1975

ANNUAL REPORT

HOP INVESTIGATIONS

Corvallis, OR.

1975 ANNUAL REPORT

HOP BREEDING, GENETICS, CHEMISTRY, AND PATHOLOGY

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TABLE OF CONTENTS

HOP PRODUCTION STATISTICS (HAC data)

Total hop production of the four states in 1975 was about 2% lower than in the previous year (page 6). Total production amounted to 55.9 million pounds or 282,229 bales. The hop acreage (page 5) showed a very slight change with an increase of 203 acres in Washington, an increase of 50 acres for Oregon and of 35 acres for California, and a decrease of 377 acres for Idaho, making the total 1975 acreage for the four states 32,467 acres, a net decrease of 90 acres from the previous year. Of these acres the largest proportion (49% or 15,973 acres) was occupied by Early Clusters followed by 13% Cascades, 12% Late Clusters, 8% Fuggles, 6% English (Bullion & Brewers Gold)and 5% Cal.Clusters. Thus, Cascades are now the second most important hop variety in the United States after Early Clusters in terms of acreage.

Hop production showed a significant increase for the state of Oregon, particularly for Cascade which resulted in a large number of bales of Oregon Cascades to be placed in the pool. Washington production decreased by about 3% to a total of 37.7 million pounds, whereas Idaho decreased by 12% and California had a 2% increase (page 6).

World hop production (page 7) in 1975 showed a slight decrease over the previous year but with 241.6 million pounds it is still a very large crop. West Germany with 29% of the total world production was the leading hop producing country followed by the U.S. (23%). Thus, the two leading hop production countries, West Germany and the United States again contributed nearly 50% of the total world hop crop.

U.S. hop imports (page 10) for the brewing year 1974-75 were down slightly from the previous year. The 14.16 million pounds of imports were still a significant factor in the domestic hop market. U.S. hop exports (page 11)

amounted to 25.2 million pounds, down slightly from the previous year. The total value of the exports was 25.92 million dollars as compared to a value 17.7 million dollars of hop imports, leaving a net favorable trade balance in 1974-75 of 8.2 million dollars. The leading hop purchasing countries in the order of pounds of hops purchased in 1974-75 were: Brazil (4.8 million pounds), Mexico (3.5 million pounds), Canada (3.4 million pounds), Soviet Union, Columbia, Peru, Ireland, Japan, Zaire, and the Phillipines in that order (pages 12-13)

In comparing U.S. hop production over the last few years with the percentage of production that was legally available (page 14) we see that in the past 3 years the production potential has not been reached. In 1973 with 93% of the base available for production we produced a total of 54.11 million pounds or 91% of the base. In 1974 the base allotment was 100% and our production was 56.36 million pounds or 95% of base. In 1975 with 100% of base available for production we only reached 93% or 55.35 million pounds. Fire losses and down yards are the main reasons for this short-coming in production as well as lower than expected yields in Washington.

The supply and hop disposition picture for 1974-75 is not very encouraging (page 15). There seems to be a over-supply of hops in brewer's and dealer's hands amounting to a total of over 100 million pounds at the end of 1975. This compares to a brewery usage of about 35 million pounds and an export of slightly over 25 million pounds which leaves about 42 million pounds of hops available for additional users. Part of the reason for this large carry-out can be found in the decrease of the hopping ratio which in 1974-75 averaged only 0.222 pounds per barrel of beer as compared to 0.238 in 1973-74 and 0.243 in 1972-73 (page 15). Increased use of hop pellets and hop extracts probably are the major reasons for further decline in the hopping ratio. A further build-up of available hop stocks was caused by a slowdown of beer production (page 16). Some

brewers, notable Miller and Olympia and Stroh showed a significant increase in beer output whereas others such as Schlitz and Anheuser-Busch remained essentially flat and some, notably Coors, Rheingold, and Carling showed a significant decrease in beer output. With a pickup in the overall economic situation for 1976 an increase in beer sales and hop useage for the coming brewing year is anticipated.

Total 1975 Production

1/14/76

Hops	Calif.	Idaho	Oregon	Wash.	Total
Actual Bales	12,667	30,752	49,265	189,545	282,229
	----------1,000 lbs.----------				
Production 1/	2,546	6,113	9,498	37,761	55,918
Less: Fire Loss	0	(4)	(45)	(176)	(225)
Reserves	0	0	(329)	(34)	(363)
Total Salable	2,546	6,109	9,124	37,551	55,330
1/ Average bale wts.	201.0	198.8	192.8	199.2	198.1

1975 Reserve Pool Categories (Bales)

I Hops					
Grp. A (Clstr. or higher alpha type)	-	-	-	165	165
" B (English type)	-	-	946	-	946
" C (Fuggle type)	-	-	171	-	171
" D (Cont. or lower alpha type)	-	-	481	3	484
II (Screenings)	-	-	-	-	-
III (Package hops)	-	-	49	-	49
Total	-	-	1,647	168	1,815 1/

1/ 50 bales of Fuggles and 49 of package hops sold to date.

Summary of Reserve Pools to Date

Reserve Pools	Hops (Bales)	Screen. (Equiv. Bales)	Total (Lbs.)	Total Income
1966 thru 1974	39,695 1/	755 2/	8,027,587	$5,324,572.02
1975	1,815	-	363,000	282,903.00 3/
Total	42,195	755	8,527,587	$5,724,572.02

1/ Includes 2,705 bales from 1974 pool (and in totals) still for sale at 73¢ plus.
2/ Includes 133 equivalent bales of unsold 1973 screenings (not in totals).
3/ Assuming 1975 pool is sold at 76¢ plus for Categ. I and 35¢ flat for package hops.

Parity and Grower Prices

Crop Year (9/1-8/31)	Season Average (9/1-8/31) Parity Price	Grower Price	Reserve Pool Gr. Return
	¢ per lb.		
1966-67	67.6	46.7	13.9
1967-68	67.8	45.9	13.9
1968-69	69.1	47.2	13.9
1969-70	70.7	51.0	69.8
1970-71	73.7	56.0	69.6
1971-72	78.5	65.9	74.3
1972-73	88.6	71.4	74.2
1973-74	101.8	76.2	76.6
1974-75	113.1	79.3	

Monthly (1974-75)

Mo.	Parity Price	Mo.	Parity Price
	$ per lb.		
Sept. -	1.18	Mar. -	
Oct. -	1.17	Apr. -	
Nov. -	1.17	May -	
Dec. -	1.18	June -	
Jan. -		July -	
Feb. -		Aug. -	

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

1975 ACREAGE BY STATE (FINAL)
(Strung for Harvest)

1/14/76

	Wash.	Oregon	Idaho	Calif.	Total	Incr. over Prior Year
			Acres			%
1970 -	18,773	4,304	3,254	1,396	27,727	3%
1971 -	19,046	5,076	3,434	1,489	29,045	5%
1972 -	19,251	5,242	3,833	1,473	29,799	3%
1973 -	20,665	5,352	3,981	1,473	31,471	6%
1974 -	21,400	5,571	4,086	1,500	32,557	3%
Plntgs. new ground 1/	462	107	1	37	606	
Plow out & not Repl.	(259)	(57)	(378)	(2)	(696)	
1975 Final	21,603	5,621	3,709	1,535	32,467	
Net Change	203	50	(377)	35	(90)	(0.3%)

1/ Plantings on new ground to be harvested for first time in 1975.

1975 BABY ACREAGE BY STATE

New Plantings 1975	462	107	1	37	607
Replantings for 1975	803	32	221	44	1,100
Total Babies	1,265	139	222	81	1,707
% of Total Acreage	6%	2%	6%	5%	5% 1/
Baby Cascade Acreage	906	156	161	0	

1/ Babies were 10% of total in 1971, 5% in 1972, 8% in 1973 and 8% in 1974.

1975 ACREAGE--BY STATE AND VARIETY
(Strung for Harvest)

	Wash.	Oregon	Idaho	Calif.	Total	% of Total
			Acres			
Category I (Cluster or higher alpha type)						
Clusters - Early	15,300	22	651	0	15,973	49%
Clusters - Late	2,800	48	1,041	0	3,889	12%
Talisman - Late	*	132	1,071	0	1,203	4%
Cal. & Gr.P. Sdls.-Late	0	140	0	1,533	1,673	5%
Comets	415	1	2	2	420	1%
Others 1/	377	1	5	0	383	1%
Category II						
English - Late 2/	*	1,897	0	0	1,897	6%
Category III						
Fuggles - Early	0	2,522	0	0	2,522	8%
Category IV (Cont. or lower alpha type)						
Cascade-Mid. to Late	2,711	846	757	0	4,314	13%
Others 3/	*	12	182	0	194	1%
Total	21,603 4/	5,621	3,709	1,535	32,468	100%

1/ Includes other Cat. I Clust. or higher alpha-type varieties such as North. Brewers, U of I 40, T-1 and other exper. varieties not falling in other three categories.

2/ Bullions - 1,277 acres (67%); Brewers Gold - 620 acres (33%).

3/ Includes Hallertau, Tettnang, Triploid Fuggles, and other flavor-type varieties.

4/ Acreage count by variety not available in Wash. except for Cascades (12%) and Comets (2%). Early Clust. estimated at 71%; Late Clust. at 13%; and other varieties (i.e. Talis., Bullions, Tettnang, Pr. of Ringwood, etc.) at 2%. Early Clust. incl. E-2, E-21 and L-1; and Late Clust. incl. L-8 and L-16 originating from certified root stock. Acreage of varieties shown with (*) are included in estimate of "other" Wash. acreage in Cat. I.

SOURCE: HAC Records.

ALL VARIETIES - ACREAGE, YIELD & PRODUCTION

1/14/76

State	Acreage Harvested 1973	Acreage Harvested 1974	Acreage Harvested 1975	Yield Per Acre (lbs.) 1973	Yield Per Acre (lbs.) 1974	Yield Per Acre (lbs.) 1975	Product. (1,000 lbs.) 1973	Product. (1,000 lbs.) 1974	Product. (1,000 lbs.) 1975	% Chge.
Oregon										
Fuggles	2,753	2,543	2,496	1,247	1,254	1,237	3,433	3,190	3,088	
English	1,872	1,891	1,877	2,371	1,924	2,288	4,439	3,638	4,295	
Others	680	1,094	1,173	1,438	1,537	1,803	978	1,682	2,115	
Sub-Tot.	5,300	5,500	5,600	1,670	1,550	1,700	8,850	8,525	9,520	12%
Wash.	20,600	21,300	21,300	1,780	1,830	1,770	36,668	38,979	37,701	(3%)
Idaho	4,000	4,100	3,700	1,750	1,700	1,660	7,000	6,970	6,142	(12%)
Calif.	1,500	1,500	1,500	1,500	1,670	1,700 1/	2,250	2,505	2,550	2%
Total	31,400	32,400	32,100	1,744	1,759	1,742	54,769	56,979	55,913	(2%)

1/ Calif. actual yield was 1660 lbs. on 1535 acres before rounding.

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

SOURCE: USDA except variety figures in Oregon.

CASCADES - ACREAGE, YIELD AND PRODUCTION

Wash.	849	1,821	2,667	1,068	1,587	1,738	907	2,890	4,634
Oregon	269	706	843	1,030	1,458	1,943	277	1,029	1,638
Idaho	141	596	757	1,163	933	1,256	164	556	951
Calif.	1	0	0	1,000	0	0	1	0	0
Total	1,260	3,123	4,267	1,071	1,433	1,693	1,349	4,475	7,223

Note: In 1975 there were 123 growers of Cascades with 80 in Wash., 28 in Oreg., and 15 in Idaho.

SOURCE: HAC records.

ALL OTHER VARIETIES - ACREAGE, YIELD AND PRODUCTION

Wash.	19,751	19,479	18,633	1,811	1,853	1,775	35,761	36,089	33,067
Oregon	5,031	4,794	4,757	1,704	1,564	1,657	8,574	7,496	7,882
Idaho	3,859	3,504	2,943	1,771	1,831	1,764*	6,836	6,414	5,191
Calif.	1,499	1,500	1,500	1,500	1,670	1,700#	2,249	2,505	2,550
Total	30,140	29,277	27,833	1,772	1,793	1,749	53,420	52,504	48,690

* 1786 in S.W. Idaho.

1660 on 1535 acres before rounding.

SOURCE: HAC records.

U.S. World Production - 1966 to Date

1/14/76

	Yield per Acre					U.S. Production	W. Germany Production	Other World Production	Total World Production 1/
	Wash.	Ore.	Idaho	Calif.	U.S.				
	---Pounds---					---1,000 lbs.---			
1965	1,710	1,450	1,950	1,840	1,714	56,100(28%)	40,100(20%)	106,900(52%)	203,100(100%)
66	1,790	1,430	1,810	1,590	1,721	55,400(27%)	38,500(18%)	114,400(55%)	208,400 "
67	1,660	1,490	1,810	1,830	1,661	49,500(24%)	49,200(24%)	108,300(52%)	207,000 "
68	1,510	1,480	1,740	1,660	1,540	43,700(22%)	48,500(24%)	110,600(54%)	202,800 "
69	1,560	1,250	1,860	1,550	1,547	41,800(20%)	50,100(24%)	114,200(56%)	206,100 "
70	1,680	1,670	1,540	1,560	1,656	45,900(21%)	58,900(27%)	116,500(52%)	221,300 "
71	1,730	1,700	1,640	1,700	1,718	49,700(24%)	53,400(25%)	107,000(51%)	210,100 "
72	1,810	1,470	1,710	1,610	1,728	51,300(22%)	66,900(28%)	112,400(50%)	230,600 "
73	1,780	1,670	1,750	1,500	1,744	54,800(21%)	84,900(32%)	125,300(47%)	265,000 "
74	1,830	1,550	1,700	1,670	1,759	57,000(23%)	73,900(30%)	114,700(47%)	245,600 "
75	1,770	1,700	1,660	1,700	1,742	55,900(23%)	70,000(29%)	115,700(48%)	241,600 "

	Disposition of Salable Production					U.S. Brewery Usage	
	Exports	Net Domestic Usage of U.S. Hops 3/	Plus or (Minus) Unacc. Difference	Increase or (Decrease) in Domestic Stocks	Salable Product. 2/	Net Usage U.S. Hops	Net Usage Foreign Hops
	---1,000 lbs.---					---1,000 lbs.---	
1966-67	26,936(50%)	23,058(43%)	1,111(2%)	2,770(5%)	53,875(100%)	23,058(74%)	8,288(26%)
67-68	21,887(49%)	22,184(50%)	1,335(3%)	(710)(-2%)	44,696 "	22,184(71%)	9,060(29%)
68-69	21,150(49%)	21,597(51%)	(1,054)(-3%)	1,090(3%)	42,783 "	21,597(67%)	10,466(33%)
69-70	18,275(44%)	22,502(54%)	1,056(2%)	(150)(-*)	41,683 "	22,502(67%)	10,915(33%)
70-71	24,504(54%)	20,940(46%)	107(*)	290(*)	45,841 "	20,940(64%)	11,776(36%)
71-72	31,902(64%)	22,415(45%)	(2,257)(-4%)	(2,170)(-4%)	49,890 "	22,415(66%)	11,588(34%)
72-73	28,061(55%)	21,774(43%)	(81)(-*)	1,410(2%)	51,164 "	21,774(63%)	12,955(37%)
73-74	25,479(48%)	23,394(43%)	2,505(4%)	2,730(5%)	54,108 "	23,394(63%)	13,584(37%)
74-75	25,215(45%)	21,701(38%)	1,749(3%)	7,700(14%)	56,365 "	21,701(62%)	13,411(38%)

*Less than 1%.

1/ FAS, USDA.

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

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

SOURCE: SRS, FAS and HAC records.

1/14/76

Season Average Farm Price by States--1968 to Date

Crop Year	Wash.	Oregon	Idaho	Calif.	Average	Value of Production All States
	¢ per lb.					--$1,000--
1968	46.5	48.0	48.0	52.0	47.2	$20,659
1969	50.0	52.0	53.0	56.0	51.0	21,305
1970	55.0	58.0	58.0	59.0	56.0	25,681
1971	64.0	69.0	67.0	65.0	65.3	32,461
1972	69.0	79.0	75.0	72.0	71.4	36,631
1973	74.0	82.0	76.5	76.0	75.7	41,457
1974	77.0	87.0	81.0	84.0	79.3	45,138
1975 1/						

1/ Will be released 1/19/76.

Leaf & Stem Content (%)

1969	1.63	2.14	1.10	.31	1.55
1970	1.87	1.93	1.08	.53	1.79
1971	1.63	1.69	1.70	.60	1.60
1972	1.71	1.69	1.32	.39	1.60
1973	2.05	2.29	1.22	.71	1.93
1974	1.95	1.57	1.02	.56	1.72
1975	1.75	1.24	.97	.65	1.53

1975 Down & Unharvested Acreage

	Rounded Prod. for Harvest	Actual Prod. for Harvest	Unharvested			Actual Harvested	Rounded Harvested
			Down 1/	Standing	Total		
Wash.	21,600	21,603	180	112	292 2/	21,311	21,300
Oregon	5,700	5,621	42	27	69 3/	5,552	5,600
Idaho	3,700	3,709	--	--	--	3,709	3,700
Calif.	1,500	1,535	--	--	--	1,535	1,500
Total	32,500	32,468	222	139	361	32,107	32,100

1/ Total down yards were 882 acres (Wash. 759 & Oregon 123).

2/ 44 Cascades, 248 others -- total 292

3/ $\frac{3}{47}$ Cascades, $\frac{66}{314}$ others -- total $\frac{69}{361}$

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

1/14/76

HOPS: PRODUCTION IN SPECIFIED COUNTRIES
ANNUAL 1971-75 1/
(In thousand metric tons) 2/

Region and Country	1971	1972	1973	1974 3/	1975 (Prelim.) Nov.	1975 (Prel.) Jan.
NORTH AMERICA:						
Canada	0.7	0.5	0.7	0.4	0.4	0.6
United States	22.5	23.3	24.8	25.8	25.0	25.4
Total	23.2	23.8	25.5	26.2	25.4	26.0
WESTERN EUROPE:						
Austria	0.1	0.1	0.1	0.1	0.1	
Belgium	2.3	1.9	2.0	2.3	1.8	
France	1.9	1.9	2.2	2.1	2.0	2.0
Germany, West	24.3	30.3	38.5	33.6	30.9	31.7
Spain	1.2	2.1	2.4	2.7	2.2	2.4
United Kingdom	11.5	9.0	10.4	10.2	9.1	7.2
Total	41.3	45.3	55.6	51.0	46.1	
EASTERN EUROPE:						
Bulgaria	0.6	0.6	0.7	0.7	0.7	
Czechoslovakia	7.5	10.7	10.3	7.6	10.5	10.0
Germany, East	2.2	2.6	2.5	2.3	2.8	2.6
Hungary	0.2	0.3	0.3	0.3	0.3	
Poland	1.9	2.5	3.2	2.5	2.5	
Romania	0.5	0.5	0.5	0.5	0.5	
Yugoslavia	4.4	5.0	5.5	5.6	5.2	4.9
Total	17.3	22.2	23.0	19.5	22.5	
Total Europe	58.6	67.5	78.6	70.5	68.6	
Total USSR 4/	8.7	8.7	10.9	9.2	10.3	Down
OTHER:						
Australia	1.8	1.8	2.1	2.9	2.4	
Japan	2.4	2.3	2.6	2.1	2.3	
New Zealand	0.5	0.4	0.4	0.4	0.5	
So. Africa, Rep. of	0.1	0.1	0.1	0.1	0.1	
Total	4.8	4.6	5.2	5.5	5.3	
World total	95.3	104.6	120.2	111.4	109.6	
World total (Mill. lbs.)	210.1	230.6	265.0	245.6	241.6	

1/ Year of harvest.
2/ All tonnages have been converted to metric units; 1 metric ton is equivalent to 2204.6 pounds.
3/ Revised.
4/ Revised data, 1971-74.

SOURCE: "World Agricultural Production and Trade", FAS, USDA, Nov. 1975, except for last column which is latest est. available to HAC.

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

1/14/76

Imports of Hops - Monthly

Marketing Year (1975-76)	West Germany	Yugoslavia	Belgium	France	Others	Total
			(Pounds)			
Sept.	--	--	--	--	--	-0-
Oct.	--	--	--	--	--	-0-
Nov.	--	--	--	--	--	-0-
Dec.						
Jan.						
Feb.						
March						
April						
May						
June						
July						
August						
Total						

Imports of Hops - Annual

			(1,000 lbs.)			
1967-68	6,389	1,929	112	623	4	9,056
1968-69	6,861	2,894	119	533	55	10,461
1969-70	7,244	2,714	305	490	366	11,120
1970-71	8,520	3,515	113	796	692	13,637
1971-72	7,549	3,696	58	549	400	12,251
1972-73	8,639	3,233	57	811	305	13,045
1973-74	9,255	3,583	39	801	464	14,142
1974-75	9,088	3,596	73	662	736	14,157

Imports of Hop Extract (Hop Equiv.) - Annual

	Conversion Factor					
1967-68	2.7-1	2	0	0	0	2(U.K.) 4
1968-69	2.8-1	5	0	0	0	0 5
1969-70	3.4-1	35	0	0	0	0 35
1970-71	3.4-1	6	0	0	0	3(U.K.) 9
1971-72	2.7-1	15	0	0	0	2(U.K.) 17
1972-73	2.7-1	5	0	0	0	5 10
1973-74	3.5-1	149	0	0	3	0 152
1974-75	3.5-1	3	0	0	0	1 4

Total Imports - Annual

1967-68	6,391	1,929	112	623	6	9,060
1968-69	6,866	2,894	119	533	55	10,466
1969-70	7,279	2,714	305	490	366	11,155
1970-71	8,526	3,515	113	796	695	13,646
1971-72	7,564	3,696	58	549	402	12,268
1972-73	8,644	3,233	57	811	310	13,055
1973-74	9,404	3,583	39	804	464	14,294
1974-75	9,091	3,596	73	662	737	14,161

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

SOURCE: USDA Hop Market News Reports (Monthly) and Bureau of Census (Annual).

