA-3021-4907
From: HJBROOKS
To: AD.PWA, LC.CORVALLIS
CC: HJBROOKS
Subj: Termination of CWU 5358-22000-001-00D

Done 8/29-90

August 16, 1990

SUBJECT: Termination of CWU 5358-22000-001-00D entitled "Improved hop germplasm, varieties, and production practices"

TO: W. G. Chace, Director, PWA
Ronald Welty, RL, National Forage Seed Production Research Center, Corvallis, OR
A. Haunold, Corvallis, OR

FROM: Howard J. Brooks /s/
National Program Leader
Horticultural and Sugar Crops

The subject CWU is scheduled to terminate March 31, 1991. Inasmuch as a CWU cannot exceed 5 years in duration, we need to decide if the research is to be modified, redirected, or terminated. At the beginning of this review process, we would like to have your views on how these funds could be used if the decision is made to continue with this research. It would be desirable to have a single response representing the views of the scientist(s) and the research leader. In your response, please consider the following:

1. Specific problem(s) to be addressed.
2. Specific research objectives.
3. Source of level of funds available.
4. Number of SY's to be committed to this research.
5. Proposed commodity code.
6. Proposed strategic plan code.

Call me if you wish so we can discuss your proposed research but I will still need a written reply. Since we are required to have your reply sent by telemail, please reply to HJBROOKS by September 7, 1990.

Action?

8/20

Al - note these dates and deadlines. If you have questions regarding this process, stop by my office & we can discuss.

Ron

60038 BUSC Wyo 5-1
58016 Aphid res. Ut 526-5

sent by telemail
9-21-90

FROM: A. Haunold

1301 344-3912
Dunn Gmelleson

THROUGH: R. E.Welty, RL

TO: Howard J. Brooks

CC: ADPWA, NFSPRC

SUBJECT: Termination of CWU 5358-22000-001-00D entitled IMPROVED HOP GERMPLASM, VARIETIES, AND PRODUCTION PRACTICES

The following information is provided in response to your telemail message dated August 17, 1990, concerning the subject CWU. We recommend the present CWU be terminated and be replaced with two different and updated objectives.

RESEARCH OBJECTIVES AND PROBLEMS TO BE ADDRESSED

1. Evaluate, expand, and upgrade the existing USDA clonal hop germplasm collection with special emphasis on native North American (wild) hops collected during the past five years in the Rocky Mountain states, the U.S. Midwest, and in Saskatchewan and Manitoba, Canada.

2. Continue the present work with aroma hops using the polyploidy approach to develop noble aroma hop cultivars and to reduce imports.

3. Serve as curator of USDA hop germplasm for the National Clonal Germplasm Respository at Corvallis, Oregon. Supply hop germplasm and plant material to scientists and cooperators in the United States and abroad.

4. Identify specific aroma components in the essential oil of hops. Develop screening methods for experimental male and female selections.

5. Provide certified hop analyses in behalf of the State of Oregon for the U.S. hop industry.

6. Cooperate with state and industry scientists in evaluating promising herbicides and pesticides to obtain registration for use on hops.

7. Cooperate with state chemists in identifying sources for mite and aphid resistance that could be useful for integrated pest management in hops.

8. Describe and characterize hop genotypes in the existing USDA hop germplasm collection and enter the data into the National GRIN system.

9. In behalf of the USDA serve as source of information on all aspects of hops and hop culture.

SOURCE OF LEVEL OF FUNDS AVAILABLE

CWU 5358-22000-001-00D $202,703. Note that $69,643 is taken yearly from this project for Specific Cooperative Agreement 5358-22000-001-02S.

NUMBER OF SY'S COMMITTED TO THIS RESEARCH

1.0

PROPOSED COMMODITY CODE

2831 hops

PROPOSED STRATEGIC PLAN CODE

2.2.04.1.n 100%

Source of funds available:

a) USDA appropriation about $ 200.000.00 per year.
One third of these funds (about $ 70.000.-) goes to Prosser, WA
under a congressionally mandated memorandum of cooperation.
USDA also pays 1/3 salary of hop chemist at OR. State University.

b) Hop Research Council, funding assists hop genetics and breeding ($ 26,500.-)
and hop chemistry (49.000.-)

c) Miller Brewing Co. hop genetics and breeding ($ 5,000.-)
hop chemistry (11,000.-)

d) Oregon Hop Commission: Hop Breeding and evaluation $ 7,500.-

e) Anheuser Busch Ag. Resources -- work on Native North American hops:
3-year grant of 30,000.- per year
expires May 1992.

f). Cooperative research, USDA/ARS -- Anheuser Busch Inc-- Oregon Hop Commission
about 25,000.- per year
pesticide testing and evaluation, residue analyses.
funds channelled directly to cooperator.

g). Coopearative work-- OR. State Dept. of Ag. Chemistry
Chemical fact ors responsible for insect resistance.
(about40,000.- total)
funds go directly to Ag. Chemistry department

Number of SY's involved:

federal funding: 1 full time (geneticist) (no specific funding for hop curator work
1/3 t ime (hop chemist)
3 temporary appointments, 180 days, full time (student help)
Specific use of the funds channelled to Prosser, WA is
under direction of the superintendent at the Prosser, Res. Station

Industry funds: 2/3 hop chemist at Or. State University
1 SY research assistant (hop breeding, genetics, native North American hops)
1 SY research assistant, hop chemistry
2 student ~~kepp~~ helpers, 90 days during the summer and fall for field work and harvest.
1 parttime student helper (up to 20 hrs per week), hop chemistry lab

TOTAL NO. OF SY DURING THE YEAR (Prorated where appropriate): 6

Proposed commodity code: same as before

Proposed strategic plan code: same as before

Haunold-file

Agricultural Research Service
Research Management Information System
ARS Project System
08/29/90

Executive Summary Sheet

For ARS Project No. 5358-22000-001-00D
Accession Number 0141065
Mode Code 5358-05-00

Appropriated

IMPROVED HOP GERMPLASM, VARIETIES, AND PRODUCTION PRACTICES

PACIFIC WEST AREA
CORVALLIS, OREGON
FORAGE SEED AND CEREAL RESEARCH

Project Status: ACTIVE Start: 04/30/86 Term: 03/31/91

Current Official Funding Levels:

Net to Location:	Permanent	Temporary
FY 86	$ 171,987	$ 0
FY 87	$ 171,987	$ 0
FY 88	$ 173,871	$ 0
FY 89	$ 172,132	$ 2,500
FY 90	$ 202,703	$ 0
FY 91	$ 202,703	$ 0

****** Official Strategic Plan Codes ******

2.2.04.1.n 100%

Reason Project was Initiated: Normal Progression

Comments:
Request F/T for FY90 from 5358-23000-002-00D to support Haunold's work on hops per J. Miksche & C. Murphy memo dtd. 5/10/89.

APPROVED:

Area Director: on 06/05/89 by Daniel A Niffenegger
Assoc Depty Admin: on 06/19/89 by Robert R. Oltjen

Created: on 02/28/86 By SRR
Last Modified: on 06/23/89 By DFC

Form AD-416 Document Printed 08/29/90 *****OFFICIAL PROJECT*****
USDA Date Modified: 06/23/89

RESEARCH PROJECT DESC.-RES. RESUME

1. Accession: 0141065 | 2-4. Agency ID: ARS 5358-05-00 | 5. Project Number: 5358-22000-001-00D | 6. Status: A=ACTIVE

7. Title: IMPROVED HOP GERMPLASM, VARIETIES, AND PRODUCTION PRACTICES

8. Performing Organization: 0000 1185
AGRICULTURAL RESEARCH SERVICE

Responsible Organization: 0358 6556
PACIFIC WEST
AREA OFFICE
AGRICULTURAL RESEARCH SERVICE

City/State/County/Zip/Cong. Dist.
CORVALLIS
OREGON 97331 01

City/State/Zip
ALBANY
CALIFORNIA 94710

12. Investigator(s):
HAUNOLD A

16. Research Location on Campus:
A = YES

Project Type:

17-1. D=Appropriated 17-2. = 18-4.
19-1. $202,703 19-2. 1.00 20. 90

21. Facilities: D = STATE

22. Regional Project Number:
A: - - B: - -

24. OBJECTIVES:
Develop improved hop germplasm with high-yield potential, disease resistance and a range of flavor and aroma characteristics for domestic industry needs and for exports. Maintain the USDA World Hop Cv. & Germplasm Collect. in cooperation with USDA NW Germplasm Repository, Corvallis, Oregon.

25. APPROACH:
Obtain new hop germplasm through introduction from abroad, collection of indigenous hops, and by hybridization. Evaluate progency of tetraploid X diploid crosses and select triploid females with European flavor and aroma characteristics. Use GC, HPLC, and high-resolution mass spectrometry to identfy hops with desirable aroma characteristics. Evaluate new aphicides, acaricides, and herbicides for use on hops. Function as curator for hops and maintain the USDA World Hop Collection in 4-hill field plots and the USDA Male and Female Hop Germplasm Collection in 2-hill field plots near Corvallis. Cooperate with State hop scientists at Prosser, WA, and Parma, ID.

27. KEYWORDS:
HUMULUS HOP GERMPLASM BREEDING GENETIC IMPROVEMENT QUALITY AROMA FLAVOR BREWING

Recommended			Approved		Concurred	
Signature	A/D	Date	Signature		A/D	Date
RL:		00/00/00	NPL1:	Jerome P. Miksche	A	06/07/89
LD:		00/00/00	NPL2:	Charles F. Murphy	A	06/08/89
AD: Daniel A Niffenegger	A	06/05/89	NPL3:	Edwin L. Civerolo		06/19/89
PAO:		00/00/00	BPMS:	Joseph S. Garbarino	A	0 6/20/89
			ADA:	Robert R. Oltjen	A	06/19/89

28. Award Date:	29. Start Date:	30. Termination Date:	Duration: (months)
00/00/00	04/30/86	03/31/91	059

Form AD-417 Document Printed 08/29/90 *****OFFICIAL PROJECT*****

1. Accession:	2-4. Mode Code:	5. Project Number:	Date Last Modified:
0141065	ARS 5358-05-00	5358-22000-001-00D	06/23/89

STP(s)			Net to Location
2.2.04.1.n	Minor Hort Crops Germpl	100%	202,703
	Total Net to Location:		$202,703

32.	Basic Research:	20%	40,541
33.	Applied Research:	80%	162,162
34.	Development Effort:	0%	0
	Total Net to Location:		$202,703

	Commodity Code	Activity Code	Research Problem Area Code	Field of Science Code	Prime %	Net to Location
36.	2800	4500	207	0512	10	20,270
37.	2800	4600	208	0512	30	60,811
38.	2800	5000	307	0512	50	101,352
39.	2800	5100	405	0512	10	20,270
				Total Net to Location:		$202,703

Class.	Code	Description	%	Net to Location
Commodity	2831	HOPS	100	202,703
			Total Net to Location:	$202,703
Activity	4564	INSECT/HOST INTERACTIONS	10	20,270
Activity	4612	NON-GENETIC DISEASE CNTRL	10	20,270
Activity	4615	BREED DISEASE RESIST PLNT	20	40,541
Activity	5011	IMPR BREEDS & VARIET	50	101,352
Activity	5100	CONSUMER ACCEPT PRODUCTS	10	20,270
			Total Net to Location:	$202,703
Special	PST2	NONPESTICIDAL CONTROL	20	40,541
Special	SAGP	GERMPLASM	20	40,541

* Note: Rounding may cause minor differences in calculated value compared to the actual Net to Location.

United States Department of Agriculture
Agricultural Research Service
Pacific West Area
National Forage Seed Production Research Center
3450 S. W. Campus Way
Oregon State University
Corvallis, Oregon 97331-7102
503 757-4824; FTS: 420-4824
FAX: 503 757-4370
FTS: 420-4370

September 28, 1990

SUBJECT: Research Goals and Mission

TO: S. C. Alderman, G. M. Banowetz, R. E. Barker, D. B. Churchill, S. M. Griffith, A. Haunold, J. A. Kamm, G. W. Mueller-Warrant, J. J. Steiner, and R. E. Welty

FROM: Lloyd F. Elliott, Research Leader

I would like to thank each of you and the people working with you for your warm welcome and offers of assistance. They are deeply appreciated. It is a pleasure to be here, and I look forward to working with you.

I need to be better acquainted with your goals, program, and mission. Would you please provide me, by October 9, with a brief outline of your program and objectives, your publication record for the past two years, your view of the mission of the Unit, your part in the mission of the Unit, and how individuals and the Unit should be cooperating. I personally plan on focusing my initial research efforts on grass residue utilization and rhizosphere biology (improving plant root-microbial relations for more economic production). If you have questions and suggestions, do not hesitate to discuss them with me.

United States Department of Agriculture
Agricultural Research Service
Pacific West Area

National Forage Seed Production Research Center
3450 S. W. Campus Way
Oregon State University
Corvallis, Oregon 97331-7102
503 757-4424; FTS: 420-4424
FAX: 757-4370; FTS: 420-4370

October 3, 1990

SUBJECT: Outline of Research Goals and Mission

TO: Lloyd F. Elliott, Research Leader

FROM: Alfred Haunold, Research Geneticist

Program Mission:

Hop breeding, genetics, chemistry, germplasm preservation and development

I am the only USDA scientist responsible for hop research in the U.S. I cooperate with state scientists at Oregon State University (chemistry - Dr. Deinzer, Gail Nickerson), Washington State University (agronomy - Dr. Steve Kenny, plant pathology - Dr. Bob Klein, entomology - Dr. Wyatt Cone), all at Prosser; and the University of Idaho, Parma (entomology - Dr. Keith Dorschner). All of these people work on hops.

I have developed 7 new hop cultivars in my 25 years with USDA at Corvallis, and over 30 germplasm genetic lines. Hop cultivars I have developed and have cooperated with development of now account for over 75 percent of all hops grown in the U.S.

I am the USDA curator for hops and cooperate with the Pacific Northwest Clonal Germplasm Repository near Corvallis. No funds, however, are allocated for that task.

I act as official spokesperson for the USDA in matters of hops, as a source of information for all aspects of hop production and utilization, and as a source of hop germplasm on behalf of the USDA worldwide. Our germplasm collection comprises about 400 female and 300 male selections and is constantly being upgraded and evaluated.

I am presently concentrating on development of European-type noble aroma hop cultivars (the first, Mt. Hood, was released last year). I expect to release at least one, perhaps two additional aroma cultivars in the near future.

