

EVALUATION OF SOME WILD HOPS FROM EUROPE

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Seeds were collected from wild hops in various locations of Europe. Collection areas are generally described as Bavaria, Berlin, Sachsen, Austria, and Italy. Seeds were germinated and seedlings were screened for powdery mildew resistance during 2001 at the German hop research station in Huell. In 2002, about 115 of these seedlings were sent to the U.S.A. for evaluation on high trellis. These plants were in quarantine for two seasons and finally released for planting in the field on high trellis in the spring of 2004.

During the second year in the field, the plants were evaluated for chemical and agronomic characteristics. In addition they were exposed to powdery mildew isolates containing the virulence genes Vb, V1, V2, V3, V4, V5, and V6. Many of these hop genotypes lacked vigor and only the most vigorous were evaluated. Evaluations were limited to those that reached the top or grew over the top of the 18' trellis. Of the original 115 starting number, 31 females and 9 males were evaluated.

Evaluations on both female and male genotypes were for alpha and beta acids contents, cohumulone content, storage stability of the alpha acids, and powdery mildew susceptibility. Further evaluations were made on the females to include total oil content, cone size and density, amount of lupulin in the cone, aroma of the cone, estimated number of cones, distribution of cones on the plant, lateral length and seed content.

Alpha acids contents (determined by ASBC Hops-6 spectrophotometric) in the females usually were less than 5.0% and many were less than 1.0% with the range being 0.3% to 11.4%. Beta acids contents were slightly higher and ranged from 2.2% to 5.4%. Storage stability ranged from very good, with only an 11% loss of alpha after 6 months at room temperature, to very poor with a 56% loss. Cohumulone contents were generally low, ranging from 10.0% to 27.0%. Total oil contents were low; all below 1.0 mL/100 grams dried hop except for the high alpha genotype which had total oil of 2.2 mL/100 grams of dried hops. Cone density was more loose than compact except for the one high alpha genotype which had a very dense, compact cone. Cone size was medium to small with most less than 2.5 cm in length. Lupulin content of the cones was low to medium and similar to that of low alpha aroma varieties, with the exception being the one female with the high alpha. Aroma was mild to nonexistent. Cone distribution was generally good and distribution occurred over much of the length of the plant for many of the genotypes. Lateral length was ideally medium for most of the genotypes, not too long nor too short. There were numerous males shedding pollen near the females and seed content was good in all females except in the female with high alpha, in which no seed developed in either of two years.

Hop powdery mildew isolates containing the above mentioned virulence genes were inoculated to all of the genotypes. Screenings were done with intact plants in the greenhouse and also with detached leaves in the laboratory. Only 25% of the total genotype collection has become infected with hop powdery mildew, indicating that a large percentage of these wild genotypes contains new resistance to hop powdery mildew.