U. S. HOP EXPORTS, VALUE OF EXPORTS AND IMPORTS AND TRADE BALANCE 1/14/76
1969-70 TO DATE

Mkt. Yr. Begin. 9/1	Exports: Canada	Europe: Orig. U.K.	Europe: Orig. E.C.	Europe: Other	Europe: Total	Other	Total	Total Value Exports	Total Value Imports	Net Favor. Trade Bal.
	1,000 lbs.							$1,000		
Hops										
1969-70 (Final)	2,229	88	1,704	905	2,697	7,321	12,247			
1970-71 "	2,658	29	2,929	1,435	4,393	7,535	14,586			
1971-72 "	2,187	750	6,908	4,594	12,252	7,033	21,472			
1972-73 "	2,813	782	1,726	2,669	5,177	8,418	16,408			
1973-74 "	2,425	287	540	493	1,320	11,500	15,245			
1974-75 "	3,350	33	342	1,190	1,565	9,667	14,582			
Hop Extract										
1969-70 (Final)	--	46	532	130	708	1,065	1,773			
1970-71 "	--	62	283	327	672	2,245	2,917			
1971-72 "	--	2	612	919	1,533	2,330	3,863			
1972-73 "	--	230	872	452	1,554	2,728	4,282			
1973-74 "	--	43	301	87	431	2,493	2,924			
1974-75 "	--	4	162	173	339	2,699	3,038			
Total (Hops & Hop Equiv. of Extract)										
1969-70 (Final)	2,229	244	3,513	1,347	5,104	10,942	18,275	$14,469	$10,900	$ 3,569
1970-71 "	2,658	240	3,891	2,547	6,678	15,168	24,504	20,398	13,400	6,998
1971-72 "	2,187	755	8,560	7,075	16,390	13,324	31,902	29,220	11,600	17,620
1972-73 "	2,813	1,403	4,080	3,889	9,372	15,784	27,969	26,901	12,529	14,372
1973-74 "	2,425	437	1,593	798	2,830	20,226	25,479	26,546	17,192	9,354
1974-75 "	3,350	47	909	1,796	2,752	19,113	25,215	25,920	17,718	8,202

Extract Conversion Factors

1969-70	3.4-1
1970-71	3.4-1
1971-72	2.7-1
1972-73	2.7-1
1973-74	3.5-1
1974-75	3.5-1

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

SOURCE: F.A.S. except Extract Conversion Factors from USDA Hop Market News.

1/14/76

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

	1973-74			Top	1974-75			Top
	Hops	Extract	1/Total	Ten	Hops	Extract	1/Total	Ten
Canada	2,426	1	2,430	(4)	3,350	--	3,350	(3)
Mexico	2,160	484	3,854	(1)	1,753	512	3,545	(2)
N. Am. Sub-Tot.	4,586	485	6,284		5,103	512	6,895	
Br. Honduras	--	2	7		--	--	--	
Costa Rica	5	10	40		1	1	5	
El Salvador	5	6	26		4	7	29	
Guatemala	88	4	102		78	11	115	
Honduras	--	18	63		1	16	57	
Nicaragua	56	--	56		21	5	39	
Panama	--	--	--		--	2	7	
Cent. Am. Sub-Tot.	154	40	294		105	42	252	
Barbados	8	--	8		4	--	4	
Dom. Rep.	71	--	71		--	121	424	
Haiti	--	2	7		--	--	--	
Jamaica	108	56	304		104	8	132	
Trinidad	43	5	61		35	6	56	
Carrib. Sub-Tot.	230	63	451		143	135	616	
Argentina	174	4	188		317	23	398	
Bolivia	195	2	202		135	24	219	
Brazil	2,806	272	3,758	(2)	2,881	539	4,766	(1)
Chile	214	49	386		155	2	162	
Colombia	95	591	2,164	(5)	34	461	1,648	(5)
Ecuador	96	--	96		13	85	311	
Guyana	22	2	29		19	2	26	
Paraguay	28	33	144		27	14	76	
Peru	633	49	805	(7)	440	174	1,049	(6)
Uruguay	33	34	152		48	12	90	
Venezuela	102	179	729	(8)	193	36	319	
S. Am. Sub-Tot.	4,398	1,215	8,653		4,262	1,372	9,064	
Belgium-Lux.	400	1	404		221	7	246	
Denmark	--	--	--		--	--	--	
France	--	20	70		--	31	109	
Ireland	447	--	447		994	13	1,039	(7)
Italy	22	--	22		21	--	21	
Netherlands	8	130	463		--	86	301	
U.K.-N. Ireland	287	43	438		33	4	47	
W. Germany	110	144	614	(9)	100	38	233	
EC-9 Sub-Tot.	1,274	338	2,458		1,369	179	1,996	
Austria	44	--	44		--	29	102	
Greece	--	1	4		--	--	--	
Norway	--	6	21		--	6	20	
Spain	2	25	90		7	35	130	
Switzerland	--	57	200		1	89	313	
Other Eur. Sub-Tot.	46	89	359		8	159	565	
Czechoslovakia	--	--	--		188	--	188	
E. Germany	--	--	--		--	--	--	
Poland	322	--	322		--	--	--	
USSR	2,438	--	2,438	(3)	2,023	--	2,023	(4)
Yugoslavia	--	--	--		--	--	--	
E. Eur. Sub-Tot.	2,760	--	2,760		2,211	--	2,211	

1/14/76

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

Continued-	1973-74 Hops	1973-74 Extract	1973-74 1/Total	Top Ten	1974-75 Hops	1974-75 Extract	1974-75 1/Total	Top Ten
Angola	--	35	123		--	2	7	
Burundi	--	25	88		--	--	--	
Cameroon	43	--	43		59	5	77	
Ghana	36	5	54		--	6	21	
Kenya	23	7	48		--	--	--	
Liberia	13	--	13		14	8	42	
Mauritius	4	--	4		5	--	5	
Morocco	11	--	11		--	--	--	
Mozambique	23	5	41		--	71	249	
Nigeria	543	78	816	(6)	242	51	420	
Rep.-S. Afr.	--	150	525		190	42	337	
Rwanda	--	11	39		--	--	--	
Sierra Leone	42	--	42		47	2	54	
Tanzania	23	--	23		5	--	5	
Togo	--	--	--		--	--	--	
Zaire	--	159	557		--	168	588	(9)
Zambia	--	3	11		--	--	--	
Africa Sub-Tot.	761	478	2,438		562	355	1,805	
Australia	--	--	--		--	2	7	
Bangladesh	2	--	2		--	--	--	
Burma	--	--	--		--	--	--	
Hong Kong	--	8	28		--	10	35	
Indonesia	8	--	8		20	1	24	
Israel	--	21	74		4	12	46	
Japan	585	1	589	(10)	700	--	700	(8)
Korea, Rep. of	18	--	18		--	17	60	
Lebanon	246	--	246		--	--	--	
Malaysia	135	31	244		90	37	220	
Pakistan	38	--	38		5	--	5	
Philippines	--	115	403		--	164	572	(10)
Singapore	--	36	126		--	41	144	
Taiwan	--	--	--		--	--	--	
Thailand	4	--	4		--	--	--	
Asia-Oceania Sub-T.	1,036	212	1,780		819	284	1,813	
GRAND TOTAL	15,245	2,924	25,479		14,582	3,038	25,215	

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

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

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

1/14/76

HOPS
ANALYSIS OF PRECEDING FOUR CROPS

	1972	1973	1974	1975	1976
	1,000 lbs.				
BASE	59,270	59,270	59,270	59,270	59,270
Allotment Percentage	85%	92%	100%	100%	
Reg. Allotment	50,380	54,528	59,270	59,270	
Special Fuggle Allot.	1,000	1,000	1,000	1,000	1,000
TOT. ALLOTS. POTENT. AVAIL.	51,380	55,528	60,270	60,270	
Reg. Allots. Not Produced	-1,324(3%)	-2,092(4%)	-3,429(6%)	-4,707(8%)	
Spec. Fug. Allot. Not Prod.	- 550(55%)	- 113(11%)	- 538(54%)	- 106(10%)	
Allots. Lost by Fire	- 129	- 688	- 54	- 225	———
Net Allots. Available	49,377	52,635	56,249	55,232	
Res. Used to Fill Defic.	0	0	0	98	
Res. Sold Normal Outlets	1,787	1,473	116	20	
ALLOTS. & RES. ACTUALLY AVAIL. & % SUCH IS OF BASE	51,164(86%)	54,108(91%)	56,365(95%)	55,350(93%)	
RECONCILIATION WITH USDA					
Reserves Not Sold in Normal Outlets	0	0	540	343	
Fire Loss	129	688	54	225	
Unacc. Diff.	16	(27)	20	(5)	
Sub-Total	145	661	614	563	
TOTAL CROP (USDA)	51,309	54,769	56,979	55,913	
PROD. IN EXCESS OF ALLOT. (RESERVES)	1,787(4%)	1,473(3%)	656(1%)	461(1%)	
Used to Fill Deficiencies	0	0	0	98	
RESERVE POOL HOPS	1,787	1,473	656	363	
Sold	1,787	1,473	116	20	
Balance for Sale	0	0	540	343	

SOURCE: Hop Administrative Committee records.

1/14/76

SUPPLY AND DISPOSITION 1970-71 TO DATE
(In 1,000 lbs.)

SUPPLY	1970-71	1971-72	1972-73	1973-74	1974-75	1975-76
Carryin Stocks 1/	27,950	30,120	28,770	30,280	33,720	42,170
Salable Product. 2/	45,841	49,890	51,164	54,108	56,365	55,350
Imports	13,656	12,268	13,055	14,294	14,161	———
Total	87,447	92,278	92,989	98,682	104,246	
DISPOSITION						
Brewery Usage	32,716	34,003	34,729	36,978	35,112	
Exported	24,504	31,902	28,061	25,479	25,215	
Carryout Stocks 1/	30,120	28,770	30,280	33,720	42,170	
Balancing Item	107	(2,397)	(81)	2,505	1,749	———
Total	87,447	92,278	92,989	98,682	104,246	
Hopping Ratio	.238	.248	.243	.238	.222	

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

Mktg. Year	Ext. Convers. Factor 3/		Brewery Consumption			Exports		
	Dom.	Export	As Hops	As Extract (Hop Equiv.)	Total	As Hops	As Extract (Hop Equiv.)	Total
1967-68	2.7-1	2.7-1	28,549	2,695	31,244	18,015	3,872	21,887
1968-69	2.8-1	2.8-1	26,862	5,201	32,063	16,976	4,174	21,150
1969-70	3.4-1	3.4-1	26,330	7,087	33,417	12,247	6,028	18,275
1970-71	3.4-1	3.4-1	25,134	7,582	32,716	14,586	9,918	24,504
1971-72	3.8-1	2.7-1	23,937	10,066	34,003	21,472	10,430	31,902
1972-73	4.0-1	2.7-1	23,598	11,131	34,729	16,360	11,701	28,061
1973-74	4.0-1	3.5-1	26,355	10,623	36,978	15,245	10,234	25,479
1974-75	4.8-1	3.5-1	29,245	5,867	35,112	14,582	10,633	25,215
1975-76								

BREAKDOWN OF FORM IN WHICH CARRYIN (SEPT. 1 STOCKS) WERE HELD
(In 1,000 lbs. - Not available prior to 1969-70)

	As Dry Hops		Pellets	As Ext. (Hop Equiv.)	Sub-Total	Total	Reserves
	Foreign	Domestic	Domestic *	Domestic *	Domestic		
1969-70	7,840	13,410	--	6,610	20,020	27,860	-
1970-71	8,080	11,660	--	8,210	19,870	27,950	-
1971-72	9,960	12,190	--	7,970	20,160	30,120	-
1972-73	10,640	9,530	--	8,600	18,130	28,770	-
1973-74	10,740	9,640	--	9,900	19,540	30,280	-
1974-75	11,450	11,990	3,920	6,360	22,270	33,720	-
1975-76	12,200	14,660	8,060	7,250	29,970	42,170	540

*May occasionally include minor quantities of foreign pellets or extract.

1/ Brewer, dealer and grower stocks as of Sept. 1.

2/ Production less fire loss and reserve hops not sold in normal outlets. Includes reserve hops sold.

3/ Beginning Jan. 1, 1972, Domestic Conversion Factor is based on actual pounds of hops used in production of extract as reported by Treasury Dept. Export Conversion Factor is based on USDA Hop Market News Service.

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

MBA Special Report:

In 1975, America's Malt Beverages Did Better Than U.S. Economy

By Stan Vlantes

ALICE IN WONDERLAND wonders out loud to say "one can't believe impossible things." At this point the Red Queen enters to say she managed to believe "as many as six impossible things before breakfast!" People who know the story know that the Red Queen always scores against Alice; we can add that the Red Queen's six-pack of impossible things is, all things considered last year, a rather modest estimate.

The overall industry increase in 1975 of 1.85 percent to a total of 148,645,000 barrels of beer sold (Modern Brewery Age estimate) should be paired off to the track record of the Gross National Product for 1975, down 2.0 percent to $1,186 billion adjusted for inflation, and down in 1974 by 1.8 percent for $1,210 billion from $1,233 billion in 1973. To this could be added the fact that per capita consumption of food also declined by almost 2.0 percent in 1975 as consumers dug in for budget trimming—nearly all in the livestock-related products.

Brewer	1975 Sales 31-Gal. Barrels	1974 Sales 31-Gal. Barrels	Gain or Loss Barrels	Gain or Loss Percentage
Anheuser-Busch, Inc.	35.2	34.1	1.1	3.2%
Jos. Schlitz Brewing Co.	23,279,000	22,661,000	618,000	2.7%
Pabst Brewing Co.	15,669,000	14,297,000	1,372,000	9.6%
Miller Brewing Co.	12,862,000	9,066,000	3,796,000	41.9%
Adolph Coors Co.	11,950,000	12,370,000	–420,000	–3.0%
The F. & M. Schaefer Brewing	5,880,755	5,710,300	170,455	3.0%
Olympia Brewing Co.	5,577,000	4,300,940	1,276,060	30.0%
The Stroh Brewing Co.	5,133,370	4,364,556	768,814	17.6%
Falstaff Brewing Corp.	n.a.	5,800,000	–	–
G. Heileman Brewing Co.**	4,535,000	4,109,000	426,000	10.4%
Carling National Breweries	4,100,000	5,892,114	–1,792,114	–30.4%
C. Schmidt & Sons	3,330,000	3,480,000	–150,000	–4.3%
General Brewing Co.***	2,480,000	1,550,000	930,000	60.0%
Genesee Brewing Co.	2,200,000	2,025,000	175,000	8.6%
Rheingold Breweries	1,720,000	1,975,000	–255,000	–12.9%
Pearl Brewing Co.	1,400,000	1,600,000	–200,000	–12.5%
Lone Star Brewing Co.	900,000	960,435	–60,435	–6.3%
Pittsburgh Brewing Co.*	898,000	925,000	–27,000	–3.0%
Rainier Brewing Co.	880,000	870,000	10,000	1.1%
Blitz-Weinhard Co.	803,000 → n.a.	763,686	+39314	+5.1 –
Latrobe Brewing Co.	710,000	710,000	no change	–
The Lion Inc.	325,000	172,427	152,573	88.5%
Peter Hand Brewing Co.*	275,000	185,000	90,000	48.7%
Jos. Huber Brewing Co.	270,000	260,000	10,000	3.9%
Erie Brewing Co.	262,228	280,000	–17,772	–6.3%
Reading Brewing Co.	205,443	n.a.	–	–

* Editor's Estimate in lieu of reply to MBA Survey
** The 1974 figure included 191,000 barrels of divested brand not shown above. The 1975 fugure does not include any Grain Belt brand sales whatsoever.
***Editor's estimate which may reflect changes in accounting procedures at General not fully completed at press-time.

HOP BREEDING

Exchange of Germplasm

Germplasm distributed: A number of requests for planting stock of hop genotypes were again filled in 1975 for both domestic and foreign interests (table 1). Cascade and the three recently registered mildew resistant males 64032M, 64033M and 64037M were sent to Yugoslavia. Cascade was also supplied to Dr. Ray Neve at Wye College. Triploid males for yield stimulation were made available to several Oregon growers (Crosby, Goschie, Kerr, King). A group of 29 high alpha selections from the 1971 nursery (from crosses 7003, 7004, 7005, 7006 and 7007 were sent to J.I. Haas Inc., Yakima, WA to be planted in a newly established off-station nursery to see whether any of these selections is adapted in the state of Washington. Identical material was also supplied to C.E. Zimmermann at Prosser, WA to be tested in the Prosser area and also to be included in the virus indexing program of Dr. Skotland. Mr. Fred Netter, the new Oregon hop root propagator received 250 pieces of prunus-free Cascade (accession #21092), 50 pieces of prunus-free Bullion 10A (accession #21056), and 150 pieces of Bullion 10B, a prunus-free line recently obtained from Prosser. Mr. Netter is attempting to increase these for the Oregon Hop Commission. He also had a contract for increase of the two triploid selections 21040 and 21041, to produce rhizomes in anticipation of commercial release of the two lines.

Dr. Romanko, Idaho, received Styrian and 7 triploid males for testing in Idaho hop yards. Dr. C. B. Skotland in Prosser, WA received several males and one female from our germplasm block for virus testing and indexing. Several other people that requested hop planting stock primarily for gardening or hobby purposes received small amounts of established varieties. Most requests, however, had to be forwarded to May Nursery Co., Yakima, WA who supply hop

TABLE 1: Hop Germplasm distributed in 1975.

Recipient and Address	Date Sent	Variety & Amount	Reason
Dr. M. Acimovic; Inst. Agric. Research 21000 Novi Sad, Yugoslavia	March 31	12 pc Cascade 6 pc 64032M " 64033M " 64037M	Germplasm & variety collection DM resistance
Ed Crosby, Rt 1, Box 264, Woodburn, OR 97071	Apr. 14	25 pc 6755-14M	Tripl. male, yield stimulation
H. Goschie, Rt. 1, Box 350, Silverton, OR 97381	Apr. 23	30 pc 21102M 50 pc 21100M	=Sel 6756-26M, E tripl. male =Sel 6659-17M, L tripl. male
J. I. Haas Co (Dr. Lloyd Rigby), Box 1441, Yakima, WA. 98901	Apr. 1	7 pc 7003-243 " 7004-03 " 7005-70 " -72 " -87 " -122 " -182 " -201 " -205 " -232 " 7006-23 " -61 " -230 4 pc -273 7 pc -294 " -302 " -318 " -356 3 pc -378 " -382 7 pc -398 3 pc -408 7 pc -445 " -450 " -468 " 7007-60 " -206 " -281 " -339	high alpha selection "

TABLE 1: Continued

Recipient and Address	Date Sent	Variety & Amount	Reason
J. I. Haas Co (Ron Kirk) Riverside Ranch Star Rt. Box 79, St. Paul, OR.	Apr. 24	1400 pc 21041	Triploid for expt. yd, propagules from P. Serres
		1250 pc 21041	Triploid experimental, propagules from Robt. Coleman
Roger Kerr, 9015 Windsor Island Rd., Salem, Or. 97303	Apr. 14	20 pc. 6774-09M	Triploid male for yield stimulation
Melvin King, 3235 Lower River Rd, Grants Pass, Or. 97526	Apr. 14	8 pc 21100M	=Sel 6659-17M, tripl. male
		6 pc 6755-13M	triploid male
		8 pc 21102M	=Sel 6756-26M, early triploid male
		8 pc 21106M	=Sel 6775-15M
Mrs. D. J. Klassen, 313 Main Ave, Big Lake, Texas 76934	Jan. 15	12 pc Cascade	Hobby gardening
		4 pc Bullion	"
Dr. Ray Neve, Wye College, England	May 16	20 pc Cascade	Variety Collection
Fred Netter, Ottaway Rd, Aurora, OR. (Or. Hop Com. root-propagator)	May 7	250 pc 21092	prunus-free Cascade, increase
		50 pc 21056	prunus-free Bullion 10A , increase
		150 pc Bullion 10B	prunus-free Bullion from Prosser
Dr. R. R. Romanko, Univ. Idaho Expt. Sta. Parma, ID	Apr. 14	40 pc 21049	"Styrian" for testing in Idaho
		12 pc 21100M	=Sel 6659-17M, triploid male
		10 pc 6755-13M	Triploid male
		12 pc 21102M	=Sel 6756-26M, early tripl. male
		5 pc 21103M	=Sel 6769-09M, tripl. male
		12 pc 21106M	=Sel 6775-15M, tripl. male
		10 pc 21107M	=Sel 6777-26M, tripl. male
Mr. Val Sigstedt, Ferry Rd, Point Pleasant PA. 18950	Apr. 14	12 pc Cascade	grow hop plants for display (artist)
Dr. C. E. Skotland, Prosser, WA.	Jan. 7	4 pc 63013M	Virus testing & indexing
		4 pc 64032M	"
		4 pc 64033M	"
		4 pc 64103M	"
		4 pc 64107	"
		4 pc 19046M	"

TABLE 1 : Concluded

Recipient and Address	Date Sent	Variety & Amount	Reason
Von Horst Co (Ernie Netter), Box 2804 Yakima, WA 98902	Feb. 21	20 pc Bullion	Brewery display
C. E. Zimmermann, USDA, ARS, Prosser, WA	Apr. 1	4 pc 7003-243	High alpha selections
		" 7004-03	"
		" 7005-70	"
		" " -72	"
		" " -87	"
		" " -122	"
		" " -182	"
		" " -201	"
		" " -205	"
		" " -232	"
		" 7006-23	"
		" " -61	"
		" " -230	"
		" " -294	"
		" " -302	"
		" " -318	"
		" " -356	"
		" " -398	"
		" " -445	"
		" " -450	"
		" " -468	"
		" 7007-60	"
		" " -206	"
		" " -281	"
		" " -339	"
C. E. Zimmermann, USDA, ARS, Prosser, WA.	June 4	6 pots 21091	Rooted SW cuttings,E. tripl. female
The following genotypes were also supplied to CEZ as softwood cuttings but failed to survive.		7005-194; 7006-74,-96,-273,-296,-311; 7006-339,-378,-382,-392, -408; 7007-162.	

propagules on a commercial basis.

Germplasm received at Corvallis: (Table 2) In April 1975 we received 25 pieces of the new German aroma/alpha variety Hüller Bitterer which were planted in the greenhouse. Softwood cuttings were made in late spring and increased in a greenhouse soil bed for field planting in 1976. The original propagules from Germany plus some softwood cuttings were subjected to Downy Mildew crown infection as part of Dr. Horner's mildew testing program. They will not be planted in the field but were discarded at the end of the test. Dr. Romanko, Idaho supplied us with 14 pieces of the new variety Pocket Talisman which were planted in the greenhouse. Unfortunately all except 3 failed to grow and the remaining 3 were rather poor. It is doubtful that this variety can be grown in the Willamette Valley since tests in previous years were also negative due to the failure of rhizomes to sprout in the field. A similar lack of vigor was also found in the greenhouse grown plants of Pocket talisman.