I cooperate with the Hop Research Council; Hop Growers of America; the Hop Commissions of Oregon, Washington, and Idaho; the Miller Brewing Company; and most international hop trading firms (copy of two sample letters of appreciation of cooperative work this summer are enclosed).

Source of Funding:

USDA - gross (approximately)	$130,000
USDA cooperative agreement with Prosser, Washington	70,000
Industry funds (approximately)	100,000

My interaction with the Forage Seed and Cereal Research Unit is very little. Prior to reorganization, we had a separate hop and mint investigations unit with five scientists. My research interests are just too different to find any common ground with forage research. Administratively, my association with the Unit has been great, I have received all the help, support and encouragement in my work, even though I am an outsider.

If future plans to develop a small fruit research center at Corvallis materialize, I would hope to join that group and cover both hops and mint (as I had done earlier).

Publications, 1989-1990:

1. Haunold, A., and G. B. Nickerson. 1989. Mt. Hood, a new American noble-aroma hop. Amer. Soc. Brewing Chemists Newsletter 49 (2):17. (Abstr.)

2. Haunold, A. 1989. Unprecedented changes in hops. The New Brewer 6 (4):14-17.

3. Haunold, A., and G. B. Nickerson. 1990. Registration of Mt. Hood hop. Crop Sci. 30:423.

4. Haunold, A., and G. B. Nickerson. 1990. Mt. Hood, a new American noble aroma hop. Amer. Soc. of Brewing Chemists J. 48:115-118.

5. Haunold, A. 1990. Development of new hop varieties: How and why they are being developed; how they differ from each other; future trends. Zymurgy. (accepted)

One additional publication, a book chapter first accepted in late 1987, has now appeared in print: Cytology and Cytogenetics of Hops, Elsevier Publishing Company, Amsterdam, Holland.

Variety release by USDA: Mt Hood, a new hop cultivar; signed by M. E. Carter March 3, 1989.

Release of an early flowering triploid hop pollinator composite; signed by M. E. Carter May 18, 1990.

I am currently on the Board of Directors of the American Society of Brewing Chemists serving as Chairman of the Publications Committee and Chairman of the Editorial Board of our Journal.

2 Enclosures

ARS:PWA:AHaunold:ca:X4824:10/03/90

STATE OF IOWA

TERRY E. BRANSTAD, GOVERNOR

DEPARTMENT OF PUBLIC SAFETY
PAUL H. WIECK II, COMMISSIONER

August 29, 1990

Dr. Alfred Haunold
USDA ARS PWA
National Forage Seed Protection Center
Crop Science Department
Room 451-B
Corvallis, Oregon 97331-7102

Dear Dr. Haunold:

Thank you so much for the wonderful dried hops plants you sent recently. I will keep them to be used by students in the future. Thank you also for the publication which has helped me understand how hops grow.

Enclosed you will find an official Iowa Division of Criminal Investigation cup as a symbol of my appreciation for the time you must have spent preparing and sending the hops specimens.

Respectfully,

MICHAEL L. REHBERG, Laboratory Administrator
B.S., M.S., D.A.B.F.T.

SANDRA J. STOLTENOW, Criminalist
Division of Criminal Investigation

SJS:cam

Hop Growers of America, Inc.

P.O.Box 9218 • Yakima, WA 98909 • 509/248-7043

September 28, 1990

Dr. Alfred Haunold
Department Crop Science
Oregon State University
Corvallis, OR 97331

SUBJECT: Letter of Appreciation

Dear Dr. Haunold,

On behalf of the Board of Directors of Hop Growers of America, I would like to thank you very much for your participation and assistance during our recent Japanese Brewers' Trade Visit from August 18-25, 1990. Your briefings and discussions were both interesting and enlightening. The very participation of a scientist of your stature in the academic community, and from within the international hop industry itself gave credibility to our objectives and encouragement to everyone involved. Through your participation, our guests had the unique opportunity to gain valuable knowledge and quality technological information on U.S. hops directly from a leading scientific authority. The development of this kind of awareness of our product was the fundamental objective of the trade visit. Your outstanding support and the time and effort you gave was very important to us and directly related to the successful achievement of our purpose. This is another of many examples, extending over many years of your dedication, commitment, and friendship for the U.S. Hop industry and concern for the interests and welfare of the grower community. We thank you and wish you continued success and the best of good fortune in the future.

Sincerely yours,

Warren H. Lee, Jr.
Manager
Hop Growers of America, Inc.

WHL/cmc
cc:file
E. Annen, OHC

SUBJECT: TECHNOLOGY TRANSFER, ARMP-1991
TO: Project Leaders
From: REW

In our ARMP reports, we have been asked to list by CRIS, examples of technology transfer. The information required has been greatly reduced this year. We have been asked to provide:

1. A short, one-sentence statement of each technology successfully transferred and used by clientele (i.e what was transferred to whom?).

2. Formal technology transfer meetings held with groups of several industry firm/commodity organizations/action or regulatory agencies.

1) release of the new aroma hop cultivar Mt. Hood. It is intended to replace imported European aroma hops and most likely will. BRewery acceptance (US, Canadian, Japanese) has been favorable. A total of 560 acres Mt. Hood was planted in 1990.

2) Release of a triploid hop pollinator composite: This composite, made up of 10 different genotypes was released to Oregon growers (Washington and Idaho forbid the use of male hops in their fields). Pollinators were planted in various commercial Oregon hop yards to help increase cone yields by stimulation due to pollination without production of unwanted seeds, since the pollinators (being triploids) are largely sterile).

Beneficiaries: US hop growing industry and various commercial breweries.

7-11-90

United States Department of Agriculture
Agricultural Research Service
Pacific West Area
DEPT. OF CROP SCIENCE
OREGON STATE UNIVERSITY
CORVALLIS, OREGON 97331

May 16, 1990.

To: Dr. Darwin Davidson, President
Hop Research Council
Adolph Coors Brewing Co.
Golden, CO 80401

From: Dr. Al Haunold
USDA-ARS, Research Geneticist
Research Coordinator,
Corvallis, OR. 97331

Subject: Extension of existing Memorandum of Understanding.

The Hop Research Council currently has three (3) Memoranda of Understanding with the Agricultural Research Foundation to conduct various phases of hop research at Oregon State University:

This letter provides for an automatic extension of the three memoranda as stated in item No. 7.

The following budget requests, subject to approval by the Hop Research Council are for Calendar Year 1990 (Jan.1 to Dec. 31, 1990).

ARF project No. 36.18 (Hop Breeding and Genetics--Haunold)	26,500.-
ARF project No. 45.22 (Hop Chemistry--Nickerson-Haunold)	49,000.-
ARF project No. 45.09 (Hop Industry-- Sam T. Likens)	13,000.-

Your signature below will assure continuation of our present arrangement.

Thank you.

Hop Research Council, D.Davidson, president — 8/14/90 date

distribution: ARF, Haunold, Nickerson, Likens

'989-90 ANNUAL REPORT FORM — Agricultural Research Foundation

ACCOUNT: 3618 US Hop Research Council

PROJECT LEADER: Haunold DEPARTMENT: Crop Science

ACCOUNTING INFORMATION:

33,532.19	Beginning Balance (July 1, 1989)
71,000.00	Contributions (Check donor list below.)
(83,973.72)	Disbursements
(1,500.00)	Transfers (from one ARF account to another)
(3,550.00)	Bookkeeping
15,508.47	Ending Balance (June 30, 1990)

Contributions:

$45,000.00	Anheuser-Busch Companies
$26,000.00	Hop Research Council

INSTRUCTIONS:
1. Limit your report to no more than 100 words.
2. Describe the account highlighting accomplishments and explain how funds were spent. If no funds were spent, describe the purpose of the account.
3. Our office is required to report to the Board of Directors on all accounts for the 1989-90 Fiscal Year, including those accounts with low balances and no activity.
4. Return to: AGRICULTURAL RESEARCH FOUNDATION, Snell Hall 537, before November 14, 1990.
5. If you have any questions, please call x7-3228.

DESCRIPTION OF PROJECT (Please type):

Busch Agricultural Resources Inc: (BARI)
a) Study of Native North American hops ($ 30,000.- work at OR. State University) All of the 78 native North American hop genotypes which had been maintained in large plastic pots at the USDA National Clonal Germplasm Repository near Corvallis have now been established in 2-hill or 4-hill field plots, respectively. About 1/3 of the plants flowered and they were sampled for chemical analysis. A total of 328 seedlings obtained from 21 of the 52 seed collections of Native North American hops obtained in late 1989 are now established in an evaluation nursery in our main hop yard.
b) Pesticide testing and evaluation in Oregon ($ 15,000.- direct grant from BARI, 10,000.- from Hop Res. Council). Six GLP (good laboratory practices according to FIFRA regulations) aphicide trials were conducted under a contract with Western Biochemical Consulting (Dave Anderson) of Beaverton, OR. The following aphicides were evaluated: Cyfluthrin, Fluvalinate (Spur), Methyl-parathion, Ethyl-parathion, Phorate (Rampart), and Naled (Dibrom).

Hop Research Council:
Four mature (USDA 21457, 21459, 21490, 21491) and one new (USDA 21484) triploid female Hallertauer seedling selections were harvested from 3-acre commercial plots. USDA 21456 was discarded. Ten early flowering triploid hop pollinators with Hallertauer mittelfrueh background were released to the public for use as yield stimulators. Single plants from the '89 Nursery (diploid Tettnanger x selected tetraploid males) were harvested and await laboratory evaluation. Tettnanger A and Tettnanger B (USDA 21496, 21497) were harvested from commercial off-station plots. Crosses between tetraploid Saazer and selected diploid males were made in the greenhouse. Diploid Saazer was crossed to selected tetraploid males in the field.

Use of funds: Salary of Research Associate, hourly help, supplies

United States Department of Agriculture
Agricultural Research Service
Pacific West Area

May 1, 1990.

To: James P. Wolf
Chairman, Oregon Hop Commission

From: Dr. Al Haunold, USDA-ARS
Hop Project Leader

Subject: Extension of Existing Memorandum of Understanding.

As provided in item No. 8 of the latest Memorandum of Understandig dated June 12, 1986, between the Agricultural Research Foundation, Oregon State University and

THE OREGON HOP COMMISSION

I propose to extend this memorandum for another year until June 30, 1991.

The proposed funding request for FY 1991 (July 1, 199o to June 30, 1991) subject to approval by the Oregon Hop Commission is as follows:

Hop Breeding and Genetics (Haunold)	$ 6,000.-
Hop Chemistry (Nickerson)	2,000.-
Total:	8,000.-

Thank you.

signed: _____ date: 5-15-90

Oregon Hop Commission

1989-90 ANNUAL REPORT FORM — Agricultural Research Foundation

ACCOUNT: 3625 Oregon Hop Commission

PROJECT LEADER: Haunold DEPARTMENT: Crop Science

ACCOUNTING INFORMATION:

1,631.66	Beginning Balance (July 1, 1989)
6,000.00	Contributions (Check donor list below.)
(1,333.82)	Disbursements
0.00	Transfers (from one ARF account to another)
0.00	Bookkeeping
6,297.84	Ending Balance (June 30, 1990)

Contributions:

$ 6,000.00	Oregon Hop Commission

INSTRUCTIONS:
1. Limit your report to no more than 100 words.
2. Describe the account highlighting accomplishments and explain how funds were spent. If no funds were spent, describe the purpose of the account.
3. Our office is required to report to the Board of Directors on all accounts for the 1989-90 Fiscal Year, including those accounts with low balances and no activity.
4. Return to: AGRICULTURAL RESEARCH FOUNDATION, Snell Hall 537, before November 14, 1990.
5. If you have any questions, please call x7-3228.

DESCRIPTION OF PROJECT (Please type):

The triploid female Hallertauer seedling selections USDA 21457, 21459, 21484, 21490 and 21491 averaged from 8 to over 11 bales per acre in 3-acre commercial off-station plots. USDA 21456 was discarded. Tettnanger A (USDA 21496) and Tettnanger B (USDA 21497) again performed below expectations. Ten early flowering triploid pollinators with Hallertauer background were released for public use as yield stimulators. Crosses between tetraploid or diploid Saazer, respectively, and selected males were made to provide a new seedling nursery for selection of Saazer quality types. Tettnanger seedling selections from the '89-Nursery were harvested for the first time in 1990.

Use of funds: hourly student help, supplies, equipment repair and maintenance

United States Department of Agriculture
Agricultural Research Service
Pacific West Area
DEPT. OF CROP SCIENCE
OREGON STATE UNIVERSITY
CORVALLIS, OREGON 97331

March 14, 1990.

To: A.J. Rehberger, Vice President
Brewing Research
Miller Brewing Co.
3939 W. Highland Blvd.
Milwaukee, WI 53201-0482

A: J. Rehberger
MAR 19 1990
V.P. Brwg. & Res.

From: Al Haunold
Research Geneticist, USDA-ARS
Hop Breeding ang Genetics
Research Coordinator

Subject: Extension of existing Memorandum of Understanding.

As provided in item No. 8 of the current Memorandum of Understanding dated March 6, 1984 between the Agricultural Research Foundation at Oregon State University and,

Miller Brewing Company,

I propose to extend the memorandum for another year until December 31, 1990.

The proposed funding request for four research projects at Oregon State University for 1990, subject to approval by Miller Brewing Company is as follows:

Hop Breeding and Genetics (Haunold)	6,000.-
Hop Chemistry (Nickerson-Haunold)	12,000.-
Hop Flavor Chemistry (Deinzer)	6,500.-
Noble Hop Aroma-humulene epoxides (Deinzer)	5,000.-
Total	29,500.-

Thank you.

Approved: _____ 4/4/90

A.J. Rehberger
V.P. Brewing & Research

Date

1989-90 ANNUAL REPORT FORM — Agricultural Research Foundation

ACCOUNT: 3634 Miller Brewing Company

PROJECT LEADER: Haunold · DEPARTMENT: Crop Science

ACCOUNTING INFORMATION:

841.81	Beginning Balance (July 1, 1989)
6,000.00	Contributions (Check donor list below.)
(219.65)	Disbursements
0.00	Transfers (from one ARF account to another)
(300.00)	Bookkeeping
6,322.16	Ending Balance (June 30, 1990)

Contributions:

$ 6,000.00	Miller Brewing

INSTRUCTIONS:
1. Limit your report to no more than 100 words.
2. Describe the account highlighting accomplishments and explain how funds were spent. If no funds were spent, describe the purpose of the account.
3. Our office is required to report to the Board of Directors on all accounts for the 1989-90 Fiscal Year, including those accounts with low balances and no activity.
4. Return to: AGRICULTURAL RESEARCH FOUNDATION, Snell Hall 537, before November 14, 1990.
5. If you have any questions, please call x7-3228.