Wild Hops From Europe

Origin	ID	% Alpha	% Beta	% Co-Hum	Storage % Loss	PM	Total Oils	Cone Compact	Cone Size	Lupulin	Aroma	Set	Cone Distribution	Laterals	Seed	
Female Plants																
Bavaria	50-8	3.4	4.0	26	12	0	0.4	3	3	3	2	2	1	3	3	
	50-11	0.8	1.9	25	18	0	0.2	2	1	2	3	2	3	5	4	
	50-12	1.5	3.1	22	15	0	0.3	3	3	2	2	3	4	3	1	
	50-13	4.6	3.3	19	11	0	0.5	3	3	3	4	4	5	5	3	
	50-17	4.9	2.5	22	10	0	0.6	3	3	3	2	4	5	5	3	
	50-19	3.5	2.4	21	12	0	0.2	3	3	3	3	3	3	5	4	
	50-20	4.6	2.8	20	14	0	0.2	3	2	2	2	3	3	5	4	
	50-21	1.2	2.6	23	20	0	0.3	3	3	3	3	3	3	5	5	3
	50-28	11.4	5.2	22	29	0	2.2	5	5	5	2	4	4	5	5	5
	50-29	1.1	2.3	27	24	0	0.3	2	1	2	3	3	4	5	5	3
50-31	2.9	2.8	18	13	1	0.2	2	3	2	2	4	4	4	5	1	
Berlin	50-32	0.6	3.2	19	36	2,3	0.3	3	4	3	5	3	5	5	1	
	50-34	0.6	3.2	15	35	2	0.5	3	3	3	5	3	5	5	3	
	50-36	2.4	4.7	19	26	1,2	0.5	3	2	3	5	4	5	5	2	
	50-38	1.0	3.6	20	33	0	0.6	3	3	2	2	1	3	5	3	
	50-40	0.4	5.4	37	41	0	0.7	3	2	2	5	3	5	5	3	
	50-41	1.2	5.0	21	28	0	0.7	3	3	2	5	3	5	5	3	
	50-42	2.5	5.8	25	35	0	0.9	4	4	3	5	2	5	1	3	
	50-43	2.0	5.3	19	51	0	0.5	3	3	3	2	3	5	5	3	
50-45	1.1	3.6	20	22	0	0.4	2	3	3	5	3	5	5	3		
Sachsen	50-48	2.0	5.1	28	29	0	0.8	2	2	2	5	5	4	5	1	
	50-49	2.0	5.4	22	31	1,2,3	1.0	2	2	2	3	3	3	5	3	
	50-53	1.4	3.4	26	38	0	0.4	2	2	2	3	3	2	5	3	
	50-56	2.9	5.1	23	23	0	0.7	2	2	2	3	3	2	5	3	
	50-58	3.0	4.6	23	23	0	0.8	3	2	3	5	3	1	5	3	
50-60	0.3	3.6	26	56	2	0.4	2	3	1	3	2	4	1	3		
Austria	50-63	3.0	2.5	23	18	1,2,3	0.2	2	2	2	3	3	2	3	2	
	50-64	1.8	2.2	28	22	0	0.2	3	2	2	3	2	4	5	3	
	50-67	1.1	2.2	24	15	1,2,3	0.1	3	3	3	1	2	1	5	1	
Italy	50-95	0.5	3.3	19	18	0	0.1	2	3	2	1	2	3	1	1	
	50-97	1.9	4.4	24	11	1,3	0.3	2	3	3	3	3	2	5	1	
Male Plants																
Bavaria	50-03	25	45	15	15	0										
	50-04	36	35	14	15	0										
	50-26	16	47	15	29	ND										
Berlin	50-37	30	43	16	21	0										
Sachsen	50-50	15	63	20	26	0	<i>These Data not Available for Male Plants</i>									
	50-55	19	55	14	21	ND										
	50-59	15	45	14	-	0										
	50-61	25	48	21	11	0										
Austria	50-66	30	42	24	13	2										

All data on these wild hop plants were taken during the 2005 growing season. Plants grew to the top of the 18 ft tall trellis. **Origin** indicates where the seeds were collected. **ID** indicates the field planting location of the genotype. **Alpha** and **beta acids** are ASBC spectrophotometric. **Storage** indicates percent resin loss after six months at room temperature on female hop cones, male loss is on lupulin glands only. **PM** is results of screening for powdery mildew infection - 0 is no infection, possible new resistance; 1 is infection with Vb, 3, or 5; 2 is infection with Vb, 3, 4, 5 or 6; 3 is infection with Vb, 1, 2, 3, 5, or 6; ND is not determined. **Total oil** is in mLs/100g dried hops. **Cone compactness** is 1 = loose, 3 = medium like Hallertau mittelfrueh, 5 = tight like Galena. **Cone size** is 1 = <0.75", 3 = 0.75-1.0", 5 = >1.0". **Lupulin** amount is 3 = medium like Hallertau mittelfrueh, 5 = high like Galena. **Aroma** is 1 = strong like Columbus, 3 = no aroma, 5 = mild like Hallertau mittelfrueh. **Set** is number of cones, 1 = few, 5 = many like Columbus. **Cone distribution** is 1 = cones only near top of plant, 5 = cones full length of plant. **Laterals** is length, 1 = <1', 3 = >2.5', 5 = in between. **Seed** is 1 = fully seeded, 5 = no seed.