Six selections from C.E. Zimmermann's program at Prosser were grown in the greenhouse in 1975 from propagules received from Prosser. They will be planted in the replicated Seedless Observation Nursery in 1976. Prunus-free Northern Brewer (accession #21093) was obtained from C.B. Skotland in March and established in the Named Variety Block in the main yard.

TABLE 2 : Germplasm received at Corvallis in 1975.

Supplier	Date rec'd	Amount and Variety	Remarks
Bay. Landesanstalt f. Bodenkultur (Hopfenforschung), Wolnzach, Kellerstrasse 1, W. Ger.	Apr. 4	25 pc. Hüller Bitterer	new German aroma variety DM res, alpha 8-10%
R. R. Romanko	May 16	14 pc. Pocket Talisman	new hop variety from Idaho, mutant of Ta, high yield, mite resistant
C. B. Skotland, Prosser, WA 99350	March 15	6 pc. 21093	Prunus-free Northern Brewer
C. E. Zimmermann, USDA,ARS, Prosser, WA	May 15	4 pc.W7006-16	seedling from OR. cross 7006
		4 pc.W7006-23	" "
		4 pc.W004-26	PrRi x 63012M
		4 pc.W101-238	Comet(PNRSV free)x63012M(PNRSV free)
		4 pc.W102-60	19137x63012M (prunus free)
		4 pc.W203-082	NB (prunus free)x63015M (prunus free)

Accession Numbers assigned or eliminated in 1975

New accession numbers: Eighteen genotypes received new accession numbers (table 3). These included three selections from a Yakima Cluster x mildew resistant male that have been in a replicated seedless test for several years and have shown good mildew resistance, yield potential, storage and acceptable levels of alpha acid and can be considered to be"improved Clusters". The new German hop variety Hüller Bitterer was given the accession #21097. Two other selections from the 1970 nursery received permanent accession numbers. One is a cross between Brewers Gold and a tetraploid male (21098) and the other one a cross between L 8 and a tetraploid male (21099). Both are female triploids with good yield potential and alpha acid levels and mature early to medium early.

Eight triploid males that have been placed into various grower's yards over the past few years received accession numbers in 1975. Most have also been tested in the Yakima Valley also one selection 6756-26M (accession #21102M) will be continued by C.E. Zimmermann for possible yield stimulation in Bullion yards in the Yakima Valley. The others are medium-late to late and are probably only useful for yield stimulation of late maturing hop varieties such as Brewers Gold or Talisman. Three males from the 1971 Nursery that were used in crosses presently grown in the 1973 nursery (7006-30M, -94M; 7007-18M, -356M) also received permanent accession numbers. All four males had excellent alpha levels in their lupulin and two (21108M and 21109M) had low cohumulone, excellent storage and low beta. The other two 21110M, 21111M had low beta values and early maturity as judged from their time of pollen shedding.

Accession numbers eliminated: A total of 28 accession had to be eliminated in 1975 primarily because of diseases (suspected virus) or very poor growth or low vigor (table 4). Seven of these genotypes were male plants and the remainder

Table 3 : New Accession Numbers Assigned in 1975

Accession Number	Location	Source	Name or Pedigree	Remarks
21094	225:12-21	Sel.6903-112	Yak.Cluster x ZS; 65102x64037M	DM res., good yield+storage, med. high α, late maturity.
21095	240:12-21	Sel.6903-259	"	DM res, good yield+storage, late maturity
21096	243:12-21	Sel.6903-350	"	DM res, good yield+storage, med. high α, late maturity
21097	WGH	Hop Res. Sta. Hüll, West Germany	Hüller Bitterer	New German variety DM res, good aroma, med. high α, quality similar to Hersbrucker
21098	232:23-32	Sel.6913-68	BGx[[XSx(Fu x EG-ECS)]xOP] 19001x6668-01M	Good yield, med. α, med. early, triploid.
21099	240:23-32	Sel.6921-06	L8x[[XSx(Fu x EG-ECS)]xOP] 65104x6751-98M	Good yield, high α, early, triploid
21100M	29:5-8	Sel.6659-17H	(BGxEG-BavS)x(BGxFu-FuS) 63020x63025M	Triploid male, DM res. late, for yield stimulation
21101M	105:41-42	Sel.6756-19M	FuTxFu-FuS;21003x19040M	Triploid male, DM res. late, for yield stimulation
21102M	106:41-42	Sel.6756-26M	"	" , DM res. med early, " Best line at Prosser, WA.
21103M	101:43-44	Sel.6769-09M	FuTxFuS;21003xFu 1-1	Triploid male, DM res. late, for yield stimulation
21104M	101:43-44	Sel.6769-33M	"	" " " "
21105M	107:43-44	Sel.6771-06M	FuTxRV-FuS;21003x19010M	" " " "
21106M	111:43-44	Sel.6775-15M	FuTxEG-BavS;21003x19062M	" " " "
21107M	102:45-46	Sel.6777-26M	FuTxOP;21003xOP	" " " "
21108M	39:13-14	Sel.7006-30M	(BGxEG-XS)xZS;65009x64035M	α_L55;β_L25;CoH19; exc. storage
21109M	41:13-14	Sel.7006-94M	"	α_L55;β_L20;CoH18; exc. storage
21110M	54:13-14	Sel.7007-18M	Bullion x ZS;64100x64035M	α_L50;β_L25; very early
21111M	38:15-16	Sel.7007-356M	"	α_L23;β_L34; very early

TABLE 4: Accession Numbers Eliminated in 1975.

Accession Number	Location Row: Hill	Reason	Remarks
19003	31:49-50	v. small cones, late.	
19032	35:49-50	poor growth	
19054M	17:53-54	yellow fleck-2 (virus ?)	
19093	36:49-50	poor growth, v. late	
19094	37:49-50	" "	
19144	39:49-50	" "	
50091	48:49-50	" "	
51104	49:49-50	" "	
52044M	8:55-56	virus (split leaf 3)	
52046M	10:55-56	poor growth	
52048M	12:55-56	yellow fleck 2 (virus?)	
53023	52:49-50	poor growth, v. late	
54007	34:51-52	YF2 virus, poor growth	
54015	36:51-52	poor growth, v. late	
54066M	13:55-56	poor growth, short sidearms, late	
58004	17:49-50	V. late, poor growth	Utah Wild American
60030M	20:55-56	yellow fleck-2 (virus?)	Colorado Wild American
60043	10:51-52	poor growth, v. late	New Mexico Wild American
61014	40:51-52	poor growth	Introduction from Poland
61016	41:51-52	very poor growth	USSR, N16
61018	43:51-52	"	USSR, N34
65003	47:51-52	very late, poor growth	
65036M	10:57-58	poor growth, short sidearms	
21005	10:49-50	very weak, poor growth	BG parentage
21010	43:49-50	poor growth, v. late	
21013	246:1-2 6:1-4	poor growth, virus (?)	Idaho 40, disc.by Romanko
21022	45:49-50	poor growth, v. late	
21026	236:1-10 22:51-52	poor storage, DM susceptible, late	No advantage over BG

were females. There appeared to be no point in continuing to nurse these sick plants along from year to year. Among the genotypes eliminated were 3 Wild Americans of extremely low vigor which also showed yellow fleck symptoms. One introduction from Poland and two from the Soviet Union (61014, 61016, 61018) were also very low in vigor and were eliminated. They looked very much like a low vigor European hop such as a Hallertauer or a poor Fuggle and little advantage could be seen in keeping this material in our program. The experimental hop variety Idaho 40 (accession #21013) in our main yard showed rather poor growth, but it was quite vigorous in our seedless location. It had been discarded by Dr. Romanko in 1974 for lack of brewer interest and was therefore also eliminated from our program. The hop variety 21026 a selection with Brewers Gold background did not offer any advantage over Brewers Gold. It was mildew susceptible particularly in the cones, late in maturity and had very poor storage stability similar to Brewers Gold. Therefore, it was also discarded from our program.

Crosses made in 1975:

Seven crosses were made in 1975 (table 5). Three crosses involved zero alpha females and the zero alpha male 7001-50M to see whether the zero alpha trait breeds true. The other four crosses involved Cascade crossed to four different males in order to see whether Cascade could be used for progeny testing of males and also to obtain selections for eventual improvement of Cascade particularly of its storage properties. Good seedset was obtained with all crosses. Of particular interest will be crosses 7504 and cross 7505. The male parent of 7504 is 19058M which in previous crosses was an excellent parent. For example, it is the male parent of USDA accession #65009 and of the high yielding but low alpha USDA selection 64007. Equally high yielding genotypes with some of the advantages of Cascade are expected from this cross. Cross 7505 should produce

TABLE 5 : Crosses made in 1975. Seed pretreatment started Jan. 9, 1976.

Number	Location of Female	Pedigree	Remarks & Reason for Cross
7501	182:31	7001-47x7001-50M;[(LGpSxFu-FuS)xLCS-FuS]^2	brother-sister cross betw. zero alpha lines
7502	182:35	7001-54x7001-50M; "	" "
7503	182:37	7001-56x7001-50M; "	" "
7504	202:1	56013x19058M;Cascade x EG-XS	Low CoH, α/β near 1, storage, yield
7505	202:1	56013x64036M;Cascade x ZS	Low CoH, α/β near 1, storage, DM res, yield
7506	202:1	56013x7006-323M;Cascade x[(BGxEG-XS)xZS]	E, α/β near 1, low CoH, DM res.
7507	202:1	56013x7006-340M;Cascade x[(BGxEG-XS)xZS]	" "

some progeny with improved storage stability inherited from the male 64036M. The other two crosses should give progeny with low cohumulone and good downy mildew resistance, early maturity and an alpha/beta ratio near 1. Seeds will be germinated in the greenhouse and seedlings transplanted to the field in 1976 without prior mildew testing.

Seedless Observation Nurseries:

The Seedless Observation Nurseries in the Smith yard in 1975 can be divided into three main groups: The old established control-varieties grown in 10-hill plots plus some very advanced selections also grown in 10-hill plots (table 6). The second group consists of advanced selections from the 1971 Nursery grown in 5-hill plots that were harvested in 1976. Some of these are also grown as babies in the Yakima Nursery. A third group of advanced selections was grown in the 5-hill Seedless Observation Nursery but was not harvested in 1975.

Advanced seedless 10-hill observation nursery: (Table 6). Twenty-two genotypes were harvested in 1975 consisting of standard varieties such as Brewers Gold, Fuggle; the heat-treated Fuggle-N (prunus-free); the new triploid varieties Columbia, Willamette; Comet; Bullion; prunus free Bullion; Cascade and prunus-free Cascade. The remainder are breeding lines in an advanced stage of the evaluation. In all cases the heat-treated genotype was superior over the non-heat treated (presumably prunus necrotic RSvirus infected) material. This superiority was pronounced particularly with the yield of Fuggle, Bullion and Cascade. Heat treated Fuggle N showed a slight superiority in alpha acids content, whereas heat treated Cascade and heat treated Bullion 10A contained significantly more alpha acids than the non heat-treated counterpart. The heat-treated Bullion 10A due to its tremendous yield and high alpha acids content had the highest alpha acids production of any line in this nursery. The two breeding lines 21054

TABLE 6 : HOP VARIETIES AND SELECTIONS GROWN IN THE 10-HILL ADVANCED SEEDLESS OBSERVATION NURSERY
CORVALLIS, 1975. PRUNED, MARCH 28. TRAINED MAY 9

Acc. or Sel. No.	Location Row:Hill	Name or Pedigree	Spring Regrowth[1]	X wire 1st (June)	X wire Most (June)	Bloom 1st (July)	Bloom Full (July)	Harv. Date	Yield[2] lbs/A	Quality α	Quality β	Quality α/β	Oil ml/100g	Alpha Production lbs/A	Remarks[3]
19001-	209:1-10	Brewers Gold	2	12	20	15	20	9/16	2739	9.7	5.1	1.91	-	264	
21016-	204:1-10	Fuggle N (heat treated)	1	7	12	6/28	7	8/26	1710	7.5	3.9	1.93	1.75	128	Early
21040-	208:23-32	Columbia	3	17	7/5	18	25	9/8	1778	9.3	4.6	2.03	1.09	165	Wirebroke
21041-	212:23-32	Willamette	4	19	30	22	30	9/8	1652	8.4	4.6	1.80	1.15	138	
21054-	210:1-10	Comet x(BGxFu-Colo 2-1)	1	8	14	3	12	9/2	1656	11.5	5.4	2.14	3.08	190	
21055-	212:1-10	"	3	12	20	5	15	8/26	1523	15.6	6.1	2.54	1.98	238	Early
21056-	206:1-10	Bullion 10 A (heat treated)	1	2	12	5	15	9/2	3570	12.2	5.7	2.13	-	434	
21091-	237:23-32	FuTxRV-FuS	3	12	18	5	15	8/26	2912	5.8	4.8	1.22	1.07	169	Early;BIS
21092	202:1-10	Cascade (heat treated)	1	8	14	5	18	9/8	3524	8.9	7.5	1.19	1.91	315	
48209-	203:1-10	Fuggle H	1	8	17	3	10	8/26	1598	7.4	3.7	2.01	1.89	118	Early
56013-	208:1-10	Cascade	1	18	30	5	22	9/8	1980	6.1	6.1	1.00	1.68	120	
56013-	211:1-10	Cascade (nuclear stock)	1	13	18	12	18	9/8	3191	7.5	6.3	1.20	1.36	239	
64100-	205:1-10	Bullion	1	6	18	5	18	9/2	2624	11.2	5.9	1.89	2.27	295	
65009-	228:23-32	BGxEG-XS	1	12	18	15	25	9/5	2610	9.9	8.3	1.20	2.51	257	
6761-16	205:23-32	FuTxFuS	3	20	28	18	25	9/11	2088	8.5	3.9	2.19	1.23	176	
6763-09	213:23-32	"	1	4	10	5	22	8/26	2173	4.4	5.2	0.83	-	95	Early
6769-47	235:12-21		1	7	14	10	18	9/2	2507	3.6	3.8	0.94	0.92	91	Early
*6903-112	225:12-21	YC x 7K49Y-OP	2	28	7/5	15	20	9/16	2160	10.7	5.6	1.90	0.83	231	BIS
* -259	240:12-21	"	4	14	30	15	28	9/16	2363	6.9	6.1	1.13	0.68	164	BIS
* -350	243:12-21	"	4	20	7/3	25	30	9/16	2507	7.3	6.2	1.19	0.52	183	BIS
*6913-68	232:23-32	BG x[[XSx(FuxEG-ECS)]xOP]	1	4	7	5	12	8/26	4191	8.3	5.8	1.42	1.38	347	Early;BIS
*6921-06	240:23-32	L8 x[[XSx(FuxEG-ECS)]xOP]	3	16	20	3	10	9/5	2804	10.6	7.5	1.40	2.88	297	

1/ 1 best to 5

2/ $\frac{\text{green wt./plot x 774}}{\text{No. plants/plot x 453.6 x 4}}$

3/ BIS = Brewer inspection samples

* New Accession Numbers assigned in 1975

and 21055, originating from a Comet cross, again had high alpha-acids content. Selection 21055 had 15.6% alpha acids which was the highest alpha acids content in this nursery. Yield potential of both lines, however, is too low to advance any of these lines for off station tests. 21055 again was earlier in maturity, similar to Bullion. Genotype 65009 which is also the parent of crosses in the 1971 nursery from which a number of high alpha selections were obtained, produced good cone yields but lower than expected alpha acids values. It's alpha acids production of 257 pounds however is still substantial. The two recently named triploid varieties Columbia and Willamette (accession numbers 21040 and 21041) had lower than expected cone yields probably due to heavy pruning in order to obtain planting stock for increase in 1975. Alpha acids production of Columbia was slightly over 9% and Willamette had slightly over 8%, resulting in an alpha acids production per acre of 165 and 138 pounds,respectively. The yield of Columbia was also adversely affected because the row-wire broke shortly after bloom and some cones did not develop properly. The early maturing triploid 21091 (formerly 6771-19) was harvested on August 26. It produced nearly 3,000 pounds of cones per acre with alpha acids content of slightly under 6%. The selection was increased in 1975 and will be planted in a two acre off-station trial in 1976 in the Willamette Valley. Anheuser-Busch has expressed an interest and will trial brew this line in 1977 as soon as mature hops are available. Oregon growers also are quite interested in this line because of its early maturity.

The three improved Cluster-type selections 6903-112, 259, and -350 which received new accession numbers in 1975 (accession numbers 21094, 21095, 21096; table 3) again produced good cone yields in 1975. The highest alpha acids production came from accession number 21094 (10.7%) while the high alpha producer in previous years (accession number 21096) only had moderate amounts of alpha acids in 1975. This line showed some peculiar growth pattern early in

the Spring. It was a sleeper perhaps due to heavy pruning and when shoots appeared they showed a yellowish discoloration similar to a cholorophyll deficiency. This discoloration disappeared later in the season. All three lines as well as the early maturing triploid 21091 were to have been submitted to the Hop Research Subcommittee as "brewer inspection" samples. Problems with our experimental dryer, however, resulted in higher moisture content and discoloration of some of thesamples; therefore no BIS samples will be mailed out in 1975. The two early maturing triploid lines 6913-68 and 6921-06 (new accession numbers 21098 and 21099, respectively) produced excellent cone yields in 1975. These are not related to Fuggle. Selection 21098 had the highest cone yields of any line in this Nursery (nearly 4,200 pounds on an acre basis, with an alpha acids content of 8.3) whereas Sel. 21099 contained 10.6% alpha acid. Selection 21098 was harvested on August 26th and appeared to be fully mature. The other line, however, matured during the first week of September. It is apparently a medium-late variety although it appeared to be early maturing at the time when the cones first began to size up. Three other Fuggle-related triploid lines were also harvested in 1975. Selection 6761-16 is a late maturing good yielding medium alpha variety; selection 6763-09 is an early maturing good yielding line which however will be discarded in 1976 since it consistently was low in alpha acids and also produced more beta than alpha acids. The third line, 6769-47, will also probably be discarded in 1976 since its alpha acids level was below expectations.

Selections harvested from the 5-hill seedless observation nursery: A total of 48 selections were harvested in this nursery and acre yields were calculated from the plot weights obtained from the 5-hill plot. Those selections marked with an asterisk were not harvested but yields are based on a visual estimate and the quality data were obtained from 5-cone samples. In Table 7 the detailed data for these selections are listed as well as yield and quality data obtained from the baby nursery at the John I. Haas location in Yakima. The remarks in the last column of the Table refer to observations made at the seedless

TABLE 7: ADVANCED SELECTIONS GROWN IN THE 5-HILL SEEDLESS OBSERVATION NURSERY IN 1975.
PRUNED MARCH 28. TRAINED MAY 9, 14, 26.

Acc. or Sel. No.	Location Row:Hill	Pedigree	Spring[1] regrowth	X wire 1st	X wire Most	Bloom 1st	Bloom Full	Harv. Date	Yield[2]	Quality α	Quality β	Quality α/β	Oil	Alpha Prod.	Yakima Nursery Yield[3]	Yakima Nursery α	Yakima Nursery β	Remarks[4]
				June		July		Sept.	lbs/A	%	%		ml/100g	lbs/A		%	%	
7002-05	206:12-16	63020x64035M	1	7	12	18	25	2	1931	6.9	5.7	1.22	1.65	134				YF1, top crop
-20	210: "	"	3	19	30	7	25	2	1697	4.9	5.3	0.93	0.95	84				E
-49	211: "	"	4	20	30	7	20	2	1474	6.6	2.9	2.29	0.81	97				Some Male;DM/C
7003-15	213: "	65009x19046M	1	12	19	15	25	15	2282	11.0	5.3	2.08	-	250				
-32	222: "	"	1	9	14	18	25	2	2217	8.1	4.5	1.80	1.68	179				
-38	227: "	"	2	7	14	18	25	15	2723	9.5	8.1	1.17	-	258				
-95	238: "	"	2	30	7/5	12	25	15	2070	8.0	8.3	0.97	-	166				
-111	239: "	"	1	10	14	15	26	11	1834	8.3	5.1	1.62	1.85	152				
-143	242: "	"	1	12	14	20	28	11	2611	10.2	8.9	1.15	1.58	266				
-243	204:17-21	"	1	3	8	5	15	15	3051	9.9	7.1	1.39	-	301	9	5.2	6.0	VE
-250	205: "	"	1	7	12	5	15	4	2385	9.4	8.7	1.08	2.07	224				E, top crop
-284	210: "	"	1	8	14	12	22	4	2591	7.3	11.8	0.62	2.78	189				YF1
7004-03	212: "	65009x19182M	1	2	8	15	22	4	2903	11.8	5.5	2.16	1.66	342	5	9.9	4.9	E
-75	221: "	"	3	8	20	7	22	4	2876	11.8	4.8	2.44	-	338				
7005-06	227: "	65009x63015M	4	7/7	7/10	20	30	15	1881	9.8	6.9	1.42	-	184				Sleeper,DM/C
-22	229: "	"	4	7/3	7/7	22	30	5	1629	11.3	5.1	2.22	-	184				Some male flow
-40	230: "	"	3	16	19	20	28	15	1746	7.7	4.9	1.57	-	135				top crop, DM/C
-70	238: "	"	2	6	18	7	20	5	2313	12.2	7.4	1.64	2.10	282	4	11.2	7.7	E
-72	239: "	"	4	28	7/5	25	30	15	1913	12.0	6.3	1.92	-	230	4	3.5	2.2	Sleeper
-87	241: "	"	4	20	30	23	30	11	2237	11.6	4.0	2.86	1.71	259	4	11.5	3.2	Sleeper
-116	242: "	"	4	7/2	7/10	25	30	5	1827	13.5	4.5	2.98	2.24	246				Sleeper
-122	203:23-27	"	4	17	7/5	12	25	11	1678	11.4	8.6	1.32	2.26	192	4	9.8	7.1	
-168	206: "	"	2	4	22	25	30	15	1837	9.8	3.2	3.08	-	179				YF1,top crop
-182	207: "	"	4	7/5	7/10	25	30	11	1484	10.7	6.3	1.71	1.50	159	4	7.8	4.5	Sleeper
-201	209: "	"	4	18	30	25	30	11	2217	10.6	7.6	1.38	1.44	230	7	9.0	5.8	YF1
-205	210: "	"	1	7	18	15	22	11	1958	14.0	6.4	2.18	2.10	274	8	8.8	4.7	
-232	211: "	"	1	8	12	5	20	8	2714	9.9	4.4	2.26	1.53	268	6	9.3	4.4	E
7006-23	214: "	65009x64035M	4	7/1	7/7	22	30	-	1800*	12.6	5.0	2.50			4	9.9	5.5	YF2
-61	215: "	"	4	7/5	7/10	25	30	5	1507	9.6	3.2	3.07	1.00	145	6	8.6	6.0	Sleeper
-96	55:7-8	"							baby						7	10.1	6.0	2hOB
-215	218:23-27	"	4	30	7/5	25	30	8	2057	10.0	6.4	1.58	1.07	206				Sleeper
-225	220: "	"	1	8	12	12	18	5	2222	6.8	8.7	0.79	2.31	152				E
-230	221: "	"	4	7/3	7/8	20	30	11	1419	7.8	10.4	0.76	2.74	111	3	9.5	3.7	Sleeper
-251	222: "	"	4	28	7/6	20	30	11	1358	7.0	8.6	0.81	1.97	95				Sleeper
-273	39:9-10	"							baby						4	7.0	2.5	2hOB

TABLE 7 : concluded.