DESCRIPTION OF PROJECT (Please type):

The special aroma hop USDA 21120 produced somewhat better yields in 1990 (6½ bales per acre) but was still below expectations. An additional 4-acre plot of USDA 21120 was established at a different location in Oregon from soft-wood cuttings. Mt. Hood (USDA 21455), evaluated in commercial brewing trials, was found to be an acceptable replacement for imported aroma hops in premium beers. A total of 159 female single plant selections from four special aroma crosses (low alpha/high beta) as a backup for USDA 21120 were harvested and await laboratory evaluation.

Use of funds: student hourly help, supplies.

1989-90 ANNUAL REPORT FORM — **Agricultural Research Foundation**

ACCOUNT: 4522 Hop Research Council

PROJECT LEADER: Haunold/Nickerson DEPARTMENT: Agricultural Chemistry

ACCOUNTING INFORMATION:

2,270.29	Beginning Balance (July 1, 1989)
32,500.00	Contributions (Check donor list below.)
(28,029.08)	Disbursements
1,500.00	Transfers (from one ARF account to another)
(1,550.00)	Bookkeeping
6,691.21	Ending Balance (June 30, 1990)

Contributions:

$31,000.00	Hop Research Council
$ 1,500.00	Oregon Hop Commission

INSTRUCTIONS:
1. Limit your report to no more than 100 words.
2. Describe the account highlighting accomplishments and explain how funds were spent. If no funds were spent, describe the purpose of the account.
3. Our office is required to report to the Board of Directors on all accounts for the 1989-90 Fiscal Year, including those accounts with low balances and no activity.
4. Return to: AGRICULTURAL RESEARCH FOUNDATION, Snell Hall 537, before November 14, 1990.
5. If you have any questions, please call x7-3228.

DESCRIPTION OF PROJECT (Please type):

This grant supports the chemical evaluation of hop germplasm. Gas chromatographic, UV spectrophotometric, HPLC and GC/MS methods were used to quantitatively measure characteristics important to brewers and useful in varietal identification. Several hop genotypes were identified from the hop breeding program that have the potential to replace imported "Tettnanger" hops. Funds were used to pay part of research assistant and chemist salaries.

1989-90 ANNUAL REPORT FORM **Agricultural Research Foundation**

ACCOUNT: 4520 Miller Brewing

PROJECT LEADER: Haunold/Nickerson DEPARTMENT: Agricultural Chemistry

ACCOUNTING INFORMATION:

0.00	Beginning Balance (July 1, 1989)
12,000.00	Contributions (Check donor list below.)
0.00	Disbursements
0.00	Transfers (from one ARF account to another)
(600.00)	Bookkeeping
11,400.00	Ending Balance (June 30, 1990)

Contributions:

$12,000.00	Miller Brewing

INSTRUCTIONS:
1. Limit your report to no more than 100 words.
2. Describe the account highlighting accomplishments and explain how funds were spent. If no funds were spent, describe the purpose of the account.
3. Our office is required to report to the Board of Directors on all accounts for the 1989-90 Fiscal Year, including those accounts with low balances and no activity.
4. Return to: AGRICULTURAL RESEARCH FOUNDATION, Snell Hall 537, before November 14, 1990.
5. If you have any questions, please call x7-3228.

DESCRIPTION OF PROJECT (Please type):

This grant supports the chemical evaluation of hop germplasm. UV spectrophotometry, HPLC, gas chromatography and GC/MS methods were used to quantitatively measure characteristics important to brewers and useful in varietal identification. Several genotypes with characteristics of particular interest to Miller Brewing Company were selected for further evaluation. Funds were used to supplement research assistant and chemist salaries.

03/05/91

ANNUAL RESEARCH PROGRESS REPORT
Report of Progress (AD-421)

Accession: 0142752 Year: 90 Project Number: 5358-22000-001-02 S
Mode Code: 5358-05-00 STP Codes: 2.2.04.1.n 100%

Title: DEVELOPMENT AND CULTURE OF HIGH QUALITY HOPS

from: Dr. Steve Kenny
WSU Prosser, WA. 99350-9687

Period Covered From: 01/90 To: 12/90

Progress Report
USDA selections 21457, 21459, 21484, 21490 and 21491, Tettnanger clones USDA 21496 and 21497, and WSU selections 8254-167 and 8254-244 were tested in large trials in Washington. Yield and alpha acid content were 1115 kg/ha and 3.7%, 1350 and 3.0, 335 and 2.7, 1624 and 1.9, 1160 and 2.2, 1140 and 2.2, 1060 and 3.0, 900 and 5.0, 588 and 3.8, respectively. WSU selection 415-90 was released as Centennial in September. Its five-year average yield was 1995 kg/ha, alpha acid content averaged 11.5%, and the hops have a citrus-floral aroma. Seedlings from new aroma crosses and crosses to measure inheritance of hop resistance to aphid were established. After hop identification publication listed below was prepared, several new hop cultivars were released. Using GC/MS analysis of hop essential oil, a new identification scheme that includes the new cultivars is in early development. Research to find RFLP markers in hop was begun, and the progress to date is construction of a nuclear hop DNA probe library.

Publications:
01. KENNY, S.T. 1990. Identification of U.S.-grown hop cultivars by hop acid and essential oil analyses. J. Amer. Soc. Brew. Chem. 48:3-8.

02. KENNY, S.T., FURTER, R., WHELEN, S. and Hall, B.D. 1990. Restriction fragment length polymorphisms (RFLPs) in hop. Agron. Abstr. Amer. Soc. of Agron., Madison, WI, p. 199.

Approved: W. RALPH NAVE Date: 02/91
Title: ASSISTANT AREA DIRECTOR

United States Department of Agriculture
Agricultural Research Service
Pacific West Area
800 Buchanan Street
Albany, California
94710

August 27, 1990

Mr. J. J. Wills, Director
Washington State University
Office of Grant and Research Development
Pullman, WA 99164-5045

Dear Mr. Wills:

The amendment listed below is forwarded to you for processing and signature. After signature completion, please return four signed copies to this office for final signature and internal distribution. Upon completion two fully executed copies will be returned to you for your files.

Agreement No.:	58-91H2-8-136 Amendment No. Two
Title:	Development and culture of high quality hops
Principal Investigator:	Lindsey R. Faulkner NO —

If you should have any questions regarding this amendment, contact me at 415/559-6019.

Sincerely,

RITA ABEYTA
Contract Specialist

Enclosure

cc:
L. R. Faulkner, Principal Investigator
A. Haunold, Corvallis, OR
B. Messenger, Corvallis, OR

retires Sept 1990.
Find another principal investigator
I suggest Dr. Steve Lutty, Prosser, WA.
All copy of letter attached
J. Haunold 9-6-90

IIB 33319-2416
Faulkner
Flo

UNITED STATES DEPARTMENT OF AGRICULTURE
RESEARCH AGREEMENT

TYPE OF RESEARCH AGREEMENT
SPECIFIC COOPERATIVE AGREEMENT

AGREEMENT NO.: 58-91H2-8-136
TYPE OF ACTION: Amendment No. Two

AGENCY (Name and address)
AGRICULTURAL RESEARCH SERVICE
PACIFIC WEST AREA
800 Buchanan Street
Albany, CA 94710

PERIOD OF AGREEMENT
May 1, 1988 thru April 30, 1993

FEDERAL OBLIGATION: $ 211,620.
CHANGE IN FEDERAL OBLIGATION: ☒ + $ 69,643. ☐ - $

CRIS NO.: 5358-22000-001-02S
AUTHORITY: 7 USC 3318

PERFORMING ORGANIZATION (Name and address)
Washington State University
Agricultural Experiment Station
Pullman, WA 99164

OBLIGATION DISTRIBUTION

Accounting Code	$ Amount	
8015358136	71,345.	1988
9015358050	70,632	1989
0015358050	69,643	1990

PRINCIPAL INVESTIGATOR (Name and address)
Lindsey R. Faulkner
Irrigated Agriculture Research and
Extension Center
P.O. Box 30
Prosser, WA 99350

FINANCE OFFICE (Complete mailing address)
NFC-Accounting Reporting Branch
Reporting Section No. 4, TANO Bldg.
P.O. Box 53326
New Orleans, LA 70153

TITLE OF PROJECT
Development and culture of high quality hops.

AUTHORIZED DEPARTMENTAL OFFICER'S DESIGNATED REPRESENTATIVE (Name and address)
Alfred Haunold
Forage Seed and Cereal Research Unit
3420 SW Orchard Avenue
Corvallis, OR 97730

This Agreement includes the following:

BASIS FOR AWARD

- ☐ Statement of Work; or
- ☐ Project Summary; or
- ☐ Proposal; and
- ☐ General Provisions
  - ☐ 7CFR 3015, Subpart U (by reference)
  - ☐ FORM ARS-452
- ☐ Special Provisions
- ☐ Submit–
  - ☐ Technical Reports,
  - ☐ Fiscal Reports,

  to: Authorized Departmental Officer's Designated Representative
- ☒ Other (Specify):

1. Funding is added in the amount of $69,643.

2. Except as provided above, all other terms and conditions shall remain the same.

FOR THE UNITED STATES DEPARTMENT OF AGRICULTURE

AUTHORIZED DEPARTMENTAL OFFICER	TYPED NAME	DATE
	JACK C. NELSON	SEP 13 1990

FOR THE PERFORMING ORGANIZATION
(Signature of person authorized by the governing body of the performing organization to incur contractual obligations.)

SIGNATURE	TYPED NAME AND TITLE	DATE
	VINCENT HUTNAK FINANCE OFFICER / SPONSORED PROGRAMS	1990

SIGNATURE	TYPED NAME AND TITLE	DATE

United States Department of Agriculture
Agricultural Research Service
Pacific West Area
National Forage Seed Production Research Center
3450 S. W. Campus Way
Oregon State University
Corvallis, Oregon 97331-7102
503 757-4824; FTS: 420-4824
FAX: 503 757-4370; FTS: 420-437

August 20, 1990

SUBJECT: Specific Cooperative Agreement 58-91H2-8-136 (5358-22000-001-02S)

TO: R. J. Reginato
Associate Director, USDA ARS PWA
800 Buchanan Street
Albany, California 94710

FROM: Ronald E. Welty, Research Leader

With the pending retirement of Lynn Faulkner as Superintendent of the Irrigated Agricultural Research and Extension Center, Prosser, Washington, Dr. Alfred Haunold (ADODR) and I recommend that Dr. Stephen Kenny be appointed as principal investigator.

cc:
A. Haunold

United States Department of Agriculture
Agricultural Research Service
Pacific West Area

April 26, 1990.

Dr. William G. Chace jr.
Area Director, USDA-ARS
800 Buchanan street
Albany, CA 94710.

From: Dr. Al Haunold
Res. Geneticist USDA-ARS
ADODR Proj. No. 88-91H2-8-136

Subject: Quarterly Progress Report , Jan. 1 through March 31, 1990.

I enclose one original and one copy of the latest progress report.

One copy was also mailed to Dr. Howard Brooks, NPS, Beltsville, Maryland.

Thank you.

Dr. Al Haunold

Washington State University
Irrigated Agriculture Research and Extension Center
Rt. 2, Box 2953-A
Prosser, WA 99350-9687
509-786-2226
FAX 509-786-3454

MEMORANDUM

DATE: April 24, 1990

TO: A. Haunold

THROUGH: L. R. Faulkner

FROM: S. T. Kenny

SUBJECT: QUARTERLY PROGRESS REPORT FOR 1/1/90 TO 3/31/90 FOR COOPERATIVE AGREEMENT No. 58-91H2-8-136

Essential oil analyses of the 1989 crop year harvest were completed. The summary of brewing quality data and agronomic data for advanced selections and commercial cultivars grown in 1989 is attached.

Washington selection 415-90, USDA Accession Number 21507, was proposed for public release as 'Centennial'. The name was chosen to honor the 1990 Washington State University centennial year. Centennial is characterized by an average hop acids content of 11.5% alpha acid and 4.3% beta acid. Cohumulone ratio of the alpha acids is 29%. The essential oil averages 1.5% of the dried hops and its composition averages 58% myrcene, 11% humulene and 5% caryophyllene. Room temperature alpha acid storage stability is fair. Commercial trials in Washington had a five-year average yield of 1,996 kg ha^{-1}.

Much of the new hop germplasm acquired by the USDA hop program since 1988 and grown in the field at Corvallis was collected for transplanting in the Prosser hop fields.

Seedlings of some of the crosses listed in the January 9, 1990 quarterly progress report were started in the greenhouse.

