

# 2011 ORGANIC HOP VARIETY TRIAL – PRELIMINARY RESULTS

The goal of the UVM Extension hops program is to develop agronomic recommendations for hop production in the Northeast. Much has changed since hops were last grown in this area in the 1800s, with many new varieties released and a better understanding of cropping science. With this in mind, in August of 2010, UVM Extension initiated an organic hops variety trial at Borderview Farm in Alburgh, VT. The UVM Extension hopyard is trialing 19 publicly available hop varieties. The goal of these efforts is to find hop varieties that not only grow well in the Northeast and demonstrate disease and pest resistance in combination with high yields, but also present desirable characteristics to brewers. The results and observations presented below are from a first year hopyard.

## MATERIALS AND METHODS

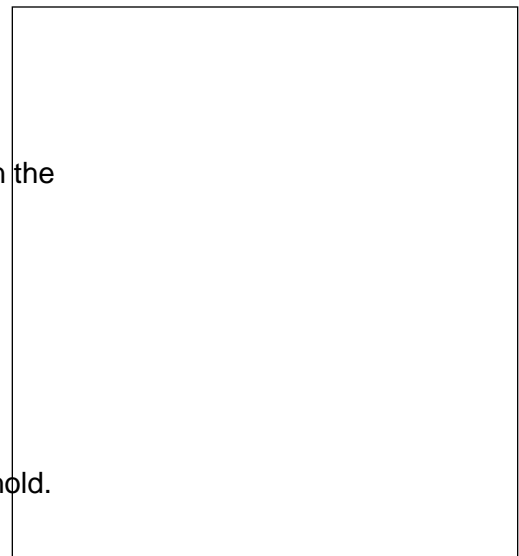
The replicated research plots were located at Borderview Farm in Alburgh, VT. The soil was a brown rocky silt loam. The experimental design was a randomized complete block with three replicates. The 19 varieties were the 19 varieties. The hopyard was constructed in the spring of 2010 using 20' x 6" larch, tamarack and cedar posts with a finished height of 16 feet. A 6' x 16' trellis was used.

Hop beds (4' in width) were tilled with a moldboard plow, followed again with a 3-point hitch, 6' rotary tiller, and then planted with two vegetative hop cuttings per hill in August 2010. Hills were distanced 7' apart, and rows were spaced at 16". Each plot consisted of five consecutive hills. Varieties were evaluated for survival on 12 April and 27 June 2011. In-row rototilling was the primary weed control method, and as the weeds were brought under control, rows were trained with two strings (coconut fiber) per hill, fertilized, and mulched with hardwood mulch. ProGro® 5-3-4 and Proboost® 10-0-0 were applied to provide 30 lbs plant available N, 40 lbs P, and 80 lbs K ac<sup>-1</sup>. Boron was also applied at a rate of 10 lbs ac<sup>-1</sup>. On 7 June Chilean nitrate (16-0-0) was sidedressed at a rate of 50 lbs N ac<sup>-1</sup>. All fertilizers were OMR approved for use in organic systems, and were applied at rates recommended in the Pacific Northwest (Gingrich et al., 2000).

In late June, three leaves per hill and two hills per plot were scouted for insect and disease pests. The hopyard was scouted weekly in July and August, and pesticides were applied as needed. Potato leafhopper (*Eriopasca fabae*) (Fig. 1) and two-spotted spider mites (*Tetranychus urticae* Koch) were identified in the hopyard and determined to be above economic threshold.

Economic thresholds for potato leafhoppers in hops have been documented, but with an in-depth literature review, it was determined that two leafhoppers per leaf were economically

damaging to the hops. Economic thresholds for two-spotted spider mites have been determined in the Pacific Northwest to be 2 spider mites per leaf in June, of 5 per leaf in July. Pyganic (Maulglin



Figure

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procedure was used to separate cultivar means when the F was significant (

Table 1. Temperature, precipitation\*, and Growing Degree Day summary, Alburgh, VT.