Acc. or Sel. No.	Location Row:Hill	Pedigree	Spring regrowth [1]	X wire 1st	X wire Most	Bloom 1st	Bloom Full	Harv. Date	Yield [2]	Quality α	Quality β	Quality α/β	Oil	Alpha Prod.	Yakima Nursery Yield [3]	Yakima Nursery α	Yakima Nursery β	Remarks [4]
				June		July		Sept.	lbs/A	%	%		ml/100g	lbs/A		%	%	
7006-278	224:23-27	65009x64035M	4	26	7/5	25	8/2	5	2222	9.7	4.0	2.41	0.41	215				
-294	229: "	"	4	7/10	7/20	25	8/2	-	1200*	9.4	5.9	1.60			5	9.0	4.8	Sleeper
-302	233: "	"	4	7/12	7/20	20	30	-	1500*	9.3	6.2	1.52			3	7.8	5.6	Sleeper, YF1
-318	236: "	"	4	7/7	7/12	20	30	-	1500*	11.1	4.7	2.35			4	12.5	4.8	Sleeper
-356	241: "	"	4					-	1000*	11.5	8.4	1.38			6	13.4	7.9	Sleeper
-370	242: "	"	4	7/5	7/10	20	30	11	2309	10.1	12.0	0.84	2.14	232				Sleeper
-378	203:28-32	"	4	25	7/6										2	10.4	7.0	YF3, disc
-382	52:9-10	"							baby						4	8.5	4.2	2hOB
-398	206:28-32	"	4	19	7/6	25	8/3	11	1242	13.5	8.0	1.69		167	4	10.5	6.9	
-404	207: "	"	4	7/7	7/15	25	8/3	11	1238	10.5	4.0	2.64	1.57					
-406	209: "	"	1	5	12	12	22	11	1746	12.5	5.4	2.32	1.95	218				
-408	210: "	"	4	20	7/10	20	30		1600*	11.5	5.0	2.31			4	12.0	5.1	Sleeper
-435	211: "	"	4	7/6	7/15	25	8/2	11	1331	12.4	6.6	1.88		164				Sleeper
-445	214: "	"	3	19	24	25	8/2	8	1985	10.3	6.7	1.55	3.26	205	8	10.6	6.1	
-450	215: "	"	1	12	22	8	28	8	2111	14.5	5.2	2.79	2.18	305	7	11.5	4.9	
-456	216: "	"	4	7/8	7/12	25	8/3	8	1430	8.7	8.3	1.05		124				Sleeper
-468	218: "	"	4	28	7/6	25	8/2	8	1634	10.7	6.9	1.54		174	5	12.6	5.3	Sleeper
7007-60	221: "	64100x64035M	4	15	7/10	18	28	8	1382	7.9	5.5	1.44		109	3	8.1	4.2	
-175	223: "	"	1	1	10	5	15	8	2291	11.6	4.8	2.44	2.68	266				VE, top crop
-206	230: "	"	3	12	22	15	20	8	1967	10.5	5.6	1.88	2.52	207	4	3.4	3.1	Top crop
-281	49:11-12	"							baby						5	12.1	6.2	2hOB
-300	236:28-32	"	1	6	10	12	18	11	1328	6.3	5.3	1.19	1.24	83				
-318	238: "	"	2	11	18	12	20	8	1917	8.3	3.1	2.71		159				VE
-339	241: "	"	1	4	12	8	15	8	2237	14.7	7.8	1.88	2.94	328	6	9.3	6.5	Some male,E
19001	209:1-10	Brewers Gold	2	12	20	15	20	16	2739	9.7	5.1	1.91		264	7	6.2	3.9	
48209	203: "	Fuggle H	1	8	17	3	10	8/26	1598	7.4	3.7	2.01	1.89	118	1	3.0	1.8	VE
56013	211: "	Cascade 5/	1	13	18	12	18	8	3191	7.5	6.3	1.20	1.36	239	3	3.1	4.1	
62013	249:3-4	Comet	1	6	14	10	18								7	8.2	4.7	
64100	205:1-10	Bullion 5/	1	6	18	5	18	2	2624	11.2	5.9	1.89	2.27	295	4	5.5	4.0	E

1/ 1 = best to 4

2/ green lot/plot x 774 ; * = estimate
No.plants/plot x 453.6x4

3/ 10 = best to 1

4/ YF = yellow fleck; VE = very early; E = early

5/ Average of 2 plots (JIH source and Prosser source) at Yakima Nursery

yard in Corvallis.

A number of lines, frequently high alpha acid producers,appeared to be sleepers early in the spring. Others showed some chlorophyll disturbance similar to yellow fleck symptoms due to virus infection. One selection (7006-378) was discarded in 1975 due to a severe chlorophyll disturbance. Yield levels for a number of lines in this nursery were good to excellent, although some showed less than desirable cone production. The three selections from cross 7002 (7002-05, -20, -49) had low alpha acids production and only one produced acceptable yields. The progeny from the female genotype 65009 (selections with the prefix 7003, 7004, 7005,and 7006) frequently had high alpha acids content and a high alpha/beta ratio. Some of the highest alpha acids content was found in selections from crosses 7005 and 7006 (for example 7005-116, 7005-205, 7006-23, -398, -406, -435, -450). One selection from cross 7007 (7007-339) also had very high alpha acids content in Corvallis and a high alpha acids content as a baby in the Yakima nursery, as well as good yield potential at both locations. Others that appeared excellent at both locations were 7004-03, 7005-70, 7005-205, 7005-232, and 7006-450. Due to the enormous work load,most lines could not be harvested always at the opportune time or when the cones might have been ready for picking. Thus, some that were designated as "early" or "very early" actually were harvested later than they could have first been picked. This, however, probably did not adversely affect the alpha acids content. Some of the "sleepers" in Corvallis might have been hurt due to heavy spring pruning in order to obtain planting stock for Prosser and Yakima in 1975. These lines will be pruned very carefully in 1976 in order to see whether they continue to be sleepers or show the normal spring regrowth expected of a vigorous hop. All lines except the ones discarded will be grown and harvested again in 1976. We will also obtain yield data and mature cone analyses from the Yakima nursery in 1976. In addition, another eight lines

that were not planted in Yakima in 1975 will be grown as babies in 1976.

Data for the controls (Brewers Gold, Fuggle-H, Cascade, Comet, and Bullion) at Corvallis were taken from the 10-hill seedless nursery grown in the same location. The Yakima data came from baby hills at the J. I. Haas Nursery planted the same time as the selections. With the exception of Comet, (which was not grown in the seedless yard in Corvallis), the alpha acids production of the controls in Yakima was disappointingly low even for the high alpha lines Brewers Gold and Bullion. Cascade and Fuggle had very low alpha acids values. This might have been due to poor planting stock and also due to a severe zinc deficiency which developed during the growing season and was not recognized until it was too late for applying this trace element. The zinc deficiency will hopefully be corrected in 1976.

Seedless Selections in the 5-hill Observation Nursery not Harvested in 1975:

Eleven Selections (table 8) were not harvested because of moderate to severe downy mildew cone infection. However, they were considered to be of sufficient interest to be continued for one more year. Quality data are based on analyses of 5-cone samples and yields are based on a visual estimate. Alpha acids levels were probably lower than normal because the mildew infected cones fluffed up and lost some lupulin even with careful hand picking. These lines will be tested for one more year in order to see whether they should be continued in the program.

Selected Genotypes Grown in the Seedless Named Variety Nursery:

This nursery consists of named hop varieties from various parts of the world which are grown at Corvallis for observation purposes only. Those that were harvested (mainly European varieties) are included in table 9. The two Hallertauer medium early selections, as expected, had very low cone production and rather low alpha acids content. The two lines from Northern Yugoslavia, Yugoslavia Golding and Savinja Golding produced yield levels expected of a Fuggle in the Willamette

TABLE 8 : Advanced 2 year old Selections Grown in the 5-hill Seedless Observation Nursery but not Harvested in 1975. Pruned March 28; Trained May 9, 14, 26.

Sel.No.	Location Row:Hill	Pedigree	Spring[1/] regrowth	X Wire 1st	X Wire Most	Bloom 1st	Bloom Full	Yield estimate	Quality α	Quality β	Quality α/β	Remarks
			May 15	June		July		lbs/A	%	%		
7003-03	212:12-16	65009x19046M	1	6	14	18	25	1800	6.5	5.9	1.10	slight, DM/cones
-30	221: "	"	1	8	14	18	25	2000	6.6	5.3	1.25	DM/cones
-66	229: "	"	1	11	14	15	25	2500	3.9	4.1	0.96	
-75	230: "	"	1	14	18	5	23	2000	7.0	5.0	1.40	DM/cones
-79	231: "	"	1	14	18	7	22	1700	5.8	6.3	0.93	DM/cones
-81	233: "	"	1	3	18	15	24	2500	7.6	6.6	1.16	DM/cones
-176	202:17-21	"	1	12	17	18	28	2000	6.5	6.3	1.03	slight DM/cones
7004-17	213:17-21	65009x19182M	3	19	28	22	28	1800	6.4	4.1	1.56	weak arms
7005-47	233:17-21	65009x63015M	1	7	11	5	22	2500	8.3	3.0	2.77	E
7006-296	230:23-27	65009x64035M	4	28	7/5	22	28	G				1 mature plant
7007-54	220:28-32	64100x64035M	4	22	7/6	18	25	1700	5.5	2.1	2.63	slight DM/cones

1/ 1 = best to 4

Table 9 : Agronomic and Quality Data of Selected Genotypes Grown in the Seedless Named Variety Nursery.
Pruned March 28; Trained May 9, 14; Harvested September 4, 1975

Accession Number	Location Row : Hill	Name	Spring Regrowth	Cross Wire	Flowering		Yield[1/]		Quality			Remarks[2/]
					1st	Full	per plot	per acre	α	β	α/β	
			May 15		July		g	lbs.				
21014	247 : 1-2	Hallertauer m.f.	3	7/15	6/26	10	3050	651	5.5	5.6	0.98	
56001	249 : "	Hallertauer	4	7/05	10	15	2800	597	5.7	5.3	1.08	
61019	246 : 3-4	Yugoslavia Golding	1	6/20	3	10	7000	1493	6.9	3.7	1.88	E
61020	247 : "	Savinja Golding	1	6/20	3	10	5550	1184	6.6	3.3	2.02	E
64107	247 : 5-6	Northern Brewer	1	6/22	5	10	4600	981	11.0	4.7	2.33	
21043	247 : 9-10	Wye Challenger	4	7/10	18	25	5150	1098	9.8	5.5	1.80	exc. pick
21044	248 : "	Wye Northdown	2	7/03	16	22	2150	917	10.6	6.7	1.58	
21050	249 : "	Ahil	1	6/30	5	15	5850	1248	11.7	5.0	2.33	E
21052	245 : 11-12	Atlas	3	7/15	22	30	4250	906	9.5	4.2	2.28	YF2
21053	246 : "	Aurora	4	7/08	25	30	4200	1792	10.8	4.2	2.57	
21049	247 : "	Styrian	1	6/07	5	10	5000	1066	7.0	3.3	2.14	E
21077	248 : "	Saazer	4	7/15	15	20	750	320	5.6	4.3	1.30	DM/cones

1/ $\frac{\text{Green wt./plot X 774}}{2 \text{ X } 453.6 \text{ X } 4}$

2/ E = early; YF2 - yellow fleck 2

Valley with an alpha acids content somewhat higher than Fuggle. They also matured early as did the Hallertau lines. Northern Brewer had low cone production but higher alpha acids content. The two new varieties from England, Wye Challenger and Wye Northdown had low cone production but good alpha acids content (around 10%). Among the three newly released varieties from Dr. Tone Wagner's program in North Yugoslavia (Slovenia), Aurora was the best yielder. It also had an alpha acids content only slightly below that of Northern Brewer. Ahil had the highest alpha acids content among the varieties listed in table 9 but its cone production was only about 6 bales per acre. Atlas showed some peculiar chlorophyll deficiency reminiscent of yellow fleck due to Prunus Necrotic Ringspot. Styrian, the most important hop variety in Slovenia, produced about 5 bales in our seedless yard and had an alpha acids content similar to Yugoslavia Golding and Savinja Golding. These 3 cultivars are probably identical and appear to be very similar to Fuggle. The lowest cone production and very low alpha acids content was found in the Czechoslovakian variety Saazer. This variety grew poorly throughout the season and barely made the top wire. It also had some cone infection from downy mildew.

Off station testing of selected high alpha lines from the 1971 nursery:

A decision was made in the spring of 1975 to place 37 high alpha lines from the 1971 nursery into observation plots with C.E. Zimmermann at Prosser, WA and into a newly established observation nursery adjacent to the John I. Haas extraction plan in Yakima, Washington. (table 10) (See also pages 31-35). John I. Haas had expressed interest in testing

Table 10: 37 Female Selections from the 1971 Nursery Planted in Two Observation Plots in the Yakima Valley, Washington; 1975.

Sel.No.	Row:Hill	Pedigree	1/ Maturity	Cone Type	2/Yield3/ Pot./ Vigor	1972 α	1972 β	1973 α	1973 β	1974babies 4/ α	1974babies 4/ β	1974 mature α	1974 mature β	CoF	Remarks	DM 5/
7003-243	150:12	65009x19046M	M	T	VG			9.6	6.7	6.5*	5.0*	10.1	7.1	43		VR
7004-03	151:33	65009x19182M	ME	T	EXC.	8.9	4.6	11.7	4.3	9.7	3.8	10.7	4.9	44		VR
7005-70	153:19	65009x63015M	ME	T	EXC.	9.9	6.4	12.1	5.6	8.1	5.5	10.2	6.1	33		I
-72	:21	"	ME	T	EXC.	9.3	3.5	9.2	3.2	6.6*	4.5*	12.2	5.4	32		R
-87	:36	"	ML	T	VG-P	12.3	3.3	14.3	3.2	12.4	3.6	13.2	4.4	32	sleeper ?	I
-122	154:18	"	ML	T	VG-P	10.6	7.2	9.4	5.8	11.2	7.6	10.4	7.7			I
-182	155:29	"	ME	M	VG	9.4	4.1	9.3	3.7	11.1	5.9	10.8	4.6			R
-194**	:41	"	M	T	VG	11.2	4.2	12.0	3.6			13.9	5.0	22		S
-201	:48	"	M	MT	EXC.	8.1	4.7	11.3	5.8	10.1	6.4	10.7	6.1	59		I
-205	:52	"	M	T	VG			14.9	5.3	14.8	5.0	15.0	7.0	45		VR
-232	156:26	"	L	MT	EXC.	11.4	4.4	9.7	3.9	10.5	5.1	12.4	5.2			VR
7006-23	156:52	65009x64035M	M	T	VG-P	10.9	4.5	9.9	5.1	12.6	6.1	10.8	5.2			VR
-61	157:12	"		T	G	10.2	2.9	11.5	3.0	9.4	2.7	11.4	3.1	20	v. low β	I
-74**	:17	"	M	T	VG	12.2	6.3	10.4	4.6			12.3	5.7	35		I
-96**	:22	"	M	T	G	11.9	3.9	13.7	5.2			13.2	6.0	29		S
-230	158:41	"	M	T	G			11.0	3.2	9.8	3.6	12.0	3.7			I
-273	159:33	"	VE	M	VG			12.1	2.8					23		S
-294	160:1	"	M	MT	VG-P			10.6	4.8	12.5	5.4	10.8	4.6	36		R
-296**	:3	"	E	M	G-VG	9.1	4.9	11.2	4.7			12.2	4.9			I
-302	:9	"	M	MT	G-VG			11.2	6.3	11.7	7.5	12.2	6.9	21		VR
-311**	:18	"	VE	M	VG	10.6	3.8	11.0	5.0					26		I
-318	:25	"	M	M	VG-P			12.1	4.2	12.7	4.3	12.5	4.6	24		I
-339**	:46	"	M	M	G	10.1	5.3	11.9	5.1					26		I
-356	161:12	"	L	T	VG-P	11.0	7.0	10.0	6.2	13.0	7.7	15.2	8.0		sleeper ?	R
-378	:34	"	M	T	VG	8.4	4.4	10.7	5.1	10.2	5.2	12.0	6.0	35		R
-382	:38	"	M	T	VG	9.3	4.1	11.9	3.9			12.6	4.7			I
-392**	:48	"	L	T	VG	11.4	4.7	11.7	4.3					34		I
-398	162:1	"	M	M	G-P	12.5	4.4	13.5	5.8	13.3	6.4	11.5	5.8	27	vg storage	I
-408	:13	"	M	MT	VG	10.1	4.1	11.3	3.2	12.4	4.6	14.2	4.9			I
-445	:50	"	M	MT	EXC.	9.5	4.8	9.9	2.1	10.5	5.2	11.0	5.8			I
-450	163:2	"	M	T	VG	10.9	4.4	11.3	3.2	8.4	3.2	12.7	3.8			R
-468	:20	"	M	M	VG-P	10.3	4.2	11.6	3.6	11.2	4.5	12.1	4.8			I
7007-60	164:38	64100x64035M	M	T	VG	6.5	3.6	10.8	3.0	11.6	4.8	10.1	3.9			I
-162**	166:38	"	M	M	VG	10.9	3.8	12.8	4.0			12.1	4.4		DM/cones	I
-206	167:29	"	E	T	EXC.	10.5	4.3	13.8	3.4	6.7*	3.3*	11.4	5.0	36		R
-281	168:53	"	M	M	G	11.5	5.9	10.6	4.5							S
-339	170:7	"	ML	T	VG-P	10.6	5.5	11.8	4.0	12.9	6.6	11.5	6.0			R

1/ VE=very early; E=early; M=medium, L=late
2/ M=medium compact; T=tight compact
3/ EXC=excellent, above 5500g/plant; VG=4500-5000g; G=4000g; P=poor; Different readings (hyphenated) represent 1973 + 1974 seasons.
4/ * = immature
5/ I=intermediate; S=susceptible; R=resistant; VR=very resistant.
** Not at the J. I. Haas Nursery.

Table II : Yield and quality data of 37 high alpha lines and controls at Corvallis, OR (2 yrs. old) and Yakima, WA (babies). 1975.

Acc. or Selection No.	Corvallis: Seedless Yard				Corv: Seeded Yd.			Remarks[3]	YAKIMA		
	Yield[1] lbs/acre	Quality			Quality[2]				Yield rating[4]	Quality[2]	
		α	β	α/β	α	β	α/β			α	β
7003-243	3051	9.9	7.1	1.39	7.1	4.8	1.48	early	9	5.2	6.0
7004-03	2903	11.8	5.5	2.16	10.7	4.5	2.36	early	5	9.9	4.9
7005-70	2313	12.2	7.4	1.64	11.9	6.3	1.89	early	4	11.2	7.7
-72	1913	12.0	6.3	1.92	12.7	6.7	1.89	sleeper	4	3.5	2.2
-87	2237	11.6	4.0	2.86	11.0	3.4	3.22	sleeper	4	11.5	3.2
-122	1678	11.4	8.6	1.32	10.9	7.8	1.39		4	9.8	7.1
-182	1484	10.7	6.3	1.71	13.4	5.1	2.64	sleeper	4	7.8	4.5
-194	--	--	-	--	11.8	3.7	3.23		-	--	-
-201	2217	10.6	7.6	1.38	9.7	5.0	1.97	slight yellow fleck	7	9.0	5.8
-205	1958	14.0	6.4	2.18	6.1	3.5	1.75		8	8.8	4.7
-232	2714	9.9	4.4	2.26	9.5	3.9	2.43	early	6	9.3	4.4
7006-23	1800*	12.6	5.0	2.50	--	-	--	yellow fleck 2	4	9.9	5.5
-61	1507	9.6	3.2	3.07	13.8	3.7	3.74	sleeper	6	8.6	6.0
-74	--	--	-	--	12.7	5.1	2.50		-	--	-
-96	--	--	-	--	15.6	6.4	2.44		7	10.1	6.0
-230	1419	7.8	10.4	0.76	11.2	2.9	3.91	sleeper	3	9.5	3.7
-273	--	12.7	3.1	4.04	12.7	3.1	4.04		4	7.0	2.5
-294	1200*	9.4	5.9	1.60	--	-	--	sleeper	5	9.0	4.8
-296	--	--	-	--	13.6	5.0	2.70	early	-	--	-
-302	1500*	9.3	6.2	1.52	7.5	6.5	1.45	sleeper, yellow fl. 1	3	7.8	5.6
-311	--	--	-	--	16.8	5.5	3.07	early	-	--	-
-318	1500*	11.1	4.7	2.35	14.3	5.8	2.48	sleeper	4	12.5	4.8
-339	--	--	-	--	13.1	7.2	1.81		-	--	-
-356	1000*	11.5	8.4	1.38	11.1	8.9	1.25	sleeper	6	13.4	7.9
-378	--	--	-	--	11.9	6.7	1.77	Disc. at Corv. (y. fleck 3)	2	10.4	7.0
-382	--	--	-	--	--	-	--		4	8.5	4.2
-392	--	--	-	--	12.7	7.1	1.78		-	--	-
-398	1242	13.5	8.0	1.69	10.8	6.2	1.75		4	10.5	6.9
-408	1600*	11.5	5.0	2.31	--	-	--	sleeper	4	12.0	5.1
-445	1985	10.3	6.7	1.55	12.4	8.1	1.53		8	10.6	6.1
-450	2111	14.5	5.2	2.79	14.4	4.6	3.10		7	11.5	4.9
-468	1634	10.7	6.9	1.54	11.9	6.8	1.75	sleeper	5	12.6	5.3
7007-60	1382	7.9	5.5	1.44	6.6	6.1	1.08				
-162	--	--	-	--	11.1	4.2	2.62		3	8.1	4.2
-206	1967	10.5	5.6	1.88	13.3	6.8	1.91	top crop	-	--	-
-281	--	--	-	--	12.9	7.0	1.85		4	3.4	3.1
-339	2237	14.7	7.8	1.88	12.9	5.9	2.19		5	12.1	6.2
									6	9.3	6.5
Brewers Gold	2739	9.7	5.1	1.91	9.9	4.7	2.10		7	6.2	3.9
Fuggle H	1598	7.4	3.7	2.01	6.0	2.9	2.09	early	1	3.0	1.8
Cascade 5/	3191	7.5	6.3	1.20	--	-	--		3	3.1	4.1
Comet	--	--	-	--	--	-	--		7	8.2	4.7
Bullion 5/	2624	11.2	5.9	1.89	--	-	--	early	4	5.5	4.0

1/ calculated from 5-hill plot; * = estimated

2/ 5 - cone analysis

3/ refer to Corvallis grown material only

4/ 1 = lowest to 10

5/ Average of 2 plots (JIH source and Prosser source) at the Yakima Nursery

Comet at the John I. Haas Nursery had an excellent yield rating of 7 which was higher than most of the high alpha selections, although its alpha acids level was lower than that of many selections in the nursery. The alpha acids level of the Brewers Gold and Bullion controls was lower than expected and no reasons other than poor planting stock and zinc deficiency can be given for this fact. Some of the outstanding high alpha selections in this nursery have been discussed already in a previous chapter. Among them were 7004-03; 7005-70, -87, -205; 7006-311, -445, -450, -468; 7007-281, and -339.