Data Analysis Samples for 1989 Crop Year

SN	RSC#		LOC.	HARVEST DATE	YLD (#/A)	ALPHA @ 8%	BETA @ 6%	HSI	COH	COL	% MC	% DRY MATTER	A+B	A/B RAT	FRESHness. lb. ml/ 100g	Cone Wt.	ALPHA /ACRE	% MYR	% FARN	% HUM	H/C RAT	% 2MEB
182	21011	L16	009/03-04	9/18/89	1805	5.97	5.09	0.216	46	66	5.38	20.5	11.06	1.17	0.59	131	107.8	56.7	0.0	20.4	2.21	2.88
212	21014	HAL	Toppenish	9/7/89		8.93	4.45	0.238	29	53	5.89		13.38	2.01	1.02		0.0	43.1	0.2	31.1	2.89	0.61
203	21015	TET	005/34-35	9/12/89	308	3.34	3.57	0.251	27	42	5.03	31.5	6.91	0.93	0.76	147	10.3	54.5	17.1	13.0	3.15	0.00
163	21016	FUN	011/24-26	9/6/89	268	3.58	2.44	0.251	33	52	8.95	25.1	6.02	1.47	1.04	107	9.6	59.7	5.1	19.4	2.68	0.79
133	21039	G S	017/31-32	9/21/89	1029	4.33	4.65	0.247	50	71	7.43	24.1	8.99	0.93	0.97	111	44.6	55.4	0.0	15.6	2.71	3.72
152	21040	COL	012/24-26	9/6/89	944	5.10	4.40	0.226	43	63	6.50	22.8	9.50	1.16	1.14	110	48.1	51.2	6.7	22.5	2.40	0.43
135	21040	COL	017/10-11	9/12/89	603	6.93	5.49	0.232	43	64	5.41	24.2	12.42	1.26	1.81	136	41.8	55.4	5.3	19.0	2.12	0.61
153	21041	WIL	012/21-23	9/6/89	1518	3.99	3.41	0.262	37	57	6.88	25.4	7.40	1.17	1.47	132	60.5	52.3	7.5	22.6	2.74	0.79
141	21041	WIL	016/09-11	9/11/89	1706	3.15	3.28	0.291	39	58	7.78	24.6	6.43	0.96	1.40	131	53.8	50.6	7.6	24.3	2.89	0.71
199	21045	SER	006/19	9/6/89	222	3.04	3.97	0.232	28	42	7.09	25.0	7.02	0.77	0.74		6.8	41.7	22.2	21.1	3.42	0.00
162	21049	STY	011/28-29	9/6/89	840	3.19	2.31	0.258	33	52	7.37	27.0	5.50	1.38	0.83	121	26.8	61.1	4.8	18.9	2.74	0.77
178	21050	AHI	009/30	9/12/89	1180	8.01	4.80	0.239	26	50	5.50	26.5	12.31	1.86	2.30	185	94.5	67.9	13.0	7.3	1.84	0.27
172	21051	APO	010/30-32	9/12/89	899	9.23	4.73	0.237	25	44	5.70	30.3	13.95	1.95	2.67	170	82.9	64.3	17.5	8.1	2.10	0.13
173	21052	ATL	010/27&29	9/11/89	936	8.26	3.98	0.239	39	62	7.88	28.5	12.23	2.08	2.16	166	77.3	64.3	15.3	7.5	2.07	1.71
187	21053	AUR	007/34	9/11/89	1487	7.39	3.71	0.247	25	51	7.66	29.9	11.10	2.00	1.86	113	110.0	66.8	5.4	14.6	3.09	0.71
160	21077	SAR	011/36	9/6/89	408	4.03	4.41	0.212	27	43	8.02	28.7	8.45	0.91	0.81	156	16.5	57.0	17.4	14.2	3.46	0.00
159	21077	SAR	011/38	9/6/89	178	2.64	3.91	0.238	27	40	7.04	25.0	6.55	0.67	0.58		4.7	29.9	25.2	26.2	3.46	0.00
102	21079		038/22	9/12/89	829	5.48	3.49	0.273	29	51	8.58	33.3	8.97	1.57	1.51	242	45.4	57.0	0.2	20.8	2.46	1.18
177	21080	BAC	009/35	9/6/89	1370	1.98	4.68	0.226	37	44	7.87	24.1	6.66	0.42	0.50	115	27.2	47.7	0.3	32.3	3.44	0.11
99	21084		039/46	9/11/89	1172	2.96	3.91	0.228	26	45	5.87	34.7	6.28	0.90	0.62	182	34.7	52.9	15.8	14.6	3.42	0.00
100	21085		038/33-34	9/11/89	490	2.58	3.75	0.238	26	44	6.70	32.4	6.38	0.69	0.58	197	12.6	50.3	19.0	14.1	3.48	0.00
101	21086		038/25-26	9/11/89	982	2.46	3.66	0.247	26	45	7.25	31.6	6.12	0.67	0.66	142	24.2	53.6	17.1	13.9	3.48	0.00
154	21092	CAS	012/18-20	9/11/89	1293	3.79	5.41	0.221	36	51	7.15	28.0	9.20	0.70	0.83	193	49.0	62.4	7.6	14.9	2.70	0.38
132	21092	CAS	017/39-40	9/12/89	1259	4.29	5.74	0.229	37	51	4.53	28.9	10.04	0.75	0.93	193	54.1	63.9	7.5	13.9	2.75	0.53
184	21093	N B	008/24-25	9/6/89	400	7.94	4.34	0.239	28	51	8.60	26.5	12.27	1.83	2.08	206	31.7	64.4	0.0	18.7	2.36	0.80
189	21097	H B	007/21-22	9/11/89	1379	5.84	3.82	0.223	31	48	8.21	27.7	9.66	1.53	1.72	185	80.6	62.2	0.2	8.2	2.07	0.99
169	21113	LU3	010/39-41	9/6/89	301	3.26	4.28	0.215	28	41	7.07	29.8	7.54	0.76	0.82	171	9.8	61.3	16.1	12.4	3.45	0.00
158	21114	NAD	011/39-41	9/6/89	377	2.76	4.40	0.24	29	41	7.67	26.5	7.16	0.63	0.86	182	10.4	54.5	16.3	17.4	3.42	0.00
174	21116	B G	010/24-26	9/18/89	2059	5.11	3.64	0.252	41	65	7.04	29.9	8.75	1.40	1.34	121	104.9	62.5	0.1	17.4	1.97	1.05
136	21116	B G	016/45-47	9/12/89	2073	7.02	5.57	0.242	43	64	6.94	25.5	12.56	1.26	1.74	185	145.4	64.3	0.0	15.3	1.81	1.34
97	21120		041/46	9/12/89	1007	0.89	4.91	0.229	46	49	5.29	33.3	5.80	0.18	0.84	162	8.9	48.5	18.3	15.4	2.72	0.48
98	21159		040/15-16	9/15/89	1070	2.36	7.87	0.216	29	43	9.45	25.1	10.23	0.30	0.69	183	25.2	45.9	0.3	3.9	0.90	0.55
193	21168	P B	006/39-41	9/8/89	374	3.21	4.20	0.226	28	42	5.95	28.7	7.40	0.76	0.79	155	12.0	57.8	15.7	14.8	3.39	0.00
186	21169	T B	007/39-40	9/12/89	843	1.86	6.56	0.182	27	34	6.65	24.3	8.42	0.28	1.01	114	15.6	45.3	0.2	17.5	2.19	0.08
194	21170	ELS	006/36-38	9/12/89	973	1.78	4.26	0.232	35	43	4.25	28.3	6.05	0.42	0.52	139	17.4	51.8	0.4	29.2	3.37	0.15
198	21172	LAN	006/24	9/6/89	311	4.08	4.88	0.218	27	41	4.57	25.0	8.96	0.83	0.76		12.7	54.5	16.8	15.7	3.36	0.00
197	21173	STR	006/27-29	9/6/89	768	3.99	3.23	0.232	34	56	7.30	24.0	7.23	1.24	1.06	134	30.7	50.3	0.5	26.4	2.68	0.68
196	21179	HEE	006/30-31	9/6/89	223	1.55	4.59	0.217	35	40	5.07	25.1	6.15	0.34	0.33	114	3.5	26.4	1.0	45.3	3.43	0.00
107	21180		026/03-04	9/15/89	1494	7.46	6.60	0.237	33	56	6.61	25.5	14.06	1.13	1.89	173	111.4	49.6	0.0	26.1	2.22	1.47
106	21181		027/03-04	9/15/89	2669	4.23	5.19	0.248	42	66	7.08	48.5	9.42	0.81	0.61	168	112.9	43.8	0.0	25.8	1.98	1.18
165	21182	GAL	011/18-20	9/12/89	2319	10.82	6.63	0.217	41	64	4.22	25.7	17.45	1.68	1.29	189	251.1	53.3	0.6	18.1	2.15	3.67
127	21182	GAL	018/30-32	9/12/89	2114	10.02	6.37	0.218	41	64	4.37	27.0	16.39	1.57	1.03	192	211.8	50.6	0.0	19.0	2.20	4.00
204	21185	HER	005/30-32	9/6/89	628	1.56	4.90	0.255	37	41	6.67	35.9	6.46	0.32	0.50	117	12.9	45.9	0.2	31.8	3.39	0.12
205	21186	SPA	005/27-29	9/6/89	348	2.63	3.93	0.239	29	42	7.50	30.1	6.56	0.67	0.75	206	9.1	60.7	12.7	11.9	3.19	0.11
167	21193	NUG	011/12-14	9/18/89	1780	12.89	4.88	0.232	30	54	7.31	23.5	17.77	2.64	2.73	154	229.4	59.2	0.0	19.5	2.36	1.98
126	21193	NUG	018/33-35	9/15/89	1524	13.36	5.17	0.247	28	54	5.91	28.9	18.54	2.58	2.10	253	203.6	57.4	0.0	20.5	2.25	1.91
170	21213	ARO	010/36-37	9/6/89	566	2.46	3.84	0.248	30	43	6.35	26.5	6.30	0.64	0.72	164	13.9	60.8	16.5	12.8	3.44	0.00
171	21214	SIR	010/33-35	9/6/89	378	3.09	4.38	0.254	27	41	15.00	27.8	7.47	0.70	0.75	146	11.7	56.9	15.7	16.1	3.46	0.00
166	21220	ERO	011/15-17	9/21/89	1730	7.11	3.57	0.238	44	67	6.91	22.1	10.68	1.99	0.58	114	123.0	56.1	0.0	1.6	0.08	0.66
120	21220	ERO	019/31-32	9/21/89	2168	8.49	4.09	0.247	42	66	6.54	23.4	12.58	2.08	0.00	149	184.0	52.5	0.0	1.7	0.08	0.51
119	21225	OLY	019/33-35	9/15/89	3077	9.09	4.69	0.292	36	59	8.49	29.7	13.78	1.94	0.00	196	279.8	55.7	0.0	19.8	1.72	1.25
103	21225	OLY	033/06-08	9/15/89	2252	7.50	3.70	0.258	33	59	6.12	39.6	11.20	2.03	1.15	173	168.9	63.9	0.1	11.6	1.33	1.30
155	21226	CHI	012/15-17	9/15/89	2637	9.89	3.21	0.252	35	58	7.29	28.3	13.10	3.08	1.96	189	260.7	43.1	0.0	20.1	2.16	2.33
118	21226	CHI	019/39-41	9/15/89	2220	10.38	3.44	0.254	35	58	6.83	28.9	13.82	3.02	1.64	147	230.5	42.6	0.0	19.9	2.14	2.01
188	21227	PER	007/24-26	9/6/89	538	7.12	4.79	0.233	32	55	7.69	28.4	11.91	1.49	1.65	183	38.3	50.5	0.8	28.8	2.77	0.46
139	21227	PER	016/24-26	9/8/89	578	5.33	4.28	0.255	33	55	5.90	27.9	9.61	1.25	1.44	147	30.8	46.6	0.1	32.9	2.93	0.19
179	21238	BLI	009/27-28	9/6/89	1736	5.96	3.75	0.243	39	62	12.21	28.7	9.72	1.59	1.87	168	103.5	53.0	23.4	12.3	2.57	0.19
95	21242		043/36	9/11/89	482	2.14	3.69	0.225	26	41	7.11	33.9	5.63	0.58	0.86	179	10.3	45.4	20.1	16.6	3.44	0.00
190	21282	SAX	007/18-20	9/11/89	460	6.40	4.36	0.244	21	41	8.87	31.0	10.76	1.47	0.98	188	29.4	64.2	10.4	9.6	2.14	0.13
191	21283	VIK	007/15-17	9/11/89	445	5.31	3.46	0.246	24	41	6.44	35.7	8.77	1.54	1.20	222	23.6	59.5	16.1	10.2	2.52	0.33