Based on National Weather Service data from cooperative observer station South Hero, VT, which is in close proximity to the variety trial. \*Due to missing data from the South Hero station, precipitation from March to July 2011, and average temperature from August and September 2011 are taken from an observer station in Burlington, VT. Historical averages are for 30 years of data (1970).

Table 2. Hop survival by variety.

Among the varieties Centennial, 'Glacier', 'Perlé', 'Saaz', 'Santiam', and 'Sterling', at least one of the two plants in every hill survived through the winter and into the end of July. All of the 'Chinook' plants also survived the winter, but one plant was lost during the growing season, uprooted by high winds. 'Tettnang' and 'Vanguard' had very poor survivability (Table 2).

Hop harvest was for 20 to 25% cone dry matter (Table 1). The var. Cluster was the earliest maturing variety and was followed by 'Crystal', 'Fuggle', Cascade, and Saaz. The latest maturing varieties were Santiam and Sterling. The hop harvest window was from mid-August to mid-September.

\* indicates that the variety did not perform differently than the top variety.

Table 3. Dry matter by harvest date and variety.

Cluster outperformed all other varieties, averaging 0.74 lbs/hill or 460 lbs/acre at 8% moisture (Table 4).

'Liberty' was the worst performing variety, although statistically no different from Centennial, Crystal, Fuggle, Glacier, Mt. Hood, Perle, Saaz, Santiam, Sterling, Tettnang, and Vanguard (Figure 4).

Table 4. Yield of 19 hop varieties at harvest and 8% moisture.

Variety	Yield at harvest moisture		Yield at 8 % moisture	
	lbs/hill	lbs/ac	lbs/hill	lbs/ac
Cluster	3.58*	2227*	0.74*	460*
Galena	1.87	1166	0.49*	303*
Newport	1.54	958	0.41	257
Willamette	1.60	993	0.41	256
Cascade	1.71	1062	0.41	255
Nugget	1.40	870	0.35	217
Chinook	1.20	747	0.30	190
Glacier	0.87	539	0.22	138

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Brewing values for select varieties are presented in Table 5. Some varieties did not produce sufficient yield to be tested for brewing characteristics. Alpha acid percentages for Cluster, Cascade, Galena, and Vanguard fell within industry averages. Nugget and Willamette exceeded industry alpha acid averages (Figure 5). Beta acid levels for Centennial, Cluster, Crystal, Mt. Hood, Newport, Nugget, and Santiam all fell within the industry averages. Cascade, Chinook, Fuggle, and Willamette all had beta acid levels higher than industry averages (Figure 6).

Table 5. Brewing values by hop variety

Variety	Alpha acids %	Beta acids %	H.S.I.
Cascade	4.7	7.4	0.20
Centennial	8.2	3.6	0.27
Chinook	9.9	4.1	0.24
Cluster	6.3	5.1	0.20
Crystal	2.1	6.2	0.19
Fuggle	3.2	2.6	0.25
Galena	12.5	6.9	0.21
Glacier	3.6	6.7	0.21
Mt. Hood	3.3	7.1	0.22
Newport	10.3	7.6	0.21
Nugget	14.4	4.6	0.23
Saaz	1.0	1.2	0.20
Santiam	3.0	6.8	0.20
Vanguard	5.9	4.7	0.20
Willamette	8.4	4.1	0.23

Figure 4. Yields of 19 hop varieties evaluated by VM Extension. Varieties with the same letter are not statistically different from each other.

Figure 5



## DISCUSSION

Traditionally, hops are propagated by rhizome, which are planted in the early spring. Rhizomes can often carry diseases like Verticillium wilt, hop latent virus and downy and powdery mildew. Unbeknownst to the grower,

knowledge, there are no established economic threshold levels for leafhoppers in hops. Reviews of threshold levels for raspberries, potatoes, and alfalfa, resulted in the establishment of a threshold level of two leafhoppers per leaf. An informational article on potato leafhoppers in hops can be found on the [UVM Extension Northwest Crops and Soils Team website](#)

The UVM Extension hopyard was planted in August of 2010, putting the hopyard at a stage of maturity between one and two year old plants in the 2011 growing season. First year yields are generally assumed to be approximately 30-50