The zinc deficiency at the Yakima nursery which was mentioned previously, hopefully will be corrected in 1976 and mature cone samples as well as yield data from the Yakima nursery, from the seedless yard in Corvallis, and probably also from the Prosser nursery will be available in 1976 in order to make prelimary selections in this material in preparation for possible off-station trials. The material however, will first be tested for prunus necrotic ringspot virus by Dr. C.B. Skotland, Prosser.

Advanced selections from the 1971 nursery grown in the original nursery hills in 1975: In addition to growing the female selections from the 1971 nursery in seedless trials at Corvallis and in Yakima, the original nursery hills of selected female and male genotypes were maintained for one more year in order to get additional quality data from this important material. These lines are listed in tables 12 (females) and 13 (males).

Female selections in the original 1971 nursery hills: Alpha acid levels of the selections in this nursery seemed to have held up rather well over the past three years as judged from analyses of five cone samples in 1975. Most of the selections had alpha levels exceeding 10% and some (7006-95, 7006-96, 7006-311, 7006-426) exceeded 15%. Spring regrowth, arm length and a rating of lateral branch development can give an indication of the vigor and yield potential of each individual line. Most selections bloomed late or medium late and are

Table 12: Advanced Female Selections from the 1971 Nursery, Grown in the Original Nursery Hills in 1975. Pruned April 7; Trained May 12, 20, 30. Selections with * also grown as babies at Prosser and/or Yakima, WA.

Sel.No.	Location Row:Hill	Pedigree	Spring[1] regrowth	Arm length	[2] laterals	[3] Bloom	Quality α	Quality β	Quality α/β	Also[4] Grown at
			May 11	Inches						
7002-49	145:13	63020x64035M	3	42	1	L	8.9	3.3	2.71	SL
7003-15	145:43	65009x19046M	2	36	2	L	11.4	5.6	2.04	SL
* -243	150:12	"	1	36	1	L	7.1	4.8	1.48	SL
-301	:19	"	1	30	1	L	10.1	11.5	0.88	SL
*7004-03	151:33	65009x19182M	1	42	1	ML	10.7	4.5	2.36	SL
-75	:43	"	1	36	1	ML	10.4	3.7	2.77	SL
-118	:48	"	2	36	3	L	10.0	2.7	3.65	SL
7005-06	152:6	65009x63015M	3	30	2	L	11.4	6.0	1.88	SL
-40	:40	"	4	36	2	L	10.7	5.6	1.91	SL
* -70	153:19	"	1	42	1	L	11.9	6.3	1.89	SL
* -72	:21	"	4	36	3	L	12.7	6.7	1.89	SL
* -87	:36	"	4	36	3	L	11.0	3.4	3.22	SL
-116	154:12	"	4	36	2	L	13.3	3.8	3.51	SL
* -122	:18	"	4	12	4	L	10.9	7.8	1.39	SL
-149	:45	"	4	16	4	L	10.4	4.1	2.54	OB
-156	155:1	"	3	33	3	L	10.7	8.3	1.29	
* -182	:29	"	4	30	3	L	13.4	5.1	2.64	SL
* -194	:41	"	1	42	1	L	11.8	3.7	3.23	OB
* -201	:48	"	2	36	1	L	9.7	5.0	1.97	SL
* -205	:52	"	4	18	3	L	6.1	3.5	1.75	SL
* -232	156:26	"	2	36	1	L	9.5	3.9	2.43	SL
*7006-61	157:12	65009x64035M	3	30	2	L	13.8	3.7	3.74	SL
* -74	:17	"	1	30	1	M	12.7	5.1	2.50	OB
-95	:21	"	2	42	1	L	15.1	6.5	2.32	OB
* -96	:22	"	4	36	2	L	15.6	6.4	2.44	OB
-134	:26	"	4	24	2	L	12.8	4.0	3.22	SL
-170	:33	"	3	48	1	L	10.6	2.3	4.54	OB
-215	158:26	"	4	36	2	L	12.5	6.1	2.04	SL
-225	:36	"	1	48	2	L	11.9	12.1	0.98	SL
-229	:40	"	2	36	2	L	10.1	7.0	1.45	OB
* -230	:41	"	4	36	3	L	11.2	2.9	3.91	SL
-257	159:15	"	4	36	1	L	10.7	8.8	1.23	OB
* -273	:33	"	1	18	3	L	12.7	3.1	4.04	OB
-276	:36	"	1	42	1	L	12.2	5.9	2.05	OB
* -296	160:3	"	1	36	2	ME	13.6	5.0	2.70	SL
* -302	:9	"	4	20	4	L	7.5	6.5	1.45	SL
* -311	:18	"	1	24	3	E	16.8	5.5	3.07	OB
-314	:21	"	4	36	1	L	10.0	4.6	2.16	OB
* -318	:25	"	4	36	3	L	14.3	5.8	2.48	SL
-326	:33	"	3	36	1	L	14.2	3.4	4.21	OB
-327	:34	"	4	30	3	L	10.4	4.0	2.59	OB

Table 12 : concluded.

Sel.No.	Location Row:Hill	Pedigree	Spring regrowth 1/	Arm length	2/ laterals	3/ Bloom	Quality α	Quality β	Quality α/β	Also Grown at 4/
			May 11	Inches						
7006-328	160:35	65009x64035M	3	36	3	L	12.0	6.9	1.74	SL
-334	:41	"	4	20	3	L	10.3	4.2	2.47	OB
* -339	:46	"	1	12	4	L	13.1	7.2	1.81	OB
-353	161:9	"	2	36	1	L	13.8	8.8	1.57	OB
* -356	:12	"	4	24	3	L	11.1	8.9	1.25	SL
-370	:26	"	4	36	1	L	11.0	9.9	1.10	SL
-371	:27	"	2	36	2	L	12.8	7.0	1.84	OB
* -378	:34	"	4	36	3	L	11.9	6.7	1.77	SL
* -382	:38	"	4	36	3	L				OB
* -392	:48	"	4	10	4	L	12.7	7.1	1.78	OB
* -398	162:1	"	4	30	3	L	10.8	6.2	1.75	SL
-404	:9	"	4	30	2	L	10.0	3.3	3.03	SL
-406	:11	"	1	42	1	ML	10.6	4.7	2.24	SL
-426	:31	"	4	42	1	L	15.2	4.4	3.46	OB
-435	:40	"	4	36	3	L	12.7	5.7	2.23	SL
-444	:49	"	1	42	1	L	10.7	5.7	1.87	OB
* -445	:50	"	4	36	2	L	12.4	8.1	1.53	SL
* -450	163:2	"	2	48	1	L	14.4	4.6	3.10	SL
-456	:8	"	3	36	3	L	10.2	3.7	2.78	SL
-463	:15	"	3	42	1	L	13.1	5.3	2.50	OB
* -468	:20	"	2	36	1	L	11.9	6.8	1.75	SL
-477	:29	"	4	36	3	L	10.5	4.7	2.22	OB
*7007-60	164:38	64100x64035M	4	36	1	L	6.6	6.1	1.08	SL
* -162	166:38	"	1	42	1	ML	11.1	4.2	2.62	OB
-175	:51	"	1	42	1	L	10.3	3.3	3.17	SL
* -206	167:29	"	4	42	1	L	13.3	6.8	1.91	SL
* -281	168:53	"	4	36	1	L	12.9	7.0	1.85	OB
-294	169:15	"	1	36	1	E	11.3	4.1	2.76	SL
* -339	170:7	"	1	38	1	L	12.9	5.9	2.19	SL
-347	:15	"	1	18	3	ME	10.5	6.5	1.61	OB
19001	5/	Brewers Gold check	3	30	2	L	9.9	4.7	2.10	
48209	5/	Fuggle H check	2	18	3	E	6.0	2.9	2.09	

1/ 1 = best to 4
2/ 1 = best to 4
3/ E = early; M = medium; L = late
4/ SL = seedless yard, 5 hills, 2 yrs old; OB = seeded yard, 2 hill babies
5/ Average of 17 hills

Table 13: Male Selections From the 1971 Nursery Grown in the Original Nursery Hills in 1975. Pruned April 7; Trained May 12, 21, 30.

Sel.No.	Location Row:Hill	Pedigree	Spring regrowth[1]	Arm length	2/ laterals	3/ Bloom	Quality α	Quality β	Quality α/β
			May 11	inches					
7002-33M	145:10	63020x64035M	1	36	1	ML	14.9	53.5	0.28
-134M	:24	"	1	12	3	M	41.4	38.8	1.07
7003-68M	146:43	65009x19046M	1	36	1	ME			
-162M	148:35	"	2	12	4	L	13.2	53.1	0.25
-166M	:39	"	4	16	3	L	15.4	61.5	0.25
-225M	149:47	"	2	16	2	L	20.2	48.7	0.42
-245M	150:14	"	4	33	2	L	25.1	57.6	0.44
-256M	:27	"	3	18	2	L	14.7	62.2	0.24
7005-115M	154:11	65009x63015M	3	12	3	L	54.1	23.5	2.30
-118M	:14	"	3	27	2	L	54.6	21.8	2.50
-121M	:17	"	4			did not flower			
-231M	156:25	"	1	36	2	E			
7006-30M	157:2	65009x64035M	4	36	2	L	48.6	29.6	1.64
-84M	:19	"	1	12	3	M	48.2	25.5	1.89
-94M	:20	"	4	45	1	VL	46.4	18.9	2.45
-163M	:32	"	3	36	1	L			
-179M	:41	"	4	18	1	L	26.8	48.4	0.55
-183M	:45	"	4	33	1	ML	51.4	24.7	2.08
-187M	:49	"	1	30	1	E			
-211M	158:22	"	1	16	2	E	25.1	47.0	0.54
-269M	159:27	"	3	24	1	ML	25.7	53.1	0.48
-293M	:53	"	1	12	2	E			
-301M	160:8	"	1	36	2	L			
-323M	:30	"	1	12	1	ML	45.3	28.3	1.60
-340M	:47	"	1	42	1	M			
-422M	162:27	"	1	12	3	E			
-430M	:35	"	1	6	4	E			
-473M	163:25	"	2	12	3	L	38.1	38.0	1.00
7007-18M	163:49	64100x64035M	1	18	1	E	51.1	25.4	2.01
-21M	:52	"	1	16	2	E			
-160M	166:36	"	4	24	1	L			
-176M	:52	"	2	28	1	L	53.9	26.9	2.00
-252M	168:24	"	2	18	2	L			
-275M	:47	"	1	30	1	ME			
-278M	:50	"	4	36	2	L	52.0	27.5	1.89
-304M	169:25	"	1	18	2	E			
-307M	:28	"	2	18	2	E			
-328M	:49	"	1	27	1	ML			
-335M	170:3	"	3	8	4	E	18.4	19.1	0.96
-356M	:24	"	3	24	1	L	31.9	38.1	0.84

1/ 1 = best to 4
2/ 1 = best to 4
3/ E = early; M = medium; L = late

probably also late maturing. Alpha/beta ratios varied from less than 1 (7003-301) to over 4 (selections 7006-170, -273, -326). The data listed in table 12, together with the data from the same selections grown in other nurseries, will form the basis for future selection procedures.

Male selections from the 1971 nursery grown in the original nursery hills: A total of 40 male genotypes (table 13) were saved from this nursery for future testing and possible inclusion in our germplasm pool. Spring regrowth varied from excellent to poor (rating 4). Data on arm length, lateral branch development, and time of bloom, further serve to characterize the agronomic potential of these selections. Quality data obtained from isolated lupulin glands at the time of bloom varied from low alpha and higher beta acids content for selections from crosses 7002 and 7003, to high alpha, medium or low beta and consequently high alpha/beta ratios with selections from crosses 7005, 7006 and 7007. The four males that were used as parents in the 1973 nursery (7006-30M, -94M; 7007-18M, -356M) had high alpha/beta ratios and high alpha acids content with the exception of 7007-356M. Other high alpha:beta ratios were found in 7005-115M, -118M, 7006-183M, 7007-176M, -278M. We are particularly interested in an early blooming vigorous male with high alpha:beta ratio and good alpha acids content in its lupulin. Only selection 7007-18M in table 13 can meet these criteria. Fortunately, this was one of the male parents of the seedlings grown presently in the 1973 nursery.

Female germplasm nursery:

A number of agronomically excellent female genotypes from the 1975 germplasm nursery are listed in Table 14. They had varying maturity types but excellent sidearm length, good lateral development and very good to excellent yield potential and should be considered as prime suspects for female parents in future crosses. Many of these have been used in crosses in the past and

TABLE 14: Agronomically excellent female genotypes in the 1975 Germplasm Nursery. Pruned April 8; Trained May 12, 17, 25, 1975.

Accession Sel. No	Location Row:Hill	Pedigree	Maturity 1/	Sidearm Length	Laterals 2/ (rating)	Yield Potential
				Inches		
19012	32:49-50	LGp x FuS	E	36	1-2	very good
19028	34: "	EG-ECS	L	36-48	1	"
19105	1:49-50	LGpSxFu-FuS	M	36	1	"
19110	2: "	XSxB31S-B31	L	36-40	1	"
19151	5: "	FuxRV-XS	VL	24-36	1	"
19185	6: "	LGpSxFu-RVS	E	48	1	Excellent
19200	7: "	Urbann x LCS	VL	48	2	"
21057	35:55-56	lg. cone Pr.Ringwood	L	36	1	very good
21063	42:53-54	(BuxRV-XS)xEG-XS	E	24-36	2	"
50024	11:49-50	Els-FuSxEKG-BavS	VL	48-56	1	"
50040	46:49-50	Spalter x EKG-BavS	VL	36-40	1	Excellent
50075	47: "	(EKGxEG-KGS)x Fu-FuS	VL	36-40	2	"
54005	33:51-52	(Tet-XSxLCS)xLGp-FuS	M	36	1	very good
56008	13:49-50	XSx(FuxEG-ECS)	E	36-48	1	"
58016	18: "	Ut526-5	L	24-36	2	"
58112	19: "	(Bu x Fu-FuS)x OP	L	36	1-2	"
60037	5:51-52	Wyo 2-1	L	36-48	1	"
60039	7: "	Mont 1-1	L	36-48	1	"
63008	11: "	BGxFu-FuS	VL	48	1	"
63018	12: "	BG^2xEKG-BavS	M	36	2	"
63019	13: "	"	VL	48	1	"
63021	15: "	BGxFu-FuS	VL	36	2	"
63027	16: "	"	VL	36-48	1	Excellent
64002	17: "	(LGpSxFu-FuS)xSSp-LCS	L	48	1	"
64003	18: "	"	L	36-48	1-2	"
64007	36:55-56	(LGpSxFu-FuS)xEG-XS	L	36-48	1	"
64008	19:51-52	2L118x OP	L	24-30	3	very good
64010	21: "	7k491x OP	L	36-48	2-3	"
64020	44:51-52	Ba x EKG-BavS	VL	36	1	"
6185-01	51: "	Su25S x Ut524-2	L	36	1	"
6230-01	33:53-54	N Mex2-2 x Ut525-2	L	36-48	1	Excellent
6305-05	37: "	Fu x SSp-LCS	L	36-48	1	very good
-06	38: "	"	E	36	2	"
6616-02	47:53-54	BGxFu-Colo2-1	L	36-48	2	"
-10	49: "	"	M	36-48	1	"
-20	50: "	"	L	36	1-2	"

1/ E = early; M = medium; L = late; VL = very late

2/ 1 = best to 4

some of them are derived from others listed in this table. For example, the germplasm Late Grape Seedling and Fuggle -Fuggle Seedling appears repeatedly in the pedigrees. Also East Kent Golding -Bavarian Seedling shows up many times as well as Fuggle-Fuggle Seedling; or Striesselspalt -Late Cluster Seedling. Among the outstanding genotypes are also some Wild Americans (Wyoming, Montana) and some selections from crosses between Wild American genotypes or Wild Americans and standard varieties. Some of these lines in previous crosses have resulted in excellent progeny which, however, was deficient in quality, particularly alpha acids content. For example, the Striesselspalt -Late Cluster pedigree has good yield potential but high beta and low alpha acids content. Thus, if some of these vigorous high yielding genotypes could be improved in two ways (maturity and alpha acids content) while the yield potential and disease resistance can be maintained we should have the opportunity to select an excellent hop.

Male Germplasm Nursery:

In Table 15 is a listing of the outstanding male genotypes in the 1975 germplasm nursery as judged by the amount of pollen shedding, side arm length and lateral branch development as well as overall vigor. Again, some of the genetic combinations seem to appear repeatedly that were noticed also in the female germplasm nursery: Fuggle Seedling x Red Vine Seedling, Fuggle Seedling x Fuggle Seedling, Striesselspalt x Late Cluster Seedling, East Kent Golding-Early Green-Kent Golding Seedling as well as some combinations of standard varieties and Wild Americans. Three recent introductions from Yugoslavia (accession numbers 21088M, 21089M, and 21090M) also scored very well in 1975. Some of these males have been used in crosses repetedly in the past and one (19058M) has repeatedly produced superior progeny that resulted in some outstanding selections such as 65009 (a high alpha plus beta and high lupulin

Table 15: Excellent pollen producing males in the 1975 Germplasm Nursery. Pruned April 8; Trained May 12, 17, 25, 1975.

Accession Number	Location Row : Hill	Pedigree	Maturity[1/] (pollen shedding)	Sidearm length (inches)	Laterals[2/] (rating)
19005M	1 : 53-54	Late Cluster Seedling	L	24-36	2
19039M	9 : "	FuS x RVS	L	36-48	1-2
19040M	10 : "	FuS x FuS	L	36-48	1-2
19041M	11 : "	EG x XS	VL	48-56	1-2
19046M	14 : "	LCS x FuS	L	24-36	1-2
19058M	18 : "	EG x XS	VL	36-48	1
19172M	24 : "	Cat's Tail x Fu-FuS	E	12-24	1-2
19173M	25 : "	SSp x LCS	L	24	2
52045M	9 : 55-56	(EKGxEG-KGS)x EG-XS	VL	24-30	1-2
60023M	17 : "	Colo 1-1	M	24-36	2-3
63011M	22 : "	(LGp - FuS) x EG-XS	E	24-30	1-2
63014M	25 : "	BG x Ut 526-4	M	12-36	2
63015M	26 : "	BG^2 x EKG - BavS	L	24-48	1-2
64035M	2 : 57-58	7K491 x OP	L	12-30	2-3
64102M	6 : "	WA x OP	E	12-24	2
65037M	40 : "	Ha^2 x Fu-FuS	VL	36	1-2
21017M	29 : 53-54	Fu x Colo 2-1	L	24-36	1-2
21059M	12 : 57-58	(LGpS x Fu-FuS) x EG-XS	L	30-48	1
21060M	13 : "	"	L	30-48	1
21061M	14 : "	(LGpS x Fu-FuS) x SSp-LCS	L	36-48	1-2
21070M	47 : "	BG^3 x EKG - BavS	L	36-48	2
21088M	16 : "	Yugoslav. Sel. 5/9	L	24-36	1-2
21089M	17 : "	" 5/10	L	36-48	2
21090M	18 : "	" 12/17	L	24-36	2-3

1/ E = early; M = medium; L = late; VL = very late

2/ 1 = best to 4

female) or 64007 (a low alpha, high beta,very high yielding type). This 19058M was used in crosses on Cascade in 1975 (table 5, page 27). Other males such as 63015M (high alpha, good storage), 64035M (medium alpha,downy mildew resistance) have been used in crosses in the past. One outstanding male (accession number 19173M) has consistently produced superior progeny that,however, was frequently deficient in alpha acids content. Again,a combination of certain of these male genotypes with selected females could produce excellent progenies both from a yield, maturity,and quality standpoint.

Fuggle-related female triploid selections from the 1971 nursery: In addition to seedlings from crosses made for increased alpha acids production in the 1971 nursery we also had a group of seedlings from a cross between colchicine induced tretraploid Fuggle and the mildew resistant male 64035M which has European (Hallertauer) background. With additional emphasis on triploid females, particularly early maturing types,we are advancing some selections from cross 71101 (table 16) to replicated testing. Unfortunately, most of the selections listed in the table are medium late or late in maturity, but some (7101-29, -67, -92, -118, -184) appeared to have good agronomic characteristics and early maturity. Others had a high alpha/beta ratio (for example 7101-08, -12, -60, -92, -98, -184, -194). These selections will be grown in either a 2-hill Observation Nursery or in a 5-hill Observation Nursery in 1976 to further screen them for yield and quality potential. Soft-wood cuttings of all of these lines will be rooted in the mistbed in the spring of 1976 for cytological analysis. Although most of these genotypes should be triploids (coming from a tetraploid x diploid cross), they should be screened to establish their true karyotype.

Table 16: Potential Fuggle-related Female Triploid Selections from the 1971 Nursery. Pruned April 7; Trained May 13, 21, 1975.