Bale Analysis Samples for 1989 Crop Year

SN	ASC#		LOC.	HARVEST DATE	YLD (#/A)	ALPHA @ 8%	BETA @ 8%	HSI	COH	COL	% MC	% DRY MATTER	A+B	A/B RAT	FRESHAve. 1b. ml/ 100g	Cone Wt.	ALPHA /ACRE	% MYR	% FARN	% HUM	H/C RAT	% 2MEB
142	21285		016/03-05	9/8/89	1223	1.21	1.94	0.315	20	28	6.93	28.6	3.16	0.62	0.52	123	14.8	28.8	0.1	45.3	3.46	0.39
96	21373		043/16	9/15/89	1847	7.73	7.07	0.228	20	41	10.81	54.7	14.80	1.09	1.24	252	142.8	68.5	2.8	9.7	1.83	1.80
94	21382		044/45-46	9/12/89	804	7.53	7.41	0.23	23	43	4.73	28.3	14.94	1.02	1.27	213	60.5	54.5	0.0	2.8	2.47	1.17
207	21397	H4X	005/22-23	COMBINED	WITH	SN#	130										ERR					
130	21397	H4X	018/08	9/8/89	216	3.01	3.45	0.286	31	47	6.70	24.3	6.46	0.87	0.68	108	6.5	36.5	0.0	38.2	3.03	0.44
104	21397	H4X	030/35	9/8/89	356	2.96	3.23	0.259	28	45	7.69	25.0	6.20	0.92	1.10		10.5	36.5	0.4	37.1	3.42	0.55
201	21405	STK	005/39	9/12/89	2167	8.31	4.90	0.247	47	69	4.11	16.9	13.20	1.70	1.15	148	180.1	61.6	6.0	10.5	2.38	2.08
125	21455		019/07-08	9/11/89	1158	3.72	6.13	0.222	28	47	8.00	22.5	9.86	0.61	1.84	118	43.1	52.9	0.2	26.2	2.47	0.57
111	21455		023/33-34	9/15/89	1204	3.67	5.39	0.23	28	47	7.03	25.1	9.06	0.68	1.59	146	44.2	50.8	0.0	27.1	2.43	0.52
221	21455		Carpenter		1908	4.23	6.33	0.28	26	45	11.01		10.56	0.67	1.32		84.0	37.8	0.0	33.7	2.45	0.24
231	21455		Dixon (Id)		1162	3.82	6.26	0.344	25	45	9.25		10.11	0.61	1.29		44.4	33.5	0.0	31.8	2.39	0.72
124	21456		019/09-11	9/11/89	728	2.98	4.27	0.251	32	49	6.70	24.6	7.25	0.70	1.28	110	21.7	45.4	0.1	33.0	3.13	0.62
110	21456		023/35-36	9/11/89	916	2.62	3.97	0.231	32	48	8.25	24.5	6.59	0.66	1.40	123	24.0	52.3	0.0	29.0	3.41	0.41
232	21456		Dixon (Id)		922	1.70	4.05	0.285	30	46	9.40		5.75	0.42	0.97		15.7	31.4	0.0	41.5	3.38	0.51
222	21456		Haas		1550	1.24	2.88	0.42	30	45	8.16		4.12	0.43	0.52		19.3	16.1	0.0	48.3	3.67	0.00
123	21457		019/12-14	9/12/89	1031	3.48	3.29	0.253	30	47	6.29	24.2	6.77	1.06	1.46	100	35.9	50.4	0.1	30.1	3.39	0.50
109	21457		023/37-38	9/11/89	1349	3.27	3.09	0.241	29	47	7.68	25.3	6.36	1.06	1.25	104	44.1	43.6	0.0	35.0	3.27	0.32
233	21457		Dixon (Id)		560	2.83	3.40	0.306	29	45	9.95		6.22	0.83	0.94		15.8	37.2	0.1	35.9	3.37	0.52
223	21457		Gamache		1025	3.19	3.15	0.318	28	46	9.19		6.34	1.01	1.11		32.7	34.3	0.1	38.6	3.47	0.24
122	21459		019/18-20	9/12/89	699	2.72	3.40	0.277	31	46	4.84	23.1	6.12	0.80	0.87	162	19.0	47.7	7.9	22.6	3.35	0.15
224	21459		Brulotte		1704	3.04	4.20	0.299	29	44	10.20		7.24	0.73	0.90		51.8	36.5	7.5	27.6	3.34	0.00
234	21459		Dixon (Id)		684	2.69	3.31	0.287	32	46	9.35		6.00	0.81	0.80		18.4	39.2	7.0	26.3	3.36	0.21
113	21484		023/16	9/11/89	1400	2.17	4.20	0.241	33	43	10.89	24.6	6.37	0.52	1.17	115	30.4	34.9	0.1	40.3	3.35	0.34
235	21490		Gooding(Id)		1638	2.08	6.05	0.41	26	38	7.50		8.13	0.34	0.79		34.1	16.3	0.0	36.0	3.79	0.23
225	21490		Norford		906	2.05	5.79	0.31	24	34	9.09		7.84	0.35	0.49		18.6	17.3	0.0	44.7	3.38	0.00
218	21490		Toppenish	9/7/89		4.11	8.93	0.197	21	32	5.79		13.04	0.46	1.22		0.0	41.8	0.0	32.4	3.28	0.00
226	21491		Norford		422	2.53	3.85	0.282	27	40	10.52		6.38	0.66	0.83		10.7	37.2	0.2	36.2	2.68	0.12
219	21491		Toppenish	9/7/89		3.61	3.82	0.285	26	42	7.14		7.43	0.94	1.79		0.0	51.3	0.0	25.1	2.40	0.47
227	21496	TEA	Gannon		408	3.67	4.77	0.251	25	42	8.98		8.44	0.77	0.66		17.9	47.6	16.8	17.5	3.32	0.00
210	21496	TEA	Toppenish	9/7/89		3.02	3.43	0.287	27	45	5.62		6.44	0.88	0.43		0.0	61.6	13.7	8.4	3.39	0.00
228	21497	TEB	Gannon		411	4.45	5.28	0.248	27	42	8.48		9.73	0.84	0.56		18.3	54.7	14.9	13.2	3.32	0.00
211	21497	TEB	Toppenish	9/7/89		3.30	4.17	0.24	30	44	5.91		7.47	0.79	0.51		0.0	61.5	13.8	8.1	3.49	0.00
208	21498	YEO	005/15-16	9/12/89	2249	10.47	3.72	0.275	28	51	4.52	32.4	14.18	2.82	1.63	208	235.4	52.2	0.0	19.2	2.99	3.58
209	21499	ZEN	005/12-14	9/12/89	501	7.14	2.77	0.274	28	52	4.69	31.3	9.91	2.58	1.77	219	35.8	52.9	0.0	17.8	3.29	0.69
114	404-006		022/25-26	9/15/89	2296	10.36	5.58	0.231	35	58	7.76	30.7	15.94	1.85	1.22	170	237.8	51.9	0.0	23.4	2.17	1.64
105	407-57		028/25	9/15/89	1581	5.76	5.16	0.239	42	68	7.47	31.8	10.92	1.12	1.68	197	91.1	71.7	0.6	3.9	1.59	1.82
108R	415-090		025/24	9/14/89	2455	7.72	3.04	0.25	31	54	12.69	28.2	10.76	2.54	3.06	265	189.5	83.1	0.0	6.4	2.19	1.05
108	415-090		025/26	9/15/89	1503	8.86	4.05	0.271	30	54	8.93	28.2	12.92	2.19	2.88	265	133.2	82.5	0.0	6.5	2.25	0.99
236	415-090		Hop Union		1621	9.56	3.84	0.392	29	52	8.76		13.41	2.49	1.46		155.0	60.3	0.0	11.3	2.58	2.83
156	415-90		012/12-14	9/18/89	2119	9.95	3.90	0.26	31	54	7.91	29.3	13.86	2.55	3.22	200	210.9	81.9	0.0	7.0	2.24	1.02
164	48209	FUH	011/21-23	9/6/89	479	3.54	2.40	0.264	32	51	9.01	26.1	5.94	1.48	0.99	133	17.0	63.3	4.1	18.1	2.76	0.69
131	48209	FUH	018/03-05	9/8/89	528	3.07	2.25	0.344	33	51	5.95	27.9	5.32	1.36	1.00	102	16.2	57.1	4.6	21.4	2.76	0.68
202	56001	HAL	005/38	9/6/89	625	2.68	4.52	0.246	29	42	8.00	25.8	7.20	0.59	1.54	117	22.1	55.0	0.1	25.2	3.16	0.66
137	56013	CAS	016/39-41	9/12/89	1230	3.91	5.83	0.229	38	51	5.50	28.8	9.74	0.67	0.94	193	46.0	63.3	7.4	14.1	2.71	0.56
78	58106		048/13-14	9/15/89	802	2.05	2.14	0.275	28	48	8.30	28.2	4.19	0.96	0.98	125	16.4	44.2	0.8	28.6	2.48	1.19
151	59008		015/12	9/18/89	1517	5.92	5.15	0.228	46	66	6.24	25.1	11.07	1.15	0.78	176	89.8	59.0	0.0	18.7	2.26	3.32
82	60020		047/25-26	9/15/89	740	5.77	5.10	0.26	42	64	7.50	28.7	10.88	1.13	0.92	241	42.7	67.6	0.0	8.1	2.15	4.30
93	60021		046/05		89	1.83	1.44	0.291	62	70	6.63	25.0	3.27	1.27			1.6					
92	60024		046/09	9/11/89	178	3.62	3.08	0.261	60	77	7.60	25.0	6.70	1.17	0.26		6.4	54.4	0.4	8.0	1.92	0.00
83	60025		047/07	9/15/89	617	6.23	4.28	0.249	50	72	6.50	34.7	10.50	1.46	1.79	277	38.4	72.8	0.0	5.7	2.48	5.74
150	60032		015/19-20	9/12/89	160	1.97	2.72	0.275	42	61	5.27	22.5	4.69	0.72	0.80	123	3.1	35.3	2.2	22.7	1.16	0.86
84	60032		047/05	9/11/89	267	6.73	2.91	0.253	40	65	9.69	25.0	9.64	2.31	1.17		17.9	64.5	0.0	12.6	2.72	2.73
149	60033		015/21-22	9/15/89	573	1.66	1.63	0.289	41	72	10.17	23.0	3.29	1.02	0.26	91	9.5	38.9	0.0	19.3	1.21	0.95
148	60035		015/23		56	1.62	2.23	0.243	47	67	3.59	25.0	3.85	0.72			0.9					
91	60035		046/15	9/15/89	1896	3.79	5.58	0.264	38	62	4.01	28.1	9.38	0.68	1.88	331	71.9	57.2	0.1	15.7	1.74	3.66
147	60037		015/25-26	9/12/89	2598	5.82	4.78	0.229	45	66	6.03	25.6	10.60	1.22	0.60	169	151.2	56.8	0.1	20.6	2.52	2.70
90	60037		046/21-22	9/11/89	3091	5.07	4.12	0.232	46	68	7.52	26.1	9.19	1.23	0.51	158	156.8	54.5	0.4	17.7	2.49	3.10
146	60038		015/27			0.59	1.62	0.39	56	73	7.09	25.0	2.21	0.37	0.11		0.0	60.4	0.1	2.1	0.11	0.00
89	60038		046/25			0.81	2.13	0.361	56	72	7.10	25.0	2.94	0.38	0.17		0.0	62.1	0.0	1.7	0.09	0.00
145	60039		015/29-30	9/12/89	2749	4.69	4.39	0.232	45	65	5.04	22.7	9.08	1.07	0.43	203	128.9	55.4	0.1	22.5	2.57	2.52

Bale Analysis Samples for 1989 Crop Year

SN	ASC#		LOC.	HARVEST DATE	YLD (#/A)	ALPHA @ 8%	BETA @ 8%	HSI	COH	COL	% MC	% DRY MATTER	A+B	A/B RAT	FRESH ml/ 100g	Ave. lb. Cone Wt.	ALPHA /ACRE	% MYR	% FARN	% HUM	H/C RAT	% 2MEB
144	60040		015/31	9/12/89	1075	4.94	2.13	0.302	54	74	4.79	24.2	7.08	2.32	0.38	114	53.1	53.4	0.0	6.7	1.28	4.47
89	60042		046/26	9/18/89	1171	4.25	4.15	0.239	48	69	5.70	27.4	8.39	1.02	0.80	147	49.8	54.2	0.0	16.0	2.84	2.98
138	60042	SHI	016/30-32	9/21/89	1030	4.32	4.52	0.244	51	71	5.52	30.0	8.83	0.96	0.95	120	44.5	51.6	0.0	18.2	2.79	3.10
87	61008		046/33-34	9/11/89	456	2.04	3.72	0.239	27	41	6.30	28.5	5.76	0.55	0.67	201	9.3	52.9	16.4	15.1	3.46	0.00
85	61011		046/41-42	9/11/89	783	2.03	3.12	0.263	25	41	11.62	35.2	5.15	0.65	0.58	223	15.9	50.8	16.8	16.0	3.39	0.00
79	61017		048/09	9/11/89	465	1.99	3.07	0.246	29	44	6.70	37.4	5.06	0.65	0.62	258	9.2	52.0	15.9	14.4	3.34	0.20
161	61020	SAV	011/31-32	9/6/89	209	3.31	2.39	0.267	33	50	4.92	26.2	5.70	1.39	0.86	111	6.9	51.6	6.4	23.5	2.82	0.66
140	61020	SAV	016/15-17	9/8/89	1121	3.84	2.69	0.286	32	50	5.58	24.3	6.52	1.43	1.57	191	43.0	59.2	1.3	21.9	2.59	0.63
195	61021	STE	006/33-34	9/6/89	669	2.01	3.72	0.222	31	43	8.75	26.9	5.73	0.54	0.79	198	13.4	58.0	16.3	14.7	3.40	0.00
200	62013	COM	006/06-08	9/18/89	1250	6.92	4.00	0.261	44	63	6.35	28.2	10.92	1.73	1.93	192	86.5	58.5	0.0	1.7	0.14	0.52
86	63018		046/37-38	9/15/89	1245	3.59	4.60	0.283	26	43	8.74	35.0	8.19	0.78	1.19	151	44.7	54.3	0.1	21.5	3.05	0.49
80	64009		047/40		133	2.65	2.51	0.286	28	45	8.05	25.0	5.16	1.06	0.65		3.5	33.0	0.0	36.0	3.39	0.67
81	64010		047/33-34	9/11/89	219	1.59	3.05	0.309	30	43	7.55	30.8	4.63	0.52	0.48	181	3.5	36.9	1.5	36.2	3.62	0.49
180	64100	BUL	009/26	9/12/89	1995	6.32	4.65	0.235	38	61	3.49	30.3	10.97	1.36	1.67	154	126.1	61.5	1.6	17.5	1.89	0.32
206	64107	N B	005/24&26	9/6/89	590	6.23	3.49	0.247	29	52	10.62	30.2	9.72	1.78	1.62	198	96.7	58.6	0.1	20.1	2.64	1.21
143	65009		015/38	9/15/89	2174	7.81	6.98	0.243	38	61	7.46	29.8	14.79	1.12	2.58	190	169.8	63.1	0.0	15.9	1.65	1.86
112	65009		023/19-20	9/15/89	1340	8.48	7.18	0.229	38	62	8.41	29.0	15.65	1.18	2.70	154	113.6	62.3	0.0	15.6	1.57	1.89
75	65009		049/03-04	9/18/89	1000	8.18	6.80	0.26	38	62	10.19	25.0	14.99	1.20	2.59	127	81.8	58.9	0.1	15.0	1.58	2.36
168	65101	TAL	011/06-07	9/21/89	1673	5.17	3.44	0.231	51	72	7.15	24.8	8.61	1.50	0.56	143	86.5	61.3	0.0	7.4	1.48	1.96
181	65102	L-1	009/06-08	9/12/89	1967	5.63	4.08	0.253	44	65	8.64	23.7	9.71	1.38	0.51	121	110.8	60.9	0.2	18.7	2.43	2.69
128	65102	L-1	018/18-20	9/12/89	2375	6.27	4.19	0.231	46	67	6.22	24.0	10.46	1.50	0.64	200	148.9	64.3	0.0	14.7	2.41	3.26
185	65103	E-2	008/03	9/6/89	1806	5.86	4.17	0.214	43	65	8.19	28.6	10.03	1.41	0.45	155	105.9	62.9	0.2	18.6	2.51	1.40
134	65103	E-2	017/18&20	9/8/89	1219	6.86	4.42	0.231	44	67	5.38	23.2	11.29	1.55	0.62	154	83.7	64.0	0.1	15.8	2.49	2.27
175	65104	L-8	010/06-08	9/21/89	1841	5.07	4.84	0.228	47	67	6.09	24.5	9.91	1.05	0.53	187	93.3	58.5	0.0	19.9	2.72	3.59
121	65104	L-8	019/24-26	9/21/89	2017	4.48	4.15	0.253	47	68	6.48	21.0	8.63	1.08	0.00	112	90.4	62.2	0.0	16.0	2.65	4.08
192	66052	PRI	006/45-47	9/21/89	839	6.22	6.95	0.221	34	52	6.80	24.8	13.16	0.89	0.99	124	52.2	50.1	0.0	3.6	0.48	0.13
183	66055	F C	008/45-46	9/18/89	476	3.84	5.49	0.24	42	64	5.90	24.3	9.32	0.70	0.73	141	18.3	58.7	13.4	4.3	1.75	0.14
77	7504-127		048/18	NO PLANT													0.0					
55	8153-020		067/07-08	9/8/89	1039	5.80	4.84	0.245	25	45	4.95	27.2	10.64	1.20	1.59	139	60.2	46.6	2.7	28.4	3.36	0.63
213	8153-020		Toppenish	9/7/89		5.94	5.73	0.223	24	43	4.41		12.67	0.88	1.02		0.0	41.2	2.5	30.0	3.34	0.14
72	8153-127		065/06&10	9/8/89	1419	1.18	4.20	0.308	26	35	6.60	26.2	5.39	0.28	0.84	130	16.8	37.8	0.1	38.3	3.38	0.70
71	8154-237		065/15-16	9/8/89	1205	5.29	3.85	0.285	22	40	7.10	27.7	9.14	1.38	1.36	146	63.8	54.6	0.0	22.7	2.28	0.55
54	8252-115		067/21-22	9/8/89	1540	5.15	3.84	0.249	26	44	7.35	28.9	8.99	1.34	1.64	345	79.3	39.1	0.0	16.4	3.22	0.57
70	8253-028		065/35-36	9/8/89	1606	3.44	3.76	0.27	30	48	7.80	26.2	7.20	0.92	1.05	219	55.3	52.0	0.0	24.7	3.42	2.80
69	8253-080		065/39-40	9/8/89	1607	0.99	3.41	0.252	29	37	6.90	27.4	4.40	0.29	0.60	160	15.9	40.4	0.0	35.9	3.52	0.75
68	8253-133		065/47-48	9/8/89	1372	4.16	5.20	0.236	23	41	6.45	27.1	9.35	0.80	1.34	180	57.0	26.0	0.0	44.8	3.45	1.11
74	8253-138		064/03-04	9/8/89	991	4.32	4.18	0.248	22	43	6.85	25.3	8.50	1.03	1.16	131	42.8	45.3	0.1	31.0	3.41	1.33
220	8253-138		Toppenish	9/7/89		5.22	4.82	0.226	23	43	7.86		10.04	1.08	1.63		0.0	51.2	0.0	27.0	3.36	1.18
73	8253-239		064/13-14	9/8/89	829	3.63	3.54	0.265	24	42	5.80	25.2	7.18	1.03	0.97	108	30.1	50.1	0.0	27.1	3.38	1.79
67	8254-133		066/03-04	9/8/89	1176	4.75	4.79	0.238	24	42	5.80	25.9	9.54	0.99	1.05	136	55.9	30.4	3.1	38.6	3.39	1.03
66	8254-142		066/05-06	9/8/89	1026	4.22	4.31	0.254	22	37	5.10	30.4	8.53	0.98	0.97	197	43.2	34.0	0.2	37.8	3.42	1.63
65	8254-146		066/10	9/11/89	556	4.62	5.95	0.21	22	38	10.00	26.1	10.57	0.78	1.50	126	25.7	42.1	0.0	33.2	3.42	0.46
64	8254-167		066/15-16	9/11/89	1668	5.08	5.83	0.217	18	35	11.99	27.2	10.91	0.87	1.16	145	84.7	31.9	0.1	33.0	3.40	0.54
229	8254-167		Gamache		544	5.81	6.49	0.257	19	35	7.42		12.30	0.89	1.22		31.6	27.4	0.2	40.8	3.45	0.45
214	8254-167		Toppenish	9/7/89		4.98	6.64	0.216	19	34	4.42		11.61	0.75	0.88		0.0	28.2	0.0	38.8	3.38	0.29
63	8254-181		066/17-18	9/11/89	1350	3.65	4.77	0.219	23	43	21.99	25.3	8.41	0.77	0.71	146	49.2	29.8	4.0	38.2	3.48	0.54
62	8254-196		066/21-22	9/8/89	985	6.64	5.39	0.229	25	41	5.80	27.7	12.04	1.23	1.70	159	65.5	43.4	0.0	30.6	3.48	1.21
61	8254-222		066/27-28	9/8/89	654	4.08	4.89	0.245	21	36	4.80	27.3	8.97	0.83	1.30	217	26.7	35.8	0.0	36.5	3.40	1.49
60	8254-239		066/29-30	9/8/89	1049	3.50	4.40	0.252	23	38	6.10	26.8	7.90	0.80	1.02	217	36.7	35.0	0.0	37.5	3.50	0.62
59	8254-241		066/31-32	9/8/89	1667	3.96	4.91	0.24	21	38	6.10	28.0	8.87	0.81	0.94	233	66.0	41.7	2.8	31.2	3.51	1.92
58	8254-244		066/33-34	9/11/89	751	3.34	4.66	0.216	24	42	11.60	27.3	8.00	0.72	1.10	242	25.1	38.4	4.5	34.1	3.39	0.57
230	8254-244		Gamache		511	4.60	6.14	0.247	24	41	8.15		10.75	0.75	1.40		23.5	30.8	4.2	38.3	3.47	0.44
215	8254-244		Toppenish	9/7/89		4.43	7.93	0.215	22	38	5.61		12.37	0.56	1.00		0.0	30.0	3.9	39.3	3.36	0.00
57	8254-265		066/39-40	9/8/89	639	3.50	5.48	0.231	24	41	6.35	25.7	8.98	0.64	1.29	182	22.4	32.3	0.0	40.8	3.41	0.65
56	8254-267		066/42	9/8/89	1075	3.31	5.18	0.231	25	42	6.30	25.2	8.50	0.64	1.39	196	35.6	32.8	0.0	41.3	3.37	0.78
52	8254-328		067/37-38	9/8/89	802	3.14	4.65	0.295	24	40	5.74	29.7	7.79	0.68	1.14	254	25.2	33.3	0.0	39.9	3.42	0.87
53	8254-334		067/33-34	9/8/89	1643	1.67	3.61	0.261	23	37	7.00	27.2	5.28	0.46	0.53	145	27.4	62.8	2.5	19.6	3.56	0.30
41	8311-014		069/03-04	9/13/89	247	6.06	8.80	0.224	20	38	4.35	25.3	14.86	0.69	0.91	237	15.0	26.9	0.0	34.5	2.36	0.17
2	8311-014		207/018	9/5/89	521	5.61	4.36	0.231	32	49	5.55	29.3	9.97	1.29	1.19	229	29.2	43.7	0.0	24.8	1.94	0.78
3	8311-130		207/134	9/5/89	826	5.31	7.92	0.211	27	46	5.85	24.5	13.23	0.67	1.29	226	43.9	65.6	0.0	12.9	1.59	0.00

Bale Analysis Samples for 1989 Crop Year

SN	ASC#	LOC.	HARVEST DATE	YLD (#/A)	ALPHA @ 8%	BETA @ 6%	HSI	COH	COL	% MC	% DRY MATTER	A+B	A/B RAT	FRESH 1ml/ 100g	FRESH Ave. lb. Cone Wt.	ALPHA /ACRE	% MYR	% FARN	% HUM	H/C RAT	% 2MEB
1	8312-120	202/124	9/1/89		3.65	7.93	0.203	27	46	5.90	25.0	11.59	0.46			0.0					
40	8412-060	069/15	9/13/89	267	6.51	4.11	0.229	38	64	5.94	25.0	10.62	1.59	0.54		17.4	66.6	4.7	6.5	3.54	1.90
34	8551-054	218/054	9/5/89	446	4.65	4.95	0.226	36	61	4.40	31.4	9.60	0.94	0.75	163	20.7	36.6	0.0	3.9	0.18	2.06
51	8552-222	068/03-04	9/13/89	441	1.69	5.80	0.229	21	36	5.70	20.7	7.49	0.29	1.15	129	7.5	58.5	0.0	18.4	1.83	0.81
25	8552-254	216/054	9/5/89	747	2.63	4.18	0.233	23	31	5.85	25.9	6.81	0.63	0.85	278	19.7	31.3	0.0	41.6	3.21	1.65
50	8553-067	068/07	9/13/89	311	5.46	6.70	0.228	34	62	7.50	25.0	12.17	0.81	1.84		17.0	68.1	0.0	12.2	2.50	0.63
21	8553-281	215/081	9/18/89	1146	4.76	6.69	0.213	40	66	5.70	28.9	11.45	0.71	1.16	103	54.7	47.9	0.0	24.2	2.72	1.82
22	8553-287	215/087	9/5/89	914	13.58	5.63	0.28	29	48	5.30	29.4	19.21	2.41	1.20	383	124.1	60.0	6.5	11.8	1.81	1.29
23	8553-310	215/110	9/5/89	1001	4.76	5.33	0.228	21	39	5.90	35.2	10.11	0.90	1.29	272	47.9	29.2	0.0	41.3	3.36	0.65
49	8553-323	068/09	9/13/89	843	1.38	4.04	0.267	21	37	4.49	28.7	5.42	0.34	0.60	183	11.6	66.6	0.0	1.2	0.08	0.80
39	8657-003	069/19-20	9/13/89	541	6.84	2.67	0.262	28	53	4.90	33.8	9.50	2.57	1.09	321	37.0	52.5	0.0	25.7	3.46	1.58
14	8657-003	214/103	9/1/89	222	4.66	3.78	0.253	22	40	5.80	25.0	8.44	1.23	0.63		10.3	36.4	0.0	33.8	3.33	0.11
38	8657-013	069/24	9/13/89	695	7.24	7.50	0.191	25	46	5.50	26.0	14.74	0.97	0.85	234	50.3	56.3	0.0	13.5	3.16	0.26
37	8657-027	069/35-36	9/13/89	445	4.68	3.94	0.219	23	42	5.00	35.7	8.62	1.19	0.64	404	20.8	54.4	0.0	23.2	3.40	1.21
36	8657-029	069/39-40	9/13/89	149	5.31	7.08	0.185	27	48	6.40	33.4	12.39	0.75	0.63	275	7.9	59.2	0.0	9.8	3.52	0.26
15	8657-033	214/135	9/1/89	857	4.45	3.63	0.23	36	59	5.70	29.7	8.09	1.23	0.75	254	38.2	48.1	0.0	22.4	2.41	1.24
16	8657-035	214/137	9/1/89	635	4.31	3.86	0.222	39	61	6.85	31.8	8.18	1.12	0.67	315	27.4	45.7	0.0	26.3	2.28	1.53
17	8657-042	214/145		111	4.99	5.92	0.216	22	43	5.40	25.0	10.91	0.84			5.5					
35	8657-043	069/43	9/13/89	44	5.26	5.71	0.198	25	46	5.65	25.0	10.97	0.92	0.66		2.3	62.6	0.0	9.0	3.22	0.71
42	8658-030	068/35-36	9/13/89	80	4.24	4.70	0.221	24	43	5.85	29.8	8.94	0.90	0.93	215	3.4	55.2	0.1	10.7	2.24	0.39
13	8658-031	213/142	9/1/89	445	5.47	7.62	0.217	40	61	10.10	25.0	13.09	0.72	0.93		24.3	68.1	0.0	8.3	2.31	1.33
11	8664-027	212/078	9/1/89		1.97	4.32	0.239	49	69	9.75	25.0	6.29	0.46	0.24		ERR	10.6	0.0	49.2	2.49	0.63
12	8666-007	212/123	9/5/89	457	3.15	5.77	0.355	48	73	5.45	28.4	8.92	0.55	0.60	80	14.4	36.2	0.0	19.2	2.15	3.08
10	8667-019	211/145	9/5/89	855	5.20	5.31	0.247	30	62	5.05	28.9	10.51	0.98	1.34	154	44.5	32.5	0.0	30.8	1.95	1.26
9	8668-027	211/117	NO PLANT													0.0					
7	8673-021	210/053	9/1/89	256	11.17	5.45	0.227	46	69	6.30	28.1	16.61	2.05	2.01	195	28.6	58.5	0.0	13.9	1.39	1.56
8	8674-001	210/060	9/1/89	955	4.82	5.34	0.225	21	41	6.35	30.7	10.16	0.90	1.03	348	46.0	34.7	0.0	33.5	2.18	1.03
6	8679-011	209/115	9/1/89	646	8.63	4.61	0.228	26	42	6.55	24.2	13.25	1.87	2.11	191	55.8	39.0	0.0	22.5	2.21	0.76
4	8685-010	208/072	9/12/89	518	4.25	4.98	0.239	48	70	5.75	29.2	9.24	0.65	1.49	145	22.0	66.6	0.0	14.8	2.71	0.00
44	8685-011	068/23	9/13/89	89	8.32	4.92	0.231	29	58	4.75	25.0	13.24	1.69	0.61		7.4	43.5	0.0	15.6	2.35	1.34
43	8685-047	068/27-28	9/13/89	22	3.26	4.22	0.236	27	60	6.70	25.0	7.49	0.77	0.57		0.7	60.5	0.0	12.1	3.59	0.00
5	8685-068	208/134	9/12/89	1218	6.11	9.90	0.201	36	59	7.85	24.5	16.01	0.62	2.07	197	74.4	66.0	0.0	11.9	1.92	1.41
45	8686-018	068/21-22	9/13/89	649	3.86	7.29	0.206	32	52	5.89	25.2	11.14	0.53	0.64	238	25.0	73.1	0.0	11.8	2.78	0.68
24	8692-026	216/040	9/12/89	376	11.30	4.44	0.237	16	35	5.95	26.5	15.74	2.54	2.24	170	42.5	45.2	0.1	24.9	2.03	1.10
29	8693-016	217/071			7.49	3.72	0.306	28	46	10.68	25.0	11.21	2.01	1.30		ERR	47.3	0.1	26.9	2.11	0.15
46	8695-003	068/18	9/13/89	89	5.95	5.60	0.229	20	36	5.20	25.0	11.55	1.06	0.99		5.3	26.0	0.0	33.0	2.00	0.47
26	8695-003	216/078	9/5/89	1011	7.42	5.75	0.269	17	34	5.10	24.7	13.16	1.29	0.66	162	75.0	16.7	0.0	38.9	2.39	0.45
27	8695-023	216/112	9/12/89	490	7.91	8.19	0.225	24	40	4.55	30.6	16.10	0.97	1.80	241	38.7	45.0	0.0	27.1	2.31	0.96
30	8696-003	217/114	9/5/89	864	8.65	3.72	0.238	16	36	5.60	30.4	12.37	2.32	1.07	127	74.7	32.3	0.0	30.2	1.72	1.35
48	8696-011	068/13	9/13/89	1011	1.65	5.73	0.255	30	41	5.40	31.6	7.39	0.29	0.72	496	16.7	67.9	1.0	16.8	3.50	0.41
31	8696-011	217/126	9/12/89	379	8.06	7.19	0.221	37	62	5.10	26.7	15.27	1.12	1.88	161	30.7	58.2	0.0	9.9	1.57	1.44
32	8696-013	217/128	9/12/89	505	7.33	6.56	0.218	37	62	1.60	25.8	13.89	1.12	2.06	154	37.1	62.5	0.0	9.3	1.56	1.41
47	8696-016	068/15-16	9/13/89	184	5.06	6.47	0.225	28	46	5.74	25.9	11.54	0.78	1.26	293	9.3	33.4	0.0	28.2	1.81	1.95
33	8696-025	217/148		56	7.89	6.96	0.21	25	43	7.70	25.0	14.85	1.13	1.59		4.4	46.7	1.2	29.5	3.30	0.88
28	8697-024	216/140	9/5/89	519	3.46	4.11	0.236	32	52	5.74	32.4	7.57	0.84	0.68	185	18.0	54.4	0.0	21.7	2.15	1.49
18	8699-015	215/058	9/5/89	715	7.18	5.94	0.278	33	53	4.50	28.7	13.11	1.21	0.97	204	51.3	28.7	0.2	4.0	0.45	0.33
19	8699-016	215/061	9/5/89	1158	6.45	6.58	0.222	33	51	5.70	26.1	13.03	0.98	1.85	157	74.7	47.6	0.0	4.2	0.29	0.45
20	8699-028	215/074	9/18/89	518	3.31	7.96	0.228	35	52	5.70	26.5	11.27	0.42	1.59	147	17.1	44.8	0.0	20.5	1.59	0.88
76	901-013	048/27-28	9/15/89	1868	5.46	8.55	0.221	37	59	8.69	28.6	14.01	0.64	0.91	179	102.0	54.7	0.0	15.7	2.68	1.97
176	CALFCLUST	010/03&05	9/18/89	1401	5.25	4.77	0.233	45	65	5.84	28.5	10.02	1.10	0.54	141	73.6	53.9	0.0	21.9	2.30	2.72
117	I33-06	020/15-16	9/11/89	1957	3.64	3.09	0.235	53	73	10.30	26.8	6.73	1.18	0.92	142	71.1	59.8	0.2	2.1	0.40	0.08
157	I43-11BAN	012/06-08	9/12/89	1705	8.80	4.98	0.224	35	58	5.84	26.4	13.78	1.77	1.89	184	150.0	57.9	0.0	23.3	2.70	0.85
129	I43-11BAN	018/15&17	9/15/89	2532	8.89	5.09	0.239	36	59	7.94	25.9	13.91	1.77	2.70	212	225.0	63.6	0.0	18.4	2.61	1.44
116	I43-11X	021/15	9/15/89	2027	5.40	5.65	0.228	48	70	8.16	29.2	11.05	0.96	1.09	161	109.5	64.6	0.0	17.6	2.45	0.18
115	I43-11Y	021/16	9/18/89	2251	7.29	4.56	0.236	39	61	7.09	27.5	11.84	1.60	1.83	187	164.0	58.4	0.0	22.2	2.61	0.99
216	SAAZ-36	Toppenish	9/7/89		5.67	4.22	0.235	25	43	5.84		9.89	1.34	0.66		0.0	57.1	14.6	11.3	3.38	0.00
217	SAAZ-38	Toppenish	9/7/89		2.60	2.32	0.265	30	47	5.30		4.92	1.12	0.19		0.0	52.2	13.0	9.1	3.74	0.00