Acc. or Sel. Number	Location Row : Hill	Pedigree	Maturity[1]	Cone wt. (mg)	Quality[2]			Remarks
					α	β	α/β	
7101-08	177 : 6	21003 x 64035M; FuT x ZaS	L	160	7.7	3.7	2.90	high α/β
-12	: 14	" "	M	413	8.7	3.2	2.70	" "
-29	: 27	" "	E	204	8.0	3.5	2.30	
-35	: 33	" "	L	143	6.6	4.0	1.66	
-59	178 : 4	" "	L	169	7.8	3.1	2.54	
-60	: 5	" "	L	208	8.3	2.8	2.92	high α/β
-62	: 7	" "	L	204	7.7	4.3	1.79	
-63	: 8	" "	L	174	7.1	3.6	1.96	
-67	: 12	" "	E	232	8.3	4.2	1.99	
-82	: 29	" "	L	179	7.8	3.7	2.10	
-87	: 34	" "	L	133	7.7	4.1	1.88	
-92	: 39	" "	E	204	10.2	4.1	2.43	high alpha
-96	: 43	" "	L	169	8.5	4.5	1.90	
-98	: 45	" "	L	174	9.0	3.1	2.90	high α/β
-99	: 46	" "	M	195	7.5	3.5	2.17	
-116	179 : 10	" "	M	254	7.9	3.9	2.05	
-118	: 12	" "	E	322	4.9	2.4	2.02	
-148	: 42	" "	M	248	6.2	2.9	2.11	
-175	180 : 16	" "	M	170	5.8	3.6	1.64	
-181	: 22	" "	L	191	7.4	3.8	1.92	
-184	: 25	" "	E	231	8.0	2.9	2.81	high α/β
-194	: 35	" "	M	219	7.5	3.6	2.80	" "
-206	: 47	" "	M	186	6.2	2.6	2.34	
-210	: 51	" "	L	161	6.1	2.5	2.44	
-223	181 : 11	" "	M	204	6.2	3.2	1.96	
19001	3/	Brewers Gold	L	259	9.0	5.0	1.80	
48209	3/	Fuggle H	E	252	6.1	3.0	1.80	

1/ E = early; M = medium; L = late
2/ 5- cone samples
3/ Average of two plots

Male Triploid Selections from the 1971 Nursery: Ten male selections from cross 7101 that were grown in the 1971 nursery were saved for future testing (table 17). All are related to the female selections listed in table 16 and all were excellent pollen producers. Unfortunately, all but two are late maturing as judged from their time of pollen shedding. They will be planted in two-hill Observation Plots in 1976 in the Male Triploid Nursery in the West Yard.

Selections from the 1972 nursery: In addition to several genetic crosses (high beta material, Wild Canadian Seedlings, progeny of a self-pollenated tetraploid hop) a group of seedlings from cross 7102 was grown in this nursery since 1973. Genetically these seedlings are similar to the potential triploids from the 1971 nursery (cross 7101) except that they were transplanted to the field one year later. The male parent of cross 7102 was earlier in maturity (pollen shedding) and therefore most of the male and female selections (tables 18 and 19) are early or medium early. Eight female selections (table 18) and nine male selections (table 19) will be advanced to replicated plots for further testing. Our main interest with the females is to find a good yielding, early maturing hop as a back-up for the advanced triploid selection 21091. With the males, the main emphasis will be on selecting an early maturing (pollen shedding) male that can be used in Fuggle yards for stimulating Fuggle females without excessive seed production.

Several promising female lines appear in Table 18 (for example; 7102-06, -12, -19, -24). All matured early, had excellent cone production, good cone size and acceptable quality.

Some of the males (table 19) had only male flowers in 1975 while others (7102-23M, -45M, -71M, -72M) had an abundance of male flowers and an occassional cone which might be valuable as a marker in case that some of these should be planted in commercial hop yards. The best pollinator of the group appears to

Table 17: Potential Fuggle-related male triploid selections from the 1971 Nursery. Pruned April 7; trained May 13, 21, 1975.

Acc. or Sel. Number	Location Row : Hill	Pedigree	Maturity (pollen shedding)	Remarks
7101-05M	177 : 3	21003 x 64035M; FuT x ZaS	L	excellent pollen producer
-38M	: 36	" "	M	" " "
-47M	: 45	" "	L	" " "
-97M	178 : 44	" "	L	" " "
-129M	179 : 23	" "	L	" " "
-144M	: 38	" "	L	" " "
-151M	: 45	" "	L	" " "
-154M	: 48	" "	M	" " "
-190M	180 : 31	" "	L	" " "
-197M	: 38	" "	L	" " "

TABLE 18: Female Selections From the 1972 Nursery (Early maturing potential triploids w. Fu.background) Pruned April 7; Trained May 13, 21, 1975.

Select. Number	Location Row:Hill	Pedigree[1]	Vigor[2]	Maturity[3]	Harv. Date	Dry Matter	Cone Weight	Yield	Quality α	Quality β	Quality α/β
			July 7			%	mg	g/Plant			
7102-04	184:4	21003x19170M	1	VE	8/22	27.9	315	3550	6.2	3.4	1.29
-06	:6	"	1	VE	"	28.8	256	5200	4.9	4.2	1.16
-12	:12	"	1	ME	"	24.0	297	5700	6.2	4.2	1.46
-13	:13	"	1	VE	"	27.4	258	3850	6.4	4.4	1.47
-19	:19	"	1	ME	"	26.4	284	5600	9.4	3.9	2.38
-24	:24	"	1	ME	"	23.0	232	7500	7.5	4.8	1.56
-26	:26	"	1	ME	"	23.3	182	7000	5.4	3.8	1.43
-32	:32	"	1	ME	"	23.9	208	6450	5.2	2.5	2.08

1/ Tetraploid Fuggle x [XSx(EKGxEG-KGS)]
2/ 1 = best to 4
3/ VE = very early; ME = medium early

TABLE 19: Male Selections From the 1972 Nursery (Potential triploids with Fuggle background). Pruned April 7; Trained May 13, 21, 1975.

Selection Number	Location Row:Hill	Pedigree	Maturity[1/]	Remarks
7102-14M	184:14	21003x19170M; FuTx[XSx(EKGxEG-KGS)]	L	
-23M	:23	" ; "	M	♂
-33M	:33	" ; "	L	V. good pollinator
-43M	:43	" ; "	E	
-45M	:45	" ; "	E	♂
-51M	:51	" ; "	E	
-54M	185:1	" ; "	M	
-71M	:18	" ; "	E	♂
-72M	:19	" ; "	E	♂

[1/] E = early; M = medium; L = late.

have been selection 7102-33M which, unfortunately, was late in maturity. Most of the others, however, were also good pollen producers and they will be advanced to two-hill plots.

Soft wood cuttings of both the female and male selections from this material will be rooted in the mistbed in the spring of 1976 and root tip samples analyzed cytologically to identify the true triploid types. There is always a possibility that some of these selections might be tetrapolids, a situation that was found with the progeny of other tetraploid x diploid crosses. Tetraploids of course would be unsuitable for yield stimulation since they would be fully fertile, comparable to diploid males presently grown in Oregon hop yards.

Wild Canadian Seedlings: A group of 81 seedlings which originally came from open-pollinated seed supplied to us by a Canadian scientist (see 1971 USDA report pg. 19) was grown for the fourth year in this nursery and the most promising plants were analyzed for quality. It was originally anticipated that perhaps some of the high alpha genes of Bullion and Brewers Gold which reportedly came from a female Wild Manitoba hop might still be found near Morden, Manitoba where wild hops are still found today.

Most of the seedlings as mature plants were extremely low in vigor and failed to reach the top wire. Alpha:beta ratios rarely exceeded a value of 2 and lupulin content was extremely low in all lines. In addition, all seedlings seemed to be extremely susceptible to downy mildew and some were lost in the second year of testing due to downy mildew crown infection. It was concluded hat this material would not contribute significantly to our germplasm resources and it would be extremely difficult to maintain many of these lines at the Corvallis location. Therefore, the whole group of Wild Canadian seedlings will be discarded in the spring of 1976.

Female Selections from the 1973 Nursery with High Alpha/Beta Ratios.

In the following Table 20, 58 female genotypes are listed from the 1973 nursery with high alpha and low beta acids content which resulted in a high α/β ratio. (The term "alpha ratio": $\frac{\alpha}{\alpha+\beta}$ is used instead of α/β which may be more meaningful). In addition, all of these genotypes had good lupulin content ($\alpha+\beta>15\%$).

Comet (62013) and 21055 produced a greater number of vigorous high α selections than Northern Brewer (64107). Among the male parents, 21108M and 21109M appear to be the most promising ones.

It is quite apparent that high alpha acids content alone is not sufficient if lupulin quantity is lacking. Frequently genotypes were found that had an excellent alpha ratio (exceeding a value of 80). However, alpha acids content was only moderately high whereas beta acids content was very low, resulting in a high α-ratio. For example, Fuggle has a moderately low alpha acids content, but has an α-ratio slightly higher than that of Brewers Gold, primarily due to its low beta acids content. A high alpha acids content (e.g. 21055) coupled with moderately low beta acids content results in high ($\alpha+\beta$) and a high α-ratio.

A number of genotypes in Table 20 approach or exceed the α-level found in 21055. For example, selections 7301-126; 7302-41; 7303-07, -200; 7306-42; 7312-42; 7314-12 all had high lupulin content (alpha plus beta exceeding 20% by weight) plus good alpha acids content. Their alpha ratio, however, was in the low - mid 70's primarily due to a somewhat higher beta content. The highest α-ratio in this nursery (84) came from Sel. 7307-16 which had 10.3% alpha and only 2% beta perhaps due to some storage deterioration (ID = 0.31). If a male parent could be found that transmits high lupulin content plus high alpha-low beta potential, we should be able to produce good yielding genotypes with α-values exceeding 80. Such a male may already be present in the 1973 nursery (see Table 21). Crosses between selected males and females from the three genetic groups in the 1973 nursery will be made in the summer of 1976, for a second cycle of recombination of high alpha acids genes.

TABLE 20: Two year old high α/β Females with good lupulin content from the 1973 Nursery: Pruned April 9, 10; Trained May 11, 17, 1975.

Acc. or Sel.No.	Location Row:Hill	Pedigree[1/]	Vigor[2/]	Quality[3/] α	β	α/α+β	Remarks
7301-01	1:15b	62013x21108M	1	12.1	3.5	78	
-09	:19b	"	1	12.5	4.0	76	
-34	:32a	"	1	15.4	4.1	79	
-126*	2:44b	"	2	15.7	5.7	74	
7302-31	4:30b	62013x21109M	3	13.0	2.7	83	
-37	:33b	"	1	13.3	4.7	74	
-39	:34b	"	1	13.1	4.5	74	
-41*	:35a	"	1	14.9	5.8	72	
-133	6:14b	"	2	14.2	4.1	77	
-146	:21a	"	1	13.6	3.9	78	
7303-07*	7:18b	62013x21110M	1	15.5	4.7	77	Early
-15	:22b	"	1	13.6	5.0	73	Early
-19	:24b	"	1	15.1	3.9	80	
-27	:28b	"	1	14.5	4.2	77	
-200*	10:14b	"	1	14.5	5.7	72	Early
7304-10	10:20a	62013x21111M	1	13.2	4.8	74	Early
-36	:33a	"	1	14.5	5.3	73	
-107	11:35a	"	1	11.1	2.7	81	
7306-30	16:32a	64107x21108M	3	11.7	3.9	75	
-40	:37a	"	1	14.2	5.0	74	
-42*	:38a	"	2	15.7	5.2	75	
-139	18:19b	"	1	13.0	4.3	75	
7307-01	19:19b	64107x21109M	1	12.3	3.9	76	
-43	19:38b	"	2	13.0	3.9	77	
-48	:41a	"	2	12.1	3.8	76	
7308-15	20:26a	64107x21110M	3	15.3	4.5	77	DM/crown
7310-29	25:40a	64107x21070M	1	11.4	4.5	72	
7311-28	27:31b	21055x21108M	1	12.6	4.2	75	
-31	:33a	"	1	13.6	4.8	74	
-32	:33b	"	1	13.0	4.0	76	
-95	29:33a	"	1	13.3	3.2	81	
-108	:39b	"	1	13.8	4.5	75	
-152	30:45b	"	1	12.5	3.1	80	
-177	31:42a	"	1	13.2	4.6	74	
7312-09	32:33a	21055x21109M	1	14.4	5.1	74	
-15	:36a	"	1	12.3	3.4	78	
-23	:40a	"	1	12.3	2.7	82	
-27	:42a	"	1	13.4	3.7	78	Early
-36	:46b	"	1	14.8	3.0	83	5-hill OB
-37	33:31a	"	3	14.6	4.9	75	
-41	:33a	"	1	14.9	4.7	76	Early
-42*	:33b	"	4	18.7	5.6	77	5-hill OB
-83	34:38a	"	1	15.6	4.1	79	5-hill OB

Table 20 Con't

Acc.or Sel.No.	Location Row:Hill	Pedigree[1/]	Vigor[2/]	Quality[3/] α	Quality[3/] β	Quality[3/] α/α+β	Remarks
7312-128	35:44b	21055x21109M	1	12.4	3.5	78	
-134	36:31b	"	1	14.3	3.1	82	
7313-25	36:45a	21055x21110M	1	13.1	4.5	74	Early
-32	37:32b	"	1	13.7	4.5	75	
-110	39:39b	"	1	12.9	4.0	76	Early
-111	:40a	"	1	13.5	4.8	74	
7314-11	39:46b	21055x21111M	3	14.1	5.3	73	
-12*	40:31a	"	3	15.3	6.7	70	
-44	41:31a	"	1	13.2	3.8	78	
-58	:38a	"	1	13.6	5.4	72	
7315-24	43:46b	21055x21070M	2	13.3	3.8	78	
-29	44:33a	"	1	14.1	3.3	81	
-30	:33b	"	1	14.9	3.6	81	
-35	:36a	"	1	14.2	3.9	79	
-48	:42b	"	1	13.6	4.7	74	
19001	4-hill avg.	Brewers Gold	1	8.5	3.8	69	
48209	4-hill avg.	Fuggle H	2	6.2	2.7	70	
62013	4-hill avg.	Comet	1	10.7	4.2	72	
64107	2-hill avg.	Northern Brewer	3	8.7	3.9	69	
21055	6-hill avg.	Cometx(BGxFu-Colo2-1)	1	13.6	4.3	76	

*

1/ Sum of α+β exceeds 20%
Female parents: Comet (62013); Northern Brewer (64107); USDA 21055.
Male parents: 21008M, 21009M = (BG x EG-XS)xZS;
21110M, 21111M = Bu x ZS
21070M = BG^3 x EKG-BavS

2/ 1 = best to 4

3/ "as is" basis.

Male selections from the 1973 nursery with high alpha/beta ratios:

This nursery which was field planted in the spring of 1974 was grown for the second year in 1975 and mature plants were available for analyses. The material which is described in detail in the 1974 report consisted of seedlings from 3 high alpha females crossed to five different high alpha males in order to see whether suspected sources of alpha acid could be combined and utilized by addidive gene action for producing additional high alpha types.

A number of selections are listed in Table 21 together with their vigor and maturity ratings and quality data. The quality data were obtained from isolated lupulin glands. In addition to the standard alpha/beta ratio there is another column of alpha/alpha plus beta which perhaps could be more meaningful than a simple alpha/beta ratio. Any "alpha ratio" over 80 indicates an extremely high alpha acids content plus very low beta acids content. Selections that fall in this catagory are of extreme importance,and if they should perform well agronomically they could be very valuable as breeding material. For example, selection 7302-153M had an excellent vigor rating, early maturity, very high alpha acids content and low beta acids, resulting in an alpha/beta ratio of 4.7 and an alpha ratio of 82. It had good storage stability and was among the highest alpha/beta ratio types in the nursery. Other outstanding selections were 7302-52M, -171M, -174M, -188M; 7303-09M, -20M, -135M, -138M, -149M, -159M, 165M; 7304-61M, -67M, -85M, -92M, -182M; 7306-13M, -117M; 7308-09M, -23M, -36M, -37M; 7309-04M, -18M, -45M, -102M; 7311-20M, -46M, -88M, -114M, -123M, -141M; 7312-28M, -29M, -54M, -105M; 7313-27M, -47M, -98M; 7314-04M, -19M, -48M, -86M, -106M; 7315-51M.

The first five crosses in this group are progeny from Comet crossed to five different males. The second five are from Northern Brewer crossed to the same males and the third are crosses of experimental 21055 (the high alpha selection from the previous Comet cross 6806; see 1968 USDA report pg. 14) and the same males used in the previous crosses. Generally, the progeny from

Table 21: Two Year Old High α/β Males From the 1973 Nursery: Pruned April 9,10; Trained May 11,17, 1975.

Sel.No.	Location Row:Hill	Pedigree	Vigor[1]	Maturity[2]	Quality α	Quality β	Quality α/β	α/α+β	ID	Remarks
7301-81M	2:22a	62013x21108M	3	L	54.5	23.7	2.30	70	0.25	
-20M	1:25a	"	4	M	40.8	16.1	2.54	72	0.27	yellow leaves
-191M	3:43b	"	2	ML	49.7	20.0	2.49	71	0.26	
7302-36M	4:33a	62013x21109M	1	M	57.4	19.7	2.92	74	0.24	
-52M	:41a	"	3	E	55.5	18.3	2.85	75	0.26	
-63M	:46b	"	4	E	52.9	19.2	2.75	73	0.29	yellow leaves
-77M	5:20a	"	1	L	53.5	20.3	2.64	72	0.27	yellow leaves
-95M	:29a	"	3	L	53.5	17.3	3.09	76	0.27	
-105M	:34a	"	2	E	41.0	16.1	2.55	72	0.32	
-125M	:44a	"	1	L	56.2	20.1	2.80	74	0.25	
-144M	6:20a	"	1	L	51.4	20.3	2.53	72	0.25	weak arms
-152M	:24a	"	2	L	54.3	22.4	2.43	71	0.25	
-153M	:24b	"	1	E	59.0	12.6	4.70	82	0.27	highest α/β, low β
-168M	:32a	"	1	L	58.3	21.2	2.75	73	0.24	
-171M	:33b	"	3	L	61.4	18.9	3.25	76	0.26	high α+β
-174M	:35a	"	2	L	56.5	27.2	2.08	68	0.24	high α+β
-183M	:39b	"	1	L	51.8	19.8	2.62	72	0.28	
-184M	:40a	"	1	M	53.8	19.3	2.78	74	0.27	
-186M	:41a	"	2	L	55.0	17.2	3.20	76	0.26	
-188M	:42a	"	2	E	57.5	16.8	3.43	77	0.26	yellow leaves
-200M	7:14b	"	1	E	53.4	22.4	2.38	71	0.25	
7303-09M	7:19b	62013x21110M	1	L	62.1	19.5	3.18	76	0.25	high α+β
-20M	:25a	"	4	E	47.6	15.3	3.12	76	0.27	
-34M	:32a	"	1	L	55.7	25.1	2.22	69	0.25	
-46M	:38a	"	2	M	52.6	19.9	2.64	73	0.25	
-52M	:41a	"	2	L	56.3	23.0	2.45	71	0.28	
-105M	8:34a	"	1	L	57.3	20.9	2.74	73	0.27	high α+β
-135M	9:15b	"	1	M	61.9	16.0	3.85	79	0.26	high α+β
-138M	:17a	"	1	M	65.4	17.5	3.75	79	0.25	high α, α/β, α+β
-149M	:22b	"	1	L	52.8	16.7	3.17	76	0.26	
-159M	:27b	"	2	M	54.8	17.1	3.21	76	0.25	
-165M	:30b	"	1	E	50.1	14.3	3.49	78	0.28	E, high α/β, low β

Table 21:
Continued

Sel.No.	Location Row:Hill	Pedigree	Vigor[1/]	Maturity[2/]	Quality α	Quality β	Quality α/β	α/(α+β)	ID	Remarks
7304-06M	10:18a	62013x21111M	2	M	56.7	20.7	2.74	73	0.27	
-11M	:20b	"	3	M	58.6	16.3	3.59	78	0.28	
-17M	:23b	"	4	L	58.7	20.8	2.83	74	0.25	high α+β
-61M	:45b	"	2	M	63.3	17.9	3.53	78	0.24	high α, α/β
-67M	11:15a	"	2	E	45.5	13.8	3.31	77	0.26	
-85M	:24a	"	2	E	50.1	12.7	3.93	80	0.24	low β
-92M	:27b	"	2	E	56.9	14.6	3.88	80	0.29	low β
-105M	:34a	"	1	E	50.2	16.9	2.97	75	0.24	yellow lvs
-123M	:43a	"	1	M	57.3	17.5	3.27	77	0.25	
-146M	12:21a	"	3	E	43.6	15.8	2.76	73	0.28	
-148M	:22a	"	1	E	53.1	16.7	3.18	76	0.25	
-165M	:30b	"	3	E	55.5	21.2	2.62	72	0.23	
-177M	:36b	"	1	M	52.6	17.2	3.05	75	0.27	
-182M	:39a	"	4	M	60.0	17.1	3.50	78	0.26	high α
-197M	:46b	"	2	M	49.2	17.4	2.83	74	0.29	
7305-101M	14:32a	62013x21070M	2	L	57.7	23.5	2.45	71	0.24	
7306-13M	16:23b	64107x21108M	2	M	54.2	16.7	3.24	76	0.25	
-46M	:40a	"	1	M	46.6	19.2	2.43	71	0.26	
-117M	17:42a	"	3	L	59.1	17.3	3.42	77	0.27	
-130M	18:15a	"	3	M	45.3	17.3	2.62	72	0.27	
-138M	:19a	"	2	L	55.5	21.2	2.62	72	0.25	
7307-06M	19:20a	64107x21109M	2	E	50.7	20.4	2.49	71	0.26	
-24M	:29a	"	4	E	58.8	22.2	2.65	73	0.24	
-35M	:34b	"	3	L	56.5	23.3	2.42	71	0.26	
7308-09M	20:23a	64107x21110M	4	M	54.3	18.2	2.99	75	0.28	
-20M	:28b	"	3	M	53.6	22.6	2.37	70	0.28	
-23M	:30a	"	1	M	63.7	19.5	3.26	77	0.25	high α, α/β
-36M	:36b	"	3	M	58.8	14.8	3.97	80	0.24	high α, low β, α/β
-37M	:37a	"	1	M	60.0	17.3	3.46	78	0.24	high α, α/β
-38M	:37b	"	1	M	53.5	23.4	2.29	70	0.24	

Table 21:
Continued

Sel.No.	Location Row:Hill	Pedigree	Vigor[1/]	Maturity[2/]	Quality α	Quality β	Quality α/β	α/(α+β)	ID	Remarks
7309-04M	21:22b	64107x21111M	2	M	35.2	9.9	3.54	78	0.29	
-18M	:29b	"	3	M	60.1	19.4	3.09	76	0.25	high α
-34M	:37b	"	2	M	54.4	19.5	2.78	74	0.25	
-45M	:43a	"	3	M	53.5	12.2	4.39	81	0.28	low β, high α/β
-102M	23:39b	"	4	M	57.1	15.1	3.79	79	0.27	low β, high α/β
7310-07M	24:45a	64107x21070M	3	M	45.0	19.4	2.33	70	0.28	
7311-12M	26:39b	21055x21108M	1	M	49.7	16.2	3.08	75	0.26	weak arms
-20M	:43b	"	1	M	62.5	19.2	3.26	76	0.25	high α
-43M	27:39a	"	1	M	42.3	14.9	2.83	74	0.27	
-46M	:40b	"	2	M	47.1	11.7	4.08	80	0.26	high α/β, lowest β
-51M	:43a	"	1	M	42.2	15.4	2.74	73	0.27	
-88M	28:45b	"	1	M	64.4	19.1	3.37	77	0.26	high α, high α+β
-114M	29:42b	"	2	L	56.3	17.7	3.18	76	0.27	
-123M	:46b	"	2	L	64.9	17.4	3.72	79	0.24	high α, high α+β
-135M	30:37a	"	1	M	51.7	16.9	3.05	75	0.27	
-141M	:40a	"	1	M	61.9	19.2	3.23	76	0.25	high α, high α+β
-142M	:40b	"	1	M	53.6	23.4	2.20	70	0.26	
7312-17M	32:37a	21055x21109M	2	M	41.8	18.5	2.80	74	0.29	
-28M	:42b	"	2	M	57.0	20.9	2.73	73	0.25	
-29M	:43a	"	2	M	55.7	21.4	2.61	72	0.27	
-54M	33:39b	"	2	M	54.7	23.4	2.34	70	0.26	
-79M	34:36a	"	2	M	56.5	21.9	2.59	72	0.24	
-102M	35:31b	"	2	M	24.0	9.1	2.65	73	0.26	low α+β, dirty sample
-105M	:33a	"	1	M	46.2	19.2	2.41	71	0.25	
7313-27M	36:46a	21055x21110M	1	M	50.7	15.2	3.35	77	0.26	low β
-47M	37:40a	"	2	L	58.6	19.9	2.94	75	0.26	high α
-98M	39:33b	"	2	M	52.3	17.3	3.01	75	0.26	

Table 21: concluded.