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MEMORANDUM

DATE: July 9, 1990

TO: A. Haunold

THROUGH: L. R. Faulkner

FROM: S. T. Kenny

SUBJECT: QUARTERLY PROGRESS REPORT FOR 4/1/90 TO 6/30/90 FOR COOPERATIVE AGREEMENT No. 58-91H2-8-136

Off-station trials of USDA 21457, 21459, 21484, 21490 and 21491, Washington selections 8254-167 and 8254-244, and Tettnanger A and B selections were observed in off-station trials. Except for 21484, established from crowns taken from a nursery established in 1989, all plantings were trained at the normal time (unlike last year). Temperatures were cooler than normal from the last half of May through the first half of June and plant growth and development was likely delayed by the low temperatures. Recent temperatures have been normal and the plantings are developing well. Likely due to grower management practices, selection 21484, is the poorest plot.

Seedlings from some of the crosses listed in the January 9, 1990 quarterly progress report were planted in the field. Germplasm materials collected earlier this year were established in the field as well.

Six month storage analysis of 1989 crop year samples was begun, but the summary is not complete.

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MEMORANDUM

DATE: January 7, 1991

TO: A. Haunold

THROUGH: E. L. Proebsting ELP

FROM: S. T. Kenny

SUBJECT: QUARTERLY PROGRESS REPORT FOR 7/1/90 TO 9/30/90 FOR COOPERATIVE AGREEMENT No. 58-91H2-8-136 (Resubmitted)

Washington selection 415-90 was released by the Washington Agricultural Research Center and by USDA-ARS as 'Centennial' in September. Its ancestry includes Brewer's Gold, Fuggle, East Kent Golding and German germplasm. During the five years Centennial was grown in a commercial plot, the average seedless hop cone yield was 1,995 kg ha^{-1} (1,780 lbs $acre^{-1}$) and the alpha-acid content averaged 11.5%. It is mid-season in maturity and produces small dense cones that weigh about 245 mg. The hops have a citrus-floral aroma.

Off-station trials of USDA 21457, 21459, 21484, 21490 and 21491, Washington selections 8254-167 and 8254-244, and Tettnanger A and B selections were harvested and cone samples obtained. Yield and brewing quality results will be available in the next quarterly report.

Crosses between individuals showing possible resistance to American hop latent virus were made, but the success of these crosses in unknown. Seed set appears to be low, perhaps due to the unusually high temperatures during pollination.

Progeny representing crosses for evaluation of hop resistance to aphid were started in a nursery. About 250 of these were propagated and sent to Dr. Keith Dorschner at the University of Idaho Parma research center for evaluation of their resistance to aphids.

Over 300 genotypes were machine harvested from nursery plots. Included in this number are 17 new aroma hop selections for brewery evaluation.

Washington State University
Irrigated Agriculture Research and Extension Center
Rt. 2, Box 2953-A
Prosser, WA 99350-9687
509-786-2226
FAX 509-786-3454

MEMORANDUM

DATE: January 7, 1991

TO: A. Haunold

THROUGH: E. L. Proebsting

FROM: S. T. Kenny

SUBJECT: QUARTERLY PROGRESS REPORT FOR 10/1/90 TO 12/31/90 FOR COOPERATIVE AGREEMENT No. 58-91H2-8-136

Table 1 summarizes the yield and brewing quality data for experimental hop selections grown in commercial trials in Washington in 1990. Selections 21457, 21459, 21484, 21490 and 21491 are triploid Hallertauer selections from the USDA hop breeding program. Selections 21496 and 21497 are Tettnanger clones imported from Germany. Selections 8245-167 and 8254-244 are from the Prosser hop breeding program. All are aroma hop selections. Yields were lower than in past years perhaps due to the unusually hot summer temperatures. The yields of the Washington selections are especially disappointing.

Evaluation of bale and cone samples taken from the hop nurseries during the 1990 crop year is in progress.

Table 1. Yield and chemical analysis data for experimental hops grown in Washington commercial trials.

Selection	Location	Yr	Yield (lb/A)	α-acid % (at 8% Moisture)	ß-acid % (at 8% Moisture)	HSI	Coh[1] %	α/ß Ratio	ml oil/ 100 g	Myr %	Farn %	Hum %	H/C Ratio	After Six Months Room Temperature Storage: % α-acid Remaining	HSI	ml oil/ 100 g	H/C Ratio	HMEB %
21455 Mt. Hood	Granger	90	1,891	3.23	6.14	0.322	22	0.53	0.86	25.6	0.0	38.2	2.45					
		89	1,988	4.23	6.33	0.280	26	0.67	1.32	37.8	0.0	33.7	2.45	19.7	1.294	0.51	3.51	7.39
		88	2,020	2.88	5.37	0.270	25	0.54	0.91	27.9	0.1	38.4	2.58	64.8	0.638	0.54	2.96	6.55
		87	910	3.27	5.42	0.239	25	0.60	0.73	24.5	0.2	41.4	2.43	32.9	0.874	0.45	2.92	8.22
21457	Toppenish	90	996	3.71	3.86	0.260	25	0.97	0.94	33.6	0.1	38.9	3.36					
		89	1,025	3.19	3.15	0.318	28	1.01	1.11	34.3	0.1	38.6	3.47	45.0	0.768	0.44	4.25	17.71
		88	NA[2]	3.76	3.08	0.276	24	1.22	0.96	35.7	0.1	34.1	3.35	81.2	0.505	0.54	3.69	6.64
		87	NA	3.38	3.23	0.271	28	1.05	0.77	21.8	0.0	43.6	3.31	73.0	0.490	0.37	3.63	6.77
21459	Toppenish	90	1,205	3.00	4.08	0.247	24	0.73	0.64	24.2	8.0	33.2	3.33					
		89	1,704	3.04	4.20	0.299	29	0.73	0.90	38.5	7.5	27.6	3.34	48.9	0.615	0.26	4.19	15.02
		88	1,740	3.59	4.27	0.268	26	0.84	1.00	40.3	6.8	26.0	3.42	NA	NA	NA	NA	NA
		87	1,400	3.93	4.05	0.243	27	0.97	0.79	24.2	9.1	32.1	3.14	64.4	0.511	0.43	3.75	7.60
21484	Toppenish	90	NA	2.67	4.30	0.241	22	0.62	0.54	14.0	0.1	53.1	3.44					
21490	Harrah	90	1,450	1.86	4.73	0.399	21	0.39	0.42	13.8	0.0	41.1	3.43					
		89	906	2.19	6.19	0.310	24	0.35	0.49	17.3	0.0	44.7	3.38	16.5	1.305	0.26	4.17	19.31
21491	Harrah	90	1,034	2.18	3.93	0.320	21	0.55	0.64	25.8	0.0	40.8	2.58					
		89	422	2.53	3.85	0.282	27	0.66	0.83	37.2	0.2	36.2	2.68	27.3	1.136	0.33	3.52	15.86
21496 Tet A	Mabton	90	1,018	2.24	4.05	0.311	25	0.55	0.51	33.2	18.8	23.6	3.22					
		89	488	3.67	4.77	0.251	25	0.77	0.66	47.6	16.8	17.5	3.32	43.5	0.766	0.31	3.56	8.40
21497 Tet B	Mabton	90	948	3.03	4.84	0.261	26	0.63	0.47	43.4	18.1	18.5	3.35					
		89	411	4.66	5.54	0.248	27	0.84	0.56	54.7	14.9	13.2	3.32	55.8	0.714	0.25	3.50	5.89
8254-167	Toppenish	90	805	5.03	6.53	0.240	16	0.77	0.95	22.0	0.3	43.8	3.39					
		89	544	5.81	6.49	0.257	18	0.89	1.22	27.4	0.2	40.8	3.45	50.9	0.671	0.65	3.85	6.49
8254-244	Toppenish	90	525	3.75	6.00	0.251	21	0.63	0.84	21.6	3.7	44.8	3.39					
		89	511	4.60	6.14	0.247	24	0.75	1.40	30.8	4.2	38.4	3.47	40.0	0.869	0.68	3.90	8.85

[1] The 1990 Coh values are lower than previous years' because we now use EBC Method 7.4.1 for HPLC determination of α-acids and ß-acids. The EBC method separates cohumulone from deoxyhumulone. Our previous HPLC method did not separate these components.

[2] NA - Not Available.

United States Department of Agriculture
Agricultural Research Service
National Program Staff
Beltsville, Maryland 20705

October 2, 1990

Dr. Dennis Oldenstadt
Associate Director
Agricultural Research Center
Washington State University
Pullman, Washington 99164

Dear Dr. Oldenstadt:

There is returned herewith the signed release notice for Centennial hop variety W415-90 which is being released by the Agricultural Research Service in cooperation with Washington State University. As originating office, you should retain the original release notice in your files and as suggested in your letter of September 11, we would appreciate your distributing copies to the enclosed distribution list.

We appreciate this opportunity to join you in furnishing to the public one more excellent example of ARS/SAES cooperation.

Sincerely,

HOWARD J. BROOKS
Plant and Natural Resource Sciences Staff

Enclosure

cc:
A. Haunold

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
WASHINGTON, D.C.

and

WASHINGTON AGRICULTURAL EXPERIMENT STATION
WASHINGTON STATE UNIVERSITY
PULLMAN, WASHINGTON

RELEASE OF 'CENTENNIAL', A NEW HOP CULTIVAR

The Agricultural Research Service and the Washington Agricultural Experiment Station announce the release of hop selection W415-90 (USDA Accession Number 21507) as the cultivar CENTENNIAL.

CENTENNIAL originated from a cross made by C.E. Zimmermann at Prosser, Washington in 1974 between Oregon selection 6619-04 and USDA male selection 63015M. The genetic composition is 3/4 'Brewer's Gold', 3/32 'Fuggle', 1/16 'East Kent Golding', 1/32 'Bavarian' and 1/16 unknown.

CENTENNIAL was tested as selection W415-90 for twelve years in single-hill and five-hill plots at the Roza unit of the Irrigated Agriculture Research and Extension Center, Washington State University, Prosser, Washington. During this time it had a calculated average yield of 1,870 kg ha^{-1}, an average alpha acid content of 11.2%, and an average beta acid content of 4.1%. Selection W415-90 was tested in five hill plots near Corvallis, Oregon for seven years where it had a calculated average yield of 1,630 kg ha^{-1}, an average alpha acid content of 12.1%, and an average beta acid content of 4.3%. In a three-year nine-hill plot at Wilder, Idaho it had an average alpha acid content of 11.5%, and an average beta acid content of 4.2%.

Between 1985 and 1989, selection W415-90 was tested in a 0.8 ha commercial planting near Prosser, Washington. During this time it had an average seedless yield of 1,996 kg ha^{-1}, an average alpha acid content of 11.5%, and an average beta acid content of 4.6%. During the same period, the average seedless hop yield in Washington was 2,077 kg ha^{-1}.

CENTENNIAL is an early to mid-season maturing cultivar. It has excellent spring regrowth and good vigor. The bines generally cling well to the string and climb rapidly. The lateral branches range between 0.6 and 1.3 m in length and the plant has a clavate growth form.

CENTENNIAL produces small dense cones that are evenly distributed on the upper half of the plant. Seedless cones average 33 mm in length and 245 mg in dry weight. At maturity, the bracts are light green, ovate and average 17 mm in length; the seedless bracteoles are yellow-green, lanceolate and average 14 mm in length. The cones are borne in loose clusters on the lateral branches, and thus are easily picked and cleaned. The abundant lupulin is yellow and has an average alpha acid homolog composition of 61% humulone, 29% cohumulone and 10% adhumulone. After six months storage at room temperature, more than 50% of the original alpha acid content remained in the dried compressed hops, indicating fair storage stability of the alpha acids. Oil content averages 1.5% of the

dried hops. The composition of the major essential oils averages 58% myrcene, 11% humulene and 5% caryophyllene. The hops have a citrus-floral aroma. Brewing evaluations of CENTENNIAL have been favorable.