Sel.No.	Location Row:Hill	Pedigree	Vigor[1/]	Maturity[2/]	Quality α	Quality β	Quality α/β	α/(α+β)	ID	Remarks
7314-04M	39:43a	21055x21111M	3	M	42.6	13.5	3.16	76	0.26	low β , low α + β
-19M	40:34b	"	2	M	52.7	14.6	3.62	78	0.25	low β
-23M	:36b	"	3	E	43.9	14.7	2.98	75	0.27	low β , low α + β
-48M	41:33a	"	3	M	51.1	17.4	2.94	75	0.27	
-86M	42:36a	"	3	M	54.6	18.9	2.88	74	0.24	
-106M	:46a	"	1	L	52.3	22.2	2.36	70	0.26	
-109M	43:31b	"	2	M	40.0	14.0	2.85	74	0.28	low α + β
7315-31M	44:34a	21055x21070M	3	M	40.5	17.7	2.29	70	0.27	low α + β
-32M	:34b	"	4	M	41.7	15.0	2.78	74	0.28	low α + β
-50M	:43b	"	2	M	21.1	15.4	2.67	73	0.24	low α + β
-51M	:44a	"	3	M	54.0	20.4	2.65	73	0.26	

1/ 1 = best
2/ E = early, M = medium, L = late pollen shedding.

the Comet cross appears to be somewhat more susceptible to downy mildew than the progeny of the other two females. Seedlings from Comet segretated for leaf color (yellow-green). Exceptionally large amounts of lupulin were collected from male seedlings of crosses 7311 to 15 (female parent: Experimental 21055).

All the selections listed in Tables 20 and 21 will be grown for another year in the 1973 nursery and the most outstanding ones will be re-analyized in 1976. Final selection will be made in the spring of 1977. It appears at this point that we were able to some extent to capitalize on recombining sources of alpha acids and pushing the alpha acids level in the lupulin as well as the alpha/beta ratio or alpha ratio, toward the theoretical extreme which is believed to be somewhere between 4 and 5 for the alpha/beta ratio and between 80 and 90 for the alpha ratio.

Reduced Tillage-herbicide Trial with the variety Cascade. (This work was done by Donald D. Roberts in cooperation with Weed Researchers at Oregon State University.)

Detailed data of the reduced cultivation-herbicide trial in 1975 (involving paraquat and simazine in various combinations) are presented in table 22 and the summary of one year's research findings is presented in table 23. There seems to be substantial variability throughout this trial as well as from one replication to the other. Replication IV in the tilled block and replications III and IV in the non-tilled plot seem to be significantly lower in cone production than the other replications. Generally, plots that were tilled produced a higher number of pounds of fresh hops than the non-tilled plots. Part of the reason maybe found in the fact that weeds, particularly in the control plots and in some of the paraquat plots developed prolifically and competed with hops for available nutrients and moisture. Also, the northeast corner of the plot (see experimental layout map, page 61) contains very poor soil which contributed to the very low plot yields found in the treatments grown in this location. It appears that some tillage, particularly in the spring to control initial weed populations may be necessary in future years. Weed control in the paraquat plots and particularly in the combination paraquat plus simazine was excellent and hills were generally free of weeds throughout most of the growing season. No damage to hop plants was evident and volunteer hop seedlings appeared in late winter. This trial will be continued for at least one more year. In the fall of 1975 the simazine treatment was applied which is the reverse procedure that was followed in 1974/75 when paraquat was applied first in the fall and simazine in the spring. The paraquat treatment will be applied in two stages in the winter/spring of 1976 with the first paraquat application as a dormant spray probably in February. Hops will be trained in a normal fashion and harvested again to obtain yield and quality data in 1976.

Experimental layout of reduced tillage-herbicide trial. Main Yard. 1975.

Variety: Cascade. Planted: June 1974.

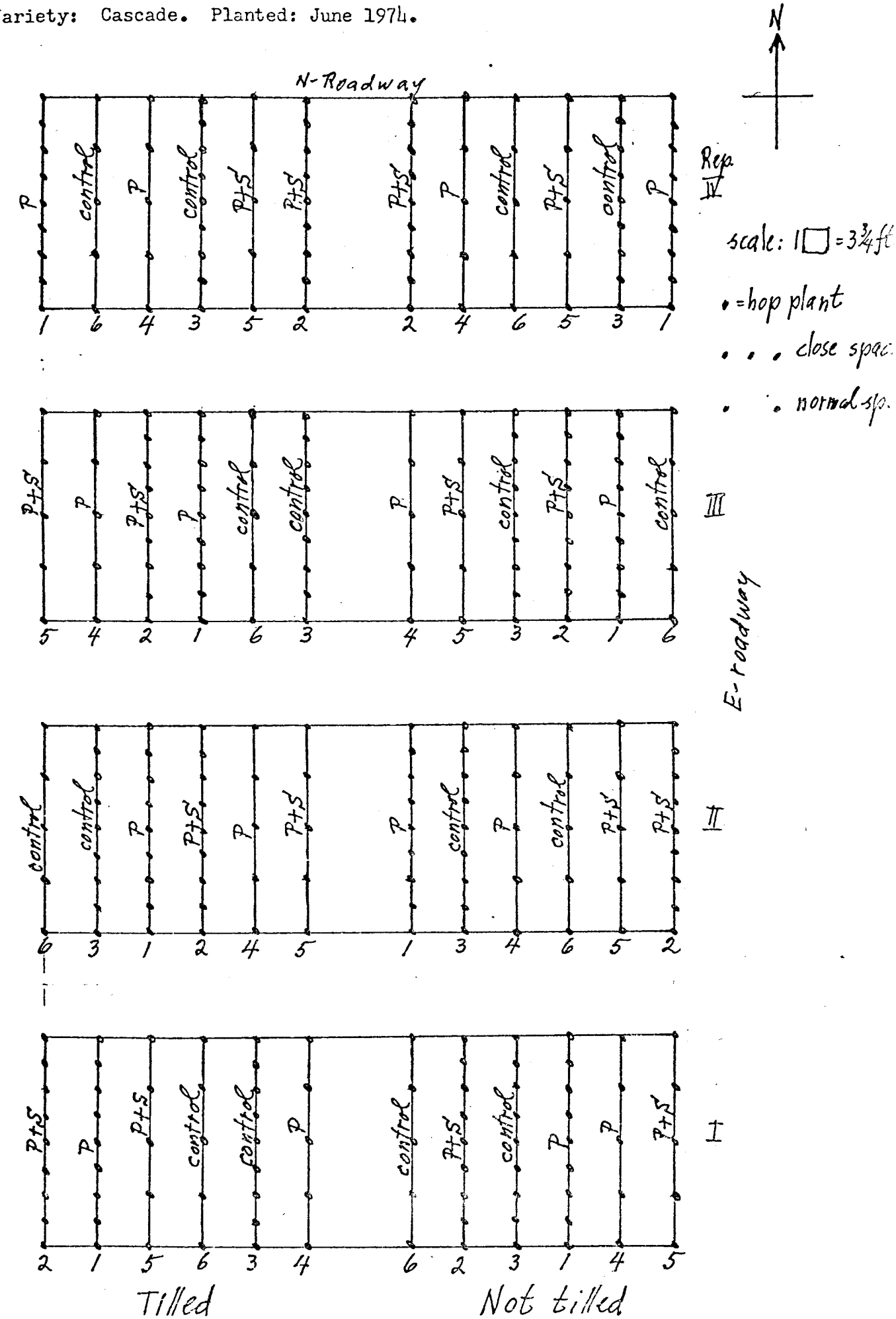

TABLE 22: Detailed Data of the Reduced Cultivation plus Herbicide Trial With Cascade 1975 - Main Yard. All Plots (5 plants/plot) Harvested Sept. 9, 1975. Yields Adjusted to 4 Vines/Plant (20r/Plot).

Replication		Treatment	Cross Wire June	50% Flower July	Yield/plot g	Yield per acre lbs
I	Tilled:	close spacing + Paraquat	30	12	19232	3282
		close sp + Par. + Simazine	28	12	13455	2296
		close sp - control (no herb)	29	12	10500	1792
		normal spac + Par	7/2	12	13000	1109
		normal sp + Par + Simaz	30	13	15500	1322
		normal sp - control (no herb)	30	13	13417	1145
	Not Tilled:	close spac + Paraquat	29	9	9700	1655
		close spac + Par + Simaz	27	12	14095	2405
		close spacing control	7/8	12	14889	2541
		normal spac + Par	7/1	9	11333	967
		normal spac + Par + Simaz	7/1	11	11370	970
		normal spac - control	7/5	13	9700	828
II	Tilled:	close spacing + Paraquat	26	12	15900	2713
		close spac + Par + Simaz	25	12	13591	2319
		close spac control	29	12	13545	2311
		normal spac + Paraquat	27	12	18364	1567
		normal spac + Par + Simaz	28	9	15625	1333
		normal spac - control	28	12	20120	1717
	Not Tilled:	close spac. + Paraquat	7/3	12	9435	1610
		close spac. + Par + Simaz	7/2	14	10955	1869
		close spac control	28	10	10333	1763
		normal spac + Par	29	10	11619	991
		normal spac + Par + Simaz	30	11	13500	1152
		normal spac - control	28	9	11200	956

TABLE 22: Continued

Replication	Treatment		Cross Wire	50% Flower	Yield/plot	Yield pre acre
			June	July	g	lbs
III	Tilled:	close spacing + Paraquat	28	10	11458	1955
		close spac + Par + Simazine	28	13	12695	2166
		close spac - control	29	9	11000	1877
		normal spac + Paraquat	29	10	17182	1466
		normal spac + Par + Simaz	28	11	16435	1402
		normal spac - control	28	12	17056	1455
	Not Tilled:	close spacing + Par	7/9	13	4750	811
		close spac + Par + Simaz	29	12	9667	1650
		close spac - control	7/6	12	9105	1554
		normal spac + Par	29	11	12842	1096
		normal spac + Par + Simaz	30	11	12565	1072
		normal spac - control	13	13	4867	415
IV	Tilled:	close spacing + Paraquat	28	12	11652	1988
		close spac + Par + Simazine	7/3	11	12526	2137
		close spac - control	7/3	12	11200	1911
		normal spac + Paraquat	29	12	16850	1438
		normal spac + Par + Simaz	30	12	10895	930
		normal spac - control	7/1	12	10720	915
	Not Tilled:	close spacing + Paraquat	7/11	13	4824	823
		close spac + Par + Simazine	7/9	14	6800	1160
		close spac - control	7/10	13	4824	823
		normal spac + Paraquat	7/6	11	7318	624
		normal spac + Par + Simaz	7/2	12	7895	674
		normal spac - control	7/19	12	7385	630

TABLE 23: Summary of Yield Data From the Reduced Cultivation Plus Herbicide Trial Corvallis 1975: Yields are in lbs/acre, Adjusted for 25% Dry Matter [1/]

		Replication I	II	III	IV	Mean
Tilled:	close spacing + Paraquat	3282	2713	1955	1988	2485
	close spac. + Par + Simazine	2296	2319	2166	2137	2230
	close spac. Control	1792	2311	1877	1911	1973
	normal spac. + Par	1109	1567	1466	1438	1395
	normal spac. + Par + Simaz.	1322	1333	1402	930	1247
	normal spac. control	1145	1717	1455	915	1308
	Mean	1824	1993	1720	1553	1773
Not Tilled:	close spac. + Paraquat	1655	1610	811	823	1225
	close spac. + Par + Simaz.	2405	1869	1650	1160	1771
	close spac. control	2541	1763	1554	823	1670
	normal spac. + Par	967	991	1096	624	920
	normal spac. + Par + Simaz.	970	1152	1072	674	967
	normal spac. control	828	956	415	630	707
	Mean	1561	1390	1100	789	1210

[1/] Yield calculations: normal spacing (7 1/2 x 7 1/2 ft.): $\frac{\text{green wt/plot} \times 774}{5 \times 453.6 \times 4}$

close spacing (3 1/2 x 7 1/2 ft.): $\frac{\text{green wt/plot} \times 1548}{5 \times 453.6 \times 4}$.

Triploid males for yield stimulation: Following the initial studies of hand pollination with diploid and triploid males, several triploid males were provided to Oregon hop growers to be included in commercial hop yards. The main purpose in Oregon was to see how susceptible these lines might be to verticillium wilt, since all but one plant came from the Fuggle-related triploid program. We also wanted to get a better idea about agronomic performance in grower's yards and amount and time of pollen shedding under field conditions. At this time, triploid males are being tested by 8 different Oregon growers (table 24). In addition, triploid males were made available to C. E. Zimmermann at Prosser, WA beginning in 1973, and to R. R. Romanko, Idaho, in 1975. Mr. Signorotti, California, planted a few hills of the Fuggle-related triploid selection 6755-13M in 1971 which grow very poorly. Additional triploid males from crosses 7008, 09, 10, and -11, which were originally grown in the 1971 nursery and are now in two-hill observation plots in the main yard, will be provided to California in 1976. Some of these selections which are not related to Fuggle will also be grown in several Oregon yards in 1976. For the Oregon planting we have selected those that have indications of early pollen shedding dates in order to find lines that best match the Fuggle maturity.

Until now in Oregon most grower's yards, unfortunately, also contained diploid males and no difinitive evaluation of the yield stimulation could be made. Some growers mentioned that all but one of the Fuggle related triploid males were too late for Fuggle in time of pollen shedding. But even at the late end of the Fuggle bloom yield stimulation could be observed. The early blooming Fuggle-related triploid selection 6756-26M has now received the accession #21102M. This is also the line that appears to be of most promise in the Yakima Valley and Mr. Zimmermann plans to increase it further. The other

Table 24: Triploid Males Presently in Off-Station Tests. 1975.

* Sel. No.	Location Row : Hill	Pedigree	Vigor[1/]	Maturity[2/] (Poll. shed.)	Distributed for testing to - - - - - -				Remarks
					OREGON	WASHINGTON	IDAHO	CALIFORNIA	
6659-17M	29 : 5-8	(BGxEKG-BavS)x(BGxFu-FuS)	2	L	Goschie '74; King '75	Zimmermann'74	Romanko '75		AC #21100M
6755-13M	102 : 41-42	FuT x EKG - BavS	1	VL	Weathers '70; King '75	--	"	Signorotti '71	
-14M	103 : "	"	1	L	Goschie '74; Crosby '75	--	--	--	
-15M	104 : "	"	1	L	Coleman '70	--	--	--	
6756-19M	105 : "	FuT x Fu - FuS	2	L		Zimmermann '74		--	AC #21101M
-26M	106 : "	"	1	E	Goschie '74; King '75	" '73,'74	Romanko '75	--	AC #21102M
6769-09M	101 : 43-44	FuT x FuS	2	VL	Goschie '74	Zimmermann '74	Romanko '75	--	AC #21103M
-33M	106 : "	"	2	L	Coleman '70; Krebs '71	" '73	--	--	AC #21104M
6771-06M	107 : "	FuT x RV - FuS	2	L	Stauffer '72	" '74	--	--	AC #21105M
6774-09M	110 : "	FuT x EG - XS	3	VL	Goschie '74; Kerr '75	--	--	--	
6775-15M	111 : "	FuT x EKG - BavS	1	L	King '75	Zimmermann '74	Romanko '75	--	AC #21106M
6777-10M	112 : "	FuT x OP	1	L	Weathers '70	--	--	--	
-15M	101 : 45-46	"	1	VL	Weathers '70; Goschie'74	--	--	--	
-26M	102 : "	"	2	L	Weathers '70	Zimmermann '74	Romanko '75	--	AC #21107M

1/ 1 = best to 4

2/ E = early; L = late; VL = very late

* New Accession numbers listed in last column

triploid males that received accession numbers are generally suitable only for yield stimulation in late blooming hops such as Brewers Gold and perhaps Bullion or Cascade in Oregon.

With the Fuggle-related material, Verticillium wilt apparently was not a problem in the Willamette Valley. One large seedless yard planted exclusively with triploid males in 1975 (Goschie) will be evaluated in 1976 and another seedless location (John I. Haas, Alluvial Farm) will be interplanted with thirteen different triploid male lines in 1976. Of these lines, one is related to Brewers Gold (accession #21100M; selection 6659-17M); seven are related to Fuggle (accession #21101M, 102M, 103M, 104M, 105M, 106M, and 107M), and the remaining five are from crosses 7008 and 7009 from the 1971 nursery (selections 7008-03M, -38M, -40M, -99M and 7009-57M). All of these are known to be good pollen producers and the latter group of five genotypes should match the Fuggle maturity very well.

Quality analyses of the progeny of a self-pollinated tetraploid hop:

Twenty predominantly female seedlings of the self-pollinated tetraploid 6668-01M were analyzed for quality constituents and considerable variability in alpha and beta acids content and lupulin content was found (Table 25). Several male genotypes are also included in this table. They were selected because of superior agronomic performance, particularly growth and vigor. Only a portion of the seedlings in this group are tetraploid ($2n = 4x = 40$), whereas another large group were triploids, apparently the offspring of a reduced ($10 x$) gamete from either the male or the female side. Some of the substantial differences in quality among seedlings are due to poor storage stability. For example, selection 7013-03 had almost no alpha acid and very little beta acid left at the time of analysis. Others had exceptionally high alpha acids content (for example 7013-24, -130 and -201). The two latter selections in this group were triploids but the first one, 7013-24 is a tetraploid with high alpha, high beta, and high lupulin content. This selection is of particular interest because we will attempt to continue

TABLE 25: Selected Seedlings from a Selfpollinated tetraploid hop. Corvallis 1975. Pruned: April 7; Trained May 13, 21, 1975.

Selection Number	Location Row:Hill	Pedigree[1]	Chrom No. 2n=	Sex	Maturity[2]	Quality α %	Quality β %	α/β	Remarks
6929-05	185:25	6668-01x6668-01	40	♂	L	5.7	4.1	1.40	
-34	:31	"	?	Fem	M	8.0	5.3	1.51	
-42	:32	"	40	Fem	E	6.5	3.6	1.81	
-44	:33	"	40	Fem	E	5.2	6.2	0.83	
7013-03	:34	6668-01x6668-01	40	Fem	E	0.7	2.0	0.37	poor stor.
-10	:37	"	40	Fem	M	4.1	2.0	2.05	
-24	:40	"	40	Fem	L	12.6	9.4	1.34	high lup.
-33M	:41	"	40	Male	E				
-49	:42	"	30	Fem	E	4.8	10.0	0.48	
-51	:43	"	40	Fem	M	4.3	3.4	1.28	
-57M	:44	"	30	Male	E				
-60	:45	"	30	Fem	M	4.5	5.0	0.90	
-76	:47	"	30	Fem	M	5.8	2.6	2.22	
-81	:48	"	30	Fem	L	6.0	5.3	1.14	
-84	:49	"	30	Fem	E	8.4	8.8	0.96	
-130	:52	"	30	Fem	M	10.1	4.2	2.37	high α,α/β
-146M	186:1	"	30	Male	M				
-151	:2	"	30	Fem	E	8.7	4.6	1.90	
-192M	:5	"	39	Male	E				
-201	:8	"	30	Fem	L	11.2	5.0	2.22	high α
-208	:9	"	30	Fem	M	4.0	6.8	0.59	
-214	:10	"	40	Fem	L	4.8	4.9	0.98	
-216	:11	"	40	♂	E	5.1	2.6	1.95	
-228	:12	"	30	Fem	L	6.5	4.1	1.60	

1/ $[[XS \times (Fu \times EG\text{-}ECS)]xOP]^2$

2/ E = early; M = medium; L = late

inbreeding by either self pollination, or back-crossing to the parental line, or brother/sister mating, to see whether quality constituents continue to segregate with continued inbreeding. Selection 7013-24 also had a very high lupulin content in its cones (32% by weight).

INTERMEDIATE EVALUATION

Several promising lines are now in an advanced stage of testing in preparation for possible off-station trials. One line, USDA accession #21091, was increased in 1975 for a two acre off-station planting in the Willamette Valley in 1976.

Early maturing triploid: An early maturing Fuggle-related triploid, accession #21091 has been tested in our seedless yard since 1970. Originally there was not much interest in this selection, but growers have felt that an early maturing, good yielding line would best fit into their hop production program as a replacement for the early maturing Fuggle. Experimental 21091 has had a good yield record in our seedless yard but the average alpha acid content (about 6% over the last four years) has been lower than in the first 3 years of testing (1969-1971, Table 26). The variety is resistant to both crown and cone infection by Downy Mildew. Additional data can be found in the information sheet (Table 26).