CENTENNIAL is moderately resistant to hop downy mildew incited by Pseudoperonospora humuli Miy. et Tak G. W. Wilson. It is free of Prunus necrotic ringspot virus and apple mosaic virus, but it carries hop mosaic virus, hop latent virus and American hop latent virus.

Planting stock of CENTENNIAL will be maintained by the Irrigated Agriculture Research and Extension Center, Washington State University, Prosser, WA 99350.

for _____ 9-11-90
Director, Washington Agricultural Experiment Station — Date

_____ SEP 27 1990
Administrator, Agricultural Research Service, USDA — Date

Table 1. Comparison of the Yield of Selection W415-90 and Galena, Nugget, and Chinook grown in Washington.

Year	Area Harvested (acres)	Yield (pounds/acre)	Area Harvested (acres)	Yield (pounds/acre)
	Galena		Chinook	
1985	3,957	1,644	109	1,834
1986	3,686	2,098	249	1,843
1987	4,050	1,870	800	1,690
1988	4,900	1,890	1,000	1,990
1989	5,735	1,920	1,269	1,880
	Average	1,884	Average	1,847
	Nugget		W415-90	
1985	1,047	1,458	2	1,580
1986	1,510	2,035	2	2,085
1987	1,400	1,870	2	1,726
1888	1,800	1,620	2	1,900
1989	2,241	1,940	2	1,621
	Average	1,785	Average	1,782

Source: 1985 and 1986 Hop Administrative Committee
1987, 1988 and 1989 Hop Growers of America

Table 2. Comparison of the Brewing Quality Analysis of Selection W415-90 and Galena, Chinook and Nugget.

Cultivar	Alpha Acid %	Beta Acid %	A/B Ratio	Cohumulone %	ml Oil/ 100 g	H/C Ratio	Storage Stability
Galena	12.4	6.9	1.79	40	1.31	1.98	Good
Chinook	12.1	3.2	3.77	32	1.53	2.02	Fair
Nugget	13.0	4.0	3.23	25	1.40	2.20	Fair
W415-90	11.5	4.6	2.50	29	1.49	2.45	Fair

Source: Average analysis of hops grown at IAREC between 1985 and 1989.

A/B ratio measures alpha to beta acid ratio which characterizes the hop soft resins.
Cohumulone is a component of alpha acid.
H/C ratio measures humulene to caryophyllene ratio which characterizes hop essential oil.

Release of Five Hop Selections for Downy Mildew Research (Germplasm Release)

Plant Breeder: S.T. Kenny Date: November 15, 1990

Agencies: Washington State University, Agricultural Research Center, Department of Agronomy and Soils, Irrigated Agriculture Research and Extension Center, Prosser.

A. Identification:

1. Selection Nos.: 8154-017, 8154-049, 8154-097, 8154-099, 8154-110.

2. Proposed Names: Ph1, Ph2, Ph3, Ph4, Ph5.

3. Pedigree: 'Hersbrucker' x open pollinated

B. General Situation:

1. Unique Cultivar Characteristics:

These selections are valuable for maintaining an annual source of hop downy mildew inoculum. Hop downy mildew is an obligate parasite. Plants which produce shoots systemically infected with hop downy mildew reliably and do not die are useful to hop downy mildew research projects. Other hop genotypes showing systemically infected shoots either die, or do not regularly produce systemically infected shoots. Each year, for eight years, these selections produced systemically infected shoots.

2. Use-Type:

The selections are useful to hop downy mildew research projects as a reservoir of hop downy mildew inoculum.

3. Description and General Information:

The selections originated from open pollinated seed collected in 1981 from a clone of 'Hersbrucker' grown near Harrah, Washington. Seedlings were planted at Prosser in spring 1982, and by 1983 many seedlings were infected with hop downy mildew. The seedlings surviving the hop downy mildew infection were observed for two years and those with the most consistent incidence of disease were propagated for further field study. The plants were evaluated for five (1986 to 1990) additional years. They were used by Dr. Cal Skotland, WSU Plant Pathologist, as a source of hop downy mildew inoculum for his research.

4. To Supplant:

To my knowledge, these are the first hop plants to be released as a source of hop downy mildew inoculum.

C. Performance Evaluations:

1. Agronomic:

Because of the severe hop downy mildew infection generally shown by these selections, they were never evaluated in yield trials. They are not useful commercial types because of their high level of susceptibility to hop downy mildew. The selections were grown in three different locations at the Headquarters Unit of the IAREC at Prosser, but no where else.

2. Quality:

The brewing quality of these selections has not been evaluated.

3. Resistance to Diseases, Insects, Other:

The plants are very susceptible to hop downy mildew caused by Pseudoperonospora humuli. Their reaction to Phytophthora root rot and Verticillium wilt is unknown. The plants are not infected with prunus necrotic ringspot virus or apple mosaic virus. They are symptomless carriers of hop mosaic virus, hop latent virus and American hop latent virus. No unusual resistance or susceptibility to either hop aphid or twospotted spider mite is apparent.

4. Winterhardiness (of winter types):

The winterhardiness of the selections is similar to that of other hop genotypes.

5. Area of Adaptation:

The selections should be adapted to areas were hop is grown.

6. Other Important Traits:

None.

7. Weaknesses?

Because the plants are very susceptible to hop downy mildew, they are unsuitable as commercial cultivars.

D. Seed Source, Status and Availability:

After public release of the germplasm, rhizomes will be available to interested researchers through Stephen Kenny at WSU-Prosser.

E: Other Comments:

None.

F: Probable Date for Possible Release:

January 1991.

G: Any Provisions for PVP?

None.

COLLEGE OF AGRICULTURE AND HOME ECONOMICS
Agriculture Research Center 6240

M E M O R A N D U M

TO: Interested Hop Researchers/Administrators

FROM: James J. Zuiches, Director

DATE: February 8, 1991

SUBJ: Hop Germplasm Release

Attached is the information about 5 germplasm lines of hop selections for Hop Downy Mildew Research.

klSHop.var

Encl.

WASHINGTON AGRICULTURAL RESEARCH CENTER
WASHINGTON STATE UNIVERSITY
PULLMAN, WASHINGTON

RELEASE OF FIVE HOP SELECTIONS FOR HOP DOWNY MILDEW RESEARCH

The Washington Agricultural Research Center announces the release of five hop, (Humulus lupulus L.) selections. The selections are useful as a yearly source of hop downy mildew inoculum (Pseudoperonospora humuli Miy. et Tak G. W. Wilson).

The selections originated from open pollinated seed collected in 1981 from a clone of 'Hersbrucker' grown near Harrah, Washington. The seedlings were planted at the Washington State University Irrigated Agriculture Research and Extension Center at Prosser in spring 1982. By 1983 many seedlings were infected with hop downy mildew. The seedlings surviving the infection were observed for two additional years and those with the most consistent incidence of disease were selected and propagated for further field study.

Each year these selections produce shoots systemically infected with hop downy mildew and uninfected shoots. Table 1 lists the five-year (1986 to 1990) average proportion of systemically infected shoots produced each year. The selections do not show crown die-out induced by hop downy mildew infection. Ph2 can produce systemically infected shoots during the entire growing season. The other selections usually do not produce systemically infected shoots after mid-July.

Hop downy mildew is an obligate parasite. Usually hop plants that produce shoots systemically infected with hop downy mildew either die or do not regularly produce systemically infected shoots. These selections are valuable because they can produce shoots systemically infected with hop downy mildew every year. They are also unique in their ability to produce systemically infected shoots until mid-summer. Using these selections, a disease cycle can be maintained even during periods when lesions on infected leaves dry. The five selections provide a consistent annual source of inoculum for hop downy mildew research.

Planting stock of the selections will be maintained by the Irrigated Agriculture Research and Extension Center, Washington State University, Prosser, WA 99350.

Table 1. Proportion of the total shoots produced per year that are systemically infected with hop downy mildew, five year average (1986-1990).

Selection	Systemically Infected Shoots, %
Ph1	38
Ph2	26
Ph3	21
Ph4	35
Ph5	14

Director, Washington Agricultural Research Center

12/17/90
Date

Idaho Department of Agriculture
Hop Disease Control Order
(By Provision of Title 22, Chapters 7, 19, and 20, Idaho Code)

SECTION 1. REGULATED PESTS

Verticillium wilt (Verticillium albo-atrum Reinke and Berth.) a persistent soil born fungus disease of hops and any species or strains of the genus Verticillium virulently pathogenic to hops.

SECTION 2. REGULATED PRODUCTS

(A) Rootstocks (i.e. rhizomes, strap cuttings, or greenwood cuttings of all species of the genus Humulus).

(B) Machinery, vehicles, tools, equipment, trellis poles, wire, anchor irons, and any other appurtenances used in the culture and/or production of hops.

SECTION 3. CONTROL AREA

Bonner, Boundary, and Kootenai Counties, State of Idaho.

SECTION 4. REGULATIONS GOVERNING ELIGIBLE ROOTSTOCKS

(A) Only rootstocks eligible for phytosanitary certification may be imported into the control area or transported as planting stock within the area. Eligibility will be established by meeting the following requirements:

1. Imported rootstocks

   a. A desired clone must be grown under observation at a state or federal hop research facility in Idaho, Washington, or Oregon for two (2) consecutive years or growing seasons with no evidence of Verticillium wilt.

   b. Only rooted aerial stem cuttings or apical meristems derived from clones having undergone the two (2) year observation period may be imported into the control area.

   c. Colonies derived from eligible clones may serve as sources of eligible rootstocks but only after two (2) consecutive growing seasons in a commercial yard or nursery within the control area.

   d. Eligible clonal stocks must be accompanied by a phytosanitary certificate when imported into the control area. A copy of the certificate must be filed with the Idaho Department of Agriculture, Bureau of Plant Services, at least ten (10) days prior to shipment. The certificate must affirm freedom from Verticillium wilt and compliance with subparagraphs a, b, and c of this section.

2. Eligible rootstocks from within the control area

   a. Existing eligible stocks within the control area may be moved freely from field to field by the owner.

b. Rootstocks sold, moved, or transferred within the control area to other than the owners land must be accompanied by a valid transfer permit issued by the Department. Rootstocks moved without a transfer permit will not be eligible for future sale or transfer.

(B) Inspection procedures to retain eligibility.

1. Existing plants within the control area will be inspected at least once every other year except those plantings intended for sale or transfer in which case they must have been inspected during the twelve (12) month period immediately prior to transfer.

2. All new plantings of imported rootstocks will be inspected annually for the first two (2) consecutive years following initial planting and at least every 24 months thereafter.

3. It shall be the responsibility of the individual grower to notify the Department of movement of eligible stock into new fields, sales and/or purchase of rootstocks. He shall also initiate annual requests on or before July 1 for inspections to maintain eligibility.

SECTION 5. REGULATIONS GOVERNING THE MOVEMENT OF FARMING EQUIPMENT

(A) Farm equipment, including but not limited to tillage equipment, vehicles and hop yard appurtenances moving into the control area must be clean and free of soil and hop debris.

(B) Freedom from plant material and soil may be accomplished by washing, steam cleaning, and/or use of a disinfectant appropriately labeled for the purpose.

SECTION 6. POSTING OF FIELDS

(A) All hop yards and nurseries within the control area shall be posted to prevent entry of unauthorized personnel and vehicles.

(B) Signs shall be visible from adjacent public roadways or points of access to hop yards.

SECTION 7. REGULATIONS GOVERNING DISEASE DETECTION

(A) If visual inspection detects evidence of a regulated disease, laboratory procedures sufficient to determine the causal organism will be performed by the Department of Agriculture in cooperation with the University of Idaho, Department of Plant and Soil Sciences.

(B) Positive identification of the presence of Verticillium wilt virulently pathogenic to hops will result in loss of eligibility for sale or transfer for those rootstocks within the infected field and in addition a directive may be issued that the infested area be removed from hop production and the soil be disinfested.

SECTION 8. EXEMPTIONS

(A) This order does not apply to any governmental agency growing hops in experimental plots approved by the Director, Idaho Department of Agriculture and under the supervision of qualified plant scientists.

(B) Such experimental plots may serve as quarantine areas during the period that a clone is meeting the eligibility requirements for phytosanitary certification.

SECTION 9. AUTHORITY TO ENTER AND INSPECT

(A) The Director, Idaho Department of Agriculture, or his designated agents are authorized to enter and inspect any and all hop plantings within the state of Idaho.

SECTION 10. PENALTIES AND ENFORCEMENT POWERS

(A) All designated agents of the Idaho Department of Agriculture are empowered to carry out the provisions of this order.

(B) Any person violating the provisions of the order may be subject to the penalty provisions of Title 22, Chapter 7, 19, and 20, Idaho Code.

SECTION 11. FEES AND CHARGES

(A) Under provisions of Title 22, Chapter 7, Idaho Code, the fees and charges for inspection, certificates, and permits under this order shall be as follows:

1. Transfer Permits - for in-state sale of rootstocks: $5.00 per certificate.

2. Phytosanitary Certificates for exporting purposes: $7.50 per certificate.

3. Field Inspection

   a. Application for field inspection: $2.00 per field.

   b. Late Penalty Fees: $20.00 per application on all applications received after July 1 of each year and prior to July 15.

   c. Acreage Inspection Fee: $2.00 per acre or fraction thereof per field.

4. Laboratory Fees:

   a. $50.00 per sample.

SECTION 12. EFFECTIVE DATE

This control order shall be effective on and after August 1, 1980.

STATE OF IDAHO
DEPARTMENT OF AGRICULTURE
P O BOX 790
BOISE IDAHO 83701

INSPECTION REPORT

Establishment Name Hop Stop Date 4-26-90
Address Box 304 Bonners Ferry ID 83805
Report for:

____ Feeds	____ Pesticides	Dealer license No.	____
____ Fertilizer	____ Seeds	Sent in license fee	____
X Nursery		Left application	____
____ Unregistered products found (list below)		Refused to license	____

Hop Stop is hereby given notice they must remove from sale the Hops rhizomes they were offering for sale. The reason being is the Hop Disease Control order regulating importation of hops rootstock into Boundary County.

Comments: ____

(Inspector) (Dealer)

☐ Unless otherwise stated, the establishment named above has fourteen (14) days from the date of this report to obtain the required Idaho dealer license.

☐ Unless otherwise stated, the establishment named above has 30 days from date of this report to register or cause to be registered all products listed above which are not registered. At the end of this 30-day period, all products may be subject to a "Stop Sale" order in accordance with the applicable state law.

Original - Department of Agriculture **Yellow** - Dealer **Pink** - Inspector