Planting stock of 21091 was increased from 10 hills in 1975 and one two-acre trial at the Schwabauer Ranch will be established in 1976. Commercial bale samples for trial brewing will be available in 1977. Several potted plants from softwood cuttings were made available to Mr. Zimmermann for testing at Prosser, WA in 1975. A group of about 50 rooted crowns from softwood cuttings made in 1975 will be supplied to R.R. Romanko in the spring of 1976 for testing in Idaho.

Table 26: INFORMATION SHEET FOR USDA HOP VARIETY 21091
(SELECTION NO. 6771-19)

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

MATURITY: Early, harvest last week of August.

YIELD: Very good; 1970, 10 "baby" plants 700 lbs/A
1971, 10 mature plants 2,560 lbs/A
1972, 10 mature plants 2,390 lbs/A
1973, 5 mature plants, 3,229 lbs/A
1974, 5 mature plants, 1,967 lbs/A
1975, 5 mature plants, 2,912 lbs/A

GROWTH HABIT: Vigorous, early spring regrowth, good sidearms, good cone set and clustering

PROPAGATION: Normal, good size rhizomes, increased in 1975 for offstation trials

DISEASE REACTION: Resistant to downy mildew crown infection in 1971 and 1975 greenhouse test; no crown or cone infection in field plots, 1969-70-71, 72,73. Slight DM cone infection in 1974 from adjacent susceptible genotypes. Verticillium wilt reaction similar to Fuggle in 1975 greenhouse test.

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

DRYING-BALING: Heavy strig may influence drying time

CONE TYPE: Large, dense and heavy

CONE ANALYSIS:

	% alpha	% beta	% Oil
1969	9.0	4.7	-
1970	8.6	4.0	1.7
1971	8.4	4.2	2.3
1972	5.8	4.8	-
1973	5.7	5.1	-
1974	6.3	5.2	-
1975	5.8	4.8	1.07

LUPULIN: Normal, plentiful

AROMA: Mild, somewhat spicy

STORAGE STABILITY: Medium, keeps well at 3° C

OTHER INFORMATION: Preliminary hand evaluation of baby 1970 crop by Anheuser-Busch, mixed reaction. Favorable comments by five of six USBA evaluators in 1971. Poor commercial potential at Prosser plots. 3.1% seed under heavy pollen load. Growers want an early triploid Fuggle type. A-B recommended off-station commercial tests and will conduct brewing evaluation.

Improved Cluster types: Three advanced lines from a cross between Yakima Cluster and a selected mildew resistant male of European pedigree (64037M) have been evaluated in our seedless yard since 1972. In the spring of 1975 small bale samples from the 1974 crop were submitted to several interested brewers for hand evaluation and pilot brews made by one brewer were tasted during the summer USBA meeting in Boise, ID.

None of the three lines (Accession No. 21094, 21095, 21096; information sheets Tables 27, 28 and 29) has yet been tested in the Yakima Valley, but arrangements have been made to include them in Dr. Skotland's virus program. All three lines appear to have good downy mildew resistance comparable to Bullion or Brewers Gold and all three have produced good cone yields, but mature medium late to late. Alpha acids content of USDA 21094 and 21096 has been variable in the past four years, but both lines appear to have the potential for above average alpha acid production. USDA 21095 has an apparent alpha acids level comparable to Cluster. Some problems were encountered with USDA 21096 in the spring of 1975. The line was pruned rather severely and appeared to be a sleeper early in the spring. Later in the spring the young shoots had a chlorotic appearance and some failed to grow properly. However, after training the shoots grew normally and produced an excellent yield of about 2500 pounds per acre (as calculated from a five-hill plot). Additional data on these three selections are also included in table 6, page 29 (Sel. No. 6903-112; -259; -350) and are discussed on page 30.

Table 27: INFORMATION SHEET FOR USDA-21094
(SELECTION NO. 6903-112)

PEDIGREE: Yakima Cluster crossed with mildew-resistant seedling male of European pedigree

MATURITY: Medium to medium-late

YIELD: Very good: 1972, single plant, mature, 2400 lb/A
1973, single plant, mature, 2000 lb/A
1974, 10-hill, mature, 2400 lb/A
1975, 10-hill, mature, 2160 lb/A

GROWTH HABIT: Vigorous, long sidearms, good cone set, good clustering, even set from top to bottom, adequate number of shoots in the Spring.

PROPAGATION: Readily propagated by standard methods. Produces many medium-sized rhizomes.

DISEASE REACTION: Zero Downy Mildew rating in 1972 and 1973 as single plant. Zero Downy Mildew in 10-hill plot in 1974. Light Downy Mildew cone infection in 1975 due to severe mildew in adjacent plot. No symptoms of other diseases observed. Not tested for Verticillium wilt and virus reaction.

PICKING: Good

DRYING & BALING: Normal

CONE TYPE: Medium large, loose, similar to Cluster

CONE ANALYSIS:

	%α-acids	%β-acids	ml oil	% cohumulone
1972	5.9	3.6	--	--
1973	7.1	4.6	--	--
1974	8.2	6.9	0.60	43
1975	10.7	5.6	0.83	

LUPULIN: No data

AROMA: Hoppy, no off odors after 8 months at 3° C

STORAGE STABILITY: Very good in 5 mo. Room Temperature test; equal or superior to Clusters

USBA EVALUATIONS: Olympia rated it close to Cluster and recommended advanced evaluation. Stroh rated it very similar to Cluster.

Table 28: INFORMATION SHEET FOR USDA-21095 (SELECTION NO. 6903-259)

PEDIGREE: Yakima Cluster crossed with mildew-resistant seedling male with European pedigree

MATURITY: Medium-late

YIELD: Excellent: 1972, single hill, mature, 2800 lb/A
1973, single hill, mature, 2600 lb/A
1974, 10-hill, mature, 3300 lb/A
1975, 10-hill, mature, 2363 lb/A

GROWTH HABIT: Very vigorous, long side arms, good clustering, good set, adequate number shoots in the Spring

PROPAGATION: Readily propagated by standard methods. Produces many medium-sized rhizomes. Should not be severely pruned.

DISEASE REACTION: Single hill nursery data 1972, 1973, show very light Downy Mildew symptoms. Light Cone infection in 1973, 1974 and 1975 with no subsequent adverse effect noted. No symptoms of other diseases noted. Not tested for Verticillium wilt and virus reaction.

PICKING: Good

DRYING AND BALING: Normal

CONE TYPE: Large loose, similar to Early Cluster

CONE ANALYSIS:	%α-acids	%β-acids	ml oil	% cohumulone
1972	7.8	4.1	--	--
1973	6.8	3.9	--	--
1974	6.2	5.1	0.60	39
1975	6.9	6.1	0.68	

LUPULIN: Normal

AROMA: Hoppy, not sharp, estery or floral

STORAGE STABILITY: Very good, similar to Yakima Cluster and better than Early Cluster

USBA EVALUATIONS: Olympia rated it close to Cluster and recommended advanced evaluation. This selection least preferred of the three by Stroh.

Table 29: INFORMATION SHEET FOR USDA-21096
(SELECTION NO. 6903-350)

PEDIGREE: Yakima Cluster crossed with mildew-resistant male seedling with European pedigree

MATURITY: Medium-late

YIELD: Very good: 1972, single hill, mature, 2500 lb/A
1973, single hill, mature, 2200 lb/A
1974, 10-hill, mature, 2600 lb/A
1975, 10-hill, mature, 2507 lb/A

GROWTH HABIT: Vigorous, medium-long sidearms, good cone set, good clustering. Even set from top to bottom. Adequate shoots for spring training. Tardy regrowth, spring 1975, with some chlorotic shoots.

PROPAGATION: Easily propagated by standard methods. Should not be pruned severely, Sleeper in 1975 following heavy pruning.

DISEASE REACTION: No Downy Mildew infection in main yard, 1972 as single mature plant; very light DM infection in 1973. No DM symptoms in seedless yard, 1974; light cone infection, 1975. Not tested for Verticillium wilt and virus reaction.

PICKING: Good

DRYING AND BALING: Normal

CONE TYPE: Medium large-similar to Early Cluster

CONE ANALYSIS:

	%α-acid	%β-acid	ml oil	% cohumulone
1972	4.9	2.9	--	--
1973	--	--	--	--
1974	11.1	6.0	0.61	58
1975	7.3	6.2	0.52	

LUPULIN: Normal

AROMA: Hoppy, not sharp, estery or floral

STORAGE STABILITY: Very good, similar to Yakima Cluster and better than Early Cluster

USBA EVALUATION: Rated close to Cluster by Olympia and recommended for advanced evaluation. Stroh rated it similar to Cluster.

OTHER INFORMATION: Young shoot tips pale, leaves slow in developing chlorophyll, becoming yellow and then green with age, somewhat similar to Comet.

Early-medium early maturing triploid selections from the 1969 nursery:

Two early blooming and apparently also early maturing triploid selections, 6913-68 and 6921-06 (new 1975 Accession No. 21098 and 21099; table 3) which have been discussed earlier in this report (page 31) have received additional attention in 1975. One has a Brewers Gold background and the other one a Cluster (L-8) background. Both have good yield potential (see also Table 6, page 29). Their storage stability at room temperature appears to be similar to Bullion but because of their early maturity they might be of sufficient interest to hop growers who would like to spread out their harvest operations as much as possible. Additional information on these selections is contained in the lab report dated 7-24-75 by Likens and Nickerson.

ADVANCED EVALUATION

Release of New Hop Varieties: Columbia and Willamette.

The two triploid, Fuggle-related selections USDA 21040 (Columbia) and USDA 21041 (Willamette) will be released in time for planting in the spring of 1976. The tentative release date is March 15 or March 30, 1976. The official release notice will be jointly signed by the appropriate officials of the US Brewers Association, the Oregon Agricultural Experiment Station, and the Agricultural Research Service, U.S. Department of Agriculture.

Copies of the release notice are included following this section.

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

and

THE OREGON AGRICULTURAL EXPERIMENT STATION
CORVALLIS, OREGON

THE UNITED STATES BREWERS ASSOCIATION
WASHINGTON, D.C.

NOTICE OF RELEASE OF THE NEW HOP VARIETY COLUMBIA

The Agricultural Research Service, the Oregon Agricultural Experiment Station, and the U. S. Brewers Association announce the release of the new COLUMBIA hop variety.

COLUMBIA is a female triploid aroma variety selected in 1969 from a 1967 cross between the colchicine-induced tetraploid variety Fuggle T and a male hop of unknown parentage. The male parent is presumed to have arisen from an open pollination of Fuggle. Genetically, therefore, COLUMBIA consists of at least 2/3 Fuggle and 1/3 unknown germplam, Fuggle cytoplasm, and a chromosome complement of 30.

COLUMBIA has been tested under the USDA Accession Number 21040 in a 10-hill yield trial near Corvallis, Oregon since 1971; in small off-station plots in the Willamette Valley and near Grants Pass, Oregon since 1972; in the Yakima Valley of Washington since 1971; and in Idaho since 1973. Commercial 2-acre test plots were established at two locations in the Willamette Valley in 1972.

COLUMBIA is a medium-late maturing triploid variety that is practically seedless even in the presence of fertile male plants. It was developed to offer growers and brewers a variety with an aroma profile similar to the low-yielding Fuggle and the imported Styrian varieties which are available only at premium prices. Its sterility should enable growers to earn the customary premium for seedless hops even when pollen is present in adjacent plantings.

COLUMBIA is easily propagated by layering or from softwood cuttings. It has a vigorous growth habit with long sidearms, good cone set, and good clustering. It produces many large, vigorous shoots in early spring. The vines are easy to train and rapidly climb supporting strings, frequently growing over the 18-foot top wire by 6 feet or more. Due to its great vigor, COLUMBIA sometimes forms a head which results in most of the crop being near the top.

COLUMBIA is resistant to crown and cone infection by downy mildew and moderately susceptible to Verticillium wilt. No wilt problems were encountered in commercial plots in 1973-75, or in Oregon nursery plots since 1968. In the Yakima Valley of Washington, COLUMBIA exhibited Verticillium wilt symptoms as judged from stem swelling and vascular browning. It should not be planted on soils known to be infested with Verticillium wilt.

The variety produces medium-sized cones of about 150 mg dry weight that are slightly smaller than those of Fuggle. The cones can be picked easily by machine with little or no shatter and excellent vine clean-up. The resin (lupulin) glands are plentiful and have a golden yellow color. The aroma is mild, pleasant, and similar to Fuggle.

Mature plants of COLUMBIA outyielded Fuggle by 86% in nursery trials over a 5-year period and by 38% in commercial field trials over a 2-year period. The alpha acids content of COLUMBIA in nursery trials varied from 7.0 - 10.2% with a mean of 8.5%. The proportion of alpha acids to beta acids averaged slightly higher than that of Fuggle. The cohumulone content expressed as co-fraction was higher than that of Fuggle but essential oils were slightly lower. In the two years of commercial trials, COLUMBIA produced alpha acids levels that averaged 56% higher than those of Fuggle while beta acids content was 43% higher.

COLUMBIA compares with the Cluster variety in yield of extract (15% toluene) but has a higher content of alpha acids in the extract (50-55%). Preliminary data indicate that the storage stability of baled cones of COLUMBIA is better than that of Fuggle. Commercial-scale brewing tests by a major domestic brewery indicated that COLUMBIA would be an acceptable substitute for Fuggle and other brewers have expressed interest in using it.

The variety is best adapted to the Willamette Valley of Oregon where Fuggle also grows well. It is not adapted to California or to the Yakima Valley of Washington. Tests for adaptability in Idaho have been inconclusive. Because of its late maturity, harvest of COLUMBIA might conflict with harvest of the Brewers Gold and Cascade varieties.

Planting stock of COLUMBIA was propagated in 1975 by the Oregon Hop Commission, P. O. Box 92, Mt. Angel, OR 97362. Approximately 50,000

propagules will be available to growers in 1976. The original breeders stock will be maintained by the Oregon Agricultural Experiment Station. Neither the Agricultural Research Service nor the Oregon Agricultural Experiment Station will have plants or planting stock for distribution.

Administrator, Agricultural Research Service	Date 3/25/76
Director, Oregon Agricultural Experiment Station	Date 3/2/76
V. President, United States Brewers Association	Date 3-22-76

Appendix : Agronomic and Quality Data of the Hop Variety Columbia (USDA Accession No. 21040) In Nursery Trials and Commercial Plots in Oregon.

Variety	Year	Yield/Acre	Quality 3/ Alpha Acids	Beta Acids	α/β	Oil	Co-fraction	Leaf & Stem	Seeds
Nursery trials: 1/		pounds	%	%		ml/100g	%	%	%
Fuggle Control	1971	1538	5.5	2.9	1.9	1.1	37		0.0
	1972	1015	4.7	2.7	1.7	0.7	32		0.0
	1973	1261	4.6	2.4	1.9	1.4	-		0.0
	1974	1177	5.6	2.8	2.0	-	27		0.0
	1975	1395	6.8	3.4	2.0	1.9	22*		0.0
	Average	1277	5.4	2.8	1.9	1.3	32		0.0
Columbia	1971	2798	10.2	3.0	3.4	1.3	41		0.0
	1972	1909	8.0	3.8	2.1	1.3	36		0.0
	1973	3236	7.9	4.3	1.8	1.2	-		0.0
	1974	2137	7.0	4.2	1.7	-	41		0.0
	1975	1778	9.3	4.6	2.0	1.1	34*		0.0
	Average	2377	8.5	4.0	2.2	1.2	39		0.0
Commercial trials: 2/									
Fuggle control	1974	1254	5.6	2.5	2.2			2-3	8-12
	1975	1252	5.4	2.7	2.0			2-3	8-12
	Average	1253	5.5	2.6	2.1			2-3	8-12
Columbia	1974	1661	7.5	3.3	2.3			2.9	2.2
	1975	1784	9.6	4.1	2.3			2.0	1.5
	Average	1723	8.6	3.7	2.3			2.5	1.9

not analyzed

1/ Calculated from 5-10 hill plots

2/ State Average

3/ 8% Moisture basis

* True Co-humulone

1975 analyses

	CoH	AdH	Humulone
Fuggle	22	13	65
Columbia	34	12	54

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NOTICE OF RELEASE OF THE NEW HOP VARIETY WILLAMETTE

The Agricultural Research Service, the Oregon Agricultural Experiment Station, and the U. S. Brewers Association announce the release of the new WILLAMETTE hop variety.

WILLAMETTE is a female triploid aroma variety selected in 1969 from a 1967 cross between the colchicine-induced tetraploid variety Fuggle T and a male hop of unknown parentage. The male parent is presumed to have arisen from an open pollination of the Fuggle variety. Genetically, therefore, WILLAMETTE consists of at least 2/3 Fuggle and 1/3 unknown germplasm, Fuggle cytoplasm, and a chromosome complement of 30.

WILLAMETTE has been tested under the USDA Accession Number 21041 in a 10-hill yield trial near Corvallis since 1971; in small off-station observation plots in the Willamette Valley and near Grants Pass, Oregon since 1972; in the Yakima Valley of Washington since 1971; and in Idaho since 1973. Commercial 2-acre test plots were established at two locations in the Willamette Valley of Oregon in 1972.

WILLAMETTE is a medium-late maturing variety that is practically seedless, even in the presence of fertile male plants. It was developed to offer growers and brewers a variety with an aroma profile similar to the low-yielding Fuggle and the imported Styrian varieties which are available only at premium prices. Its sterility should enable growers to earn the customary premium for seedless hops even when pollen is present in adjacent plantings. The selection was recognized by a major U. S. brewer for having exceptionally desirable aroma characteristics that closely resemble those of Oregon-grown Fuggle.

WILLAMETTE has a vigorous growth habit with long sidearms, good cone set, and good clustering. It produces many large, vigorous shoots early in the spring. The vines are easy to train and rapidly climb supporting strings and frequently grow over the 18-foot top wire by 6 feet or more. The variety is easily propagated by layering or from softwood cuttings.

This new variety is moderately resistant to crown infection by downy mildew similar to the Bullion variety but is resistant to cone infection. It is susceptible to Verticillium wilt and should not be planted on soils with a history of Verticillium wilt infestation. Only an occasional plant with mild Verticillium wilt symptoms was found in commercial yield trials in Oregon over the past 3 years with no apparent effect on cone yields. In the Yakima Valley of Washington, WILLAMETTE was readily infected by Verticillium wilt and judged to have no commercial potential in that area.

WILLAMETTE produces medium large to large cones of about 180-200 mg dry weight that closely resemble those of Fuggle. The cones can be easily picked by machine with very little shatter and excellent vine clean-up. It matures in late August or early September similar to the Bullion or Cascade varieties. Mature cones have a pleasant, estery, and slightly spicy aroma. Resin (lupulin) glands are plentiful and have a golden yellow color.

Mature plants of WILLAMETTE outyielded Fuggle by 61% in 5-year nursery trials and by 28% in 2-year commercial field trials. Alpha acids content of WILLAMETTE in nursery trials averaged 33% higher than Fuggle, and 11% higher in commercial field trials. Beta acids content was approximately 42% higher on the average resulting in a proportion of alpha acids to beta acids nearly identical to that of Fuggle. Average oil content of WILLAMETTE was identical to that of Fuggle over a 5-year period with a range similar to that of Fuggle. The cohumulone content, as measured by the co-fraction, was slightly higher than Fuggle. In 1971, six of eight industry evaluators gave the selection a good to preferred rating based on small samples. In 1972 the selection was judged to have good commercial brewing potential. Commercial-scale brewing tests by a major domestic brewery indicated that WILLAMETTE would be an acceptable substitute for Fuggle and other brewers have expressed interest in using it. The storage stability of WILLAMETTE is similar to that of Fuggle or perhaps slightly better. Like Fuggle, WILLAMETTE is best adapted to the Willamette Valley of Oregon. It is not adapted to California or to the Yakima Valley in Washington. Performance tests in Idaho have been inconclusive.

Planting stock of WILLAMETTE was propagated in 1975 by the Oregon Hop Commission, P. O. Box 92, Mt. Angel, OR 97362. Approximately

50,000 propagules will be available to growers in 1976. The original breeders stock will be maintained by the Oregon Agricultural Experiment Station. Neither the Agricultural Research Service nor the Oregon Agricultural Experiment Station will have plants or planting stock for distribution.

Administrator, Agricultural Research Service	Date 3/25/76
Director, Oregon Agricultural Experiment Station	Date 3/2/76
President, United States Brewers Association	Date 3-22-76

Appendix: Agronomic and Quality Data of the Hop Variety Willamette (USDA Accession No. 21041) In Nursery Trials and Commercial Plots in Oregon.

Variety	Year	Yield/Acre	Quality 3/ Alpha Acids	Beta Acids	α/β	Oil	Co-Fraction	Leaf & Stem	Seeds
		pounds	%	%		ml/100g	%	%	%
Nursery trials: 1/									
Fuggle control	1971	1538	5.5	2.9	1.9	1.1	37	not analyzed	0.0
	1972	1015	4.7	2.7	1.7	0.7	32		0.0
	1973	1261	4.6	2.4	1.9	1.4	-		0.0
	1974	1177	5.6	2.8	2.0	-	27		0.0
	1975	1395	6.8	3.4	2.0	1.9	22*		0.0
	Average	1277	5.4	2.8	1.9	1.3	32		0.0
Willamette	1971	2304	8.5	3.9	2.2	1.6	34		0.0
	1972	2055	6.4	3.7	1.7	1.0	31		0.0
	1973	2462	6.8	4.4	1.6	-	-		0.0
	1974	1834	6.0	4.0	1.5	1.2	37		0.0
	1975	1652	8.4	4.6	1.8	1.2	29*		0.0
	Average	2061	7.2	4.1	1.8	1.3	34		0.0
Commercial trials: 2/									
Fuggle control:	1974	1254	5.6	2.5	2.2	not analyzed	not analyzed	2-3	8-12
	1975	1252	5.4	2.7	2.0			2-3	8-12
	Average	1253	5.5	2.6	2.1			2-3	8-12
Willamette	1974	1445 4/	5.4	3.2	1.7			1.9	3.2
	1975	1751	6.8	3.9	1.7			2.0	1.0
	Average	1598	6.1	3.6	1.7			2.0	2.1

1/ Calculated from 5-10 hill plots

2/ State Average

* True Co-humulone

3/ 8% Moisture basis

1975 analyses

	CoH	AdH	Humulone
Fuggle	22	13	65
Willamette	29	13	58

4/ Poor stand at one location