About Us

Mountain View Hops, LLC was established in 2018 with a focus in providing quality propagated hop plants at an affordable price with dependable growth characteristics to existing and beginning hop farms of a half acre or less throughout the mid-Atlantic region. Our initial stock was planted in the spring of 2016 and has steadily grown in number of plants and varieties.

We currently cultivate over 20 varieties that are continually evaluated in our own small-scale hop yard nestled in the Blue Ridge Mountains of Southwest Virginia. This testing allows us to determine which commonly available cultivars and pest management practices perform best in the mid-Atlantic.

As viability testing continues and cultivars become available, the varieties we offer will change and expand. It is with this gained knowledge that we can more accurately provide existing and developing hop farms with cultivars that can do well in this geographic region. We furthermore test various trellising designs and other farming practices that can make small scale hop farming a more financially viable and less labor-intensive industry in which to get started.

Our Hop yard Design

Located at an elevation of 2,665 feet, the hop yard is laid out in a grid-like checkerboard pattern. Individual squares measure 6’ x 6’. Each pole is a 4” x 4” x 16’ treated post planted 2’ in the ground. Plants are placed within the 6’ x 6’ dirt squares around the poles in a straight line pattern to facilitate ease of tilling the ground. All plants are approximately 6’ from the center of their respective poles. Currently, each pole represents one variety with varying numbers of crowns per cultivar around each pole.

The poles have a collar with a rope and pulley system to raise and lower the collars. A strong baling twine is attached to eye hooks in the collar, and when raised, is used as both a climbing medium for the hops as well as a guy wire to support the poles via a ground stake placed near each crown around the pole. This provides a 14’-15’ grow height for each hop crown. Certain tall-growing cultivars have been fitted with specially made extensions attached to the collars that increase growing height to 18’-19’.

Harvesting and bine maintenance are performed from the ground level by lowering the collars to the desired height using the rope and pulley system. Due, in part, to the distance of the crowns from the pole, bine breakage from raising and lowering the collars is near zero.

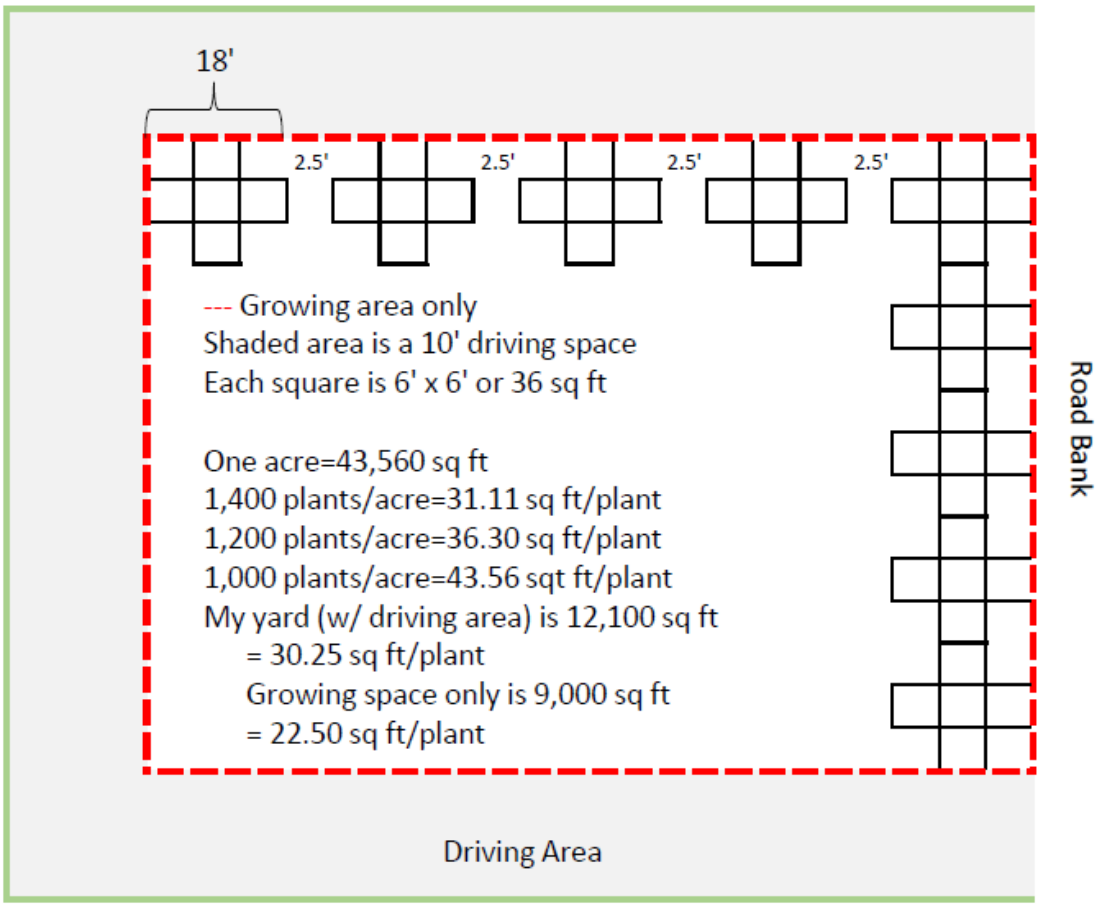
Irrigation is currently performed by hand, using a portable water tank and pump. This is a cost effective system that also enables the mixing of liquid fertilizers within the main tank which can then be metered out to each plant individually to test various fertilizer requirements between cultivars and within the same cultivars.

Granular fertilizers and other soil nutrients are weighed out during the winter months for each pole or square based on square footage and manually applied in the spring. This is then followed by tillage of the ground beside each row of crowns using a standard garden tiller.

Grass between rows and around the hop yard is mowed using a self-propelled walk behind bagging mower and zero turn riding mower. All grass is either bagged or blown away from the yard to prevent grass clippings from covering the plants or the ground surrounding them.

Depending on level of vegetation and amount of control needed, foliar applications of fungicides or pesticides are applied using either a backpack style sprayer or an independent 25 gallon pull behind sprayer with a dedicated 12 volt pump. Other controls such as Clethodim for grass control and Sevin® granules for earwigs are also used.

MOUNTAIN VIEW HOPS



Cashmere (4)	Magnum (4)	Mt. Hood (4)	Willamette (4)	Cascade (16)
Comet (4)	Pacific Gem (8)	Columbus (16)	Glacier (4)	Chinook (16)
Columbia (4)	Southern Cross (8)	Zenith (4)	Horizon (4)	Centennial (16)
Triple Perle (1)	AlphAroma (8)	Challenger (16)	Galena (16)	Canadian Redvine (4)
Newport (1)	Local (4)	Fuggle (4)	Multihead (2)	Kirin II (2)

Currently 174 crowns

Future (End of 2019 season) - 176 crowns

2018 Growth Summary

Nearly all cultivars began emerging from the ground between the last week of February and the third week of March. On April 14th, all squares received the following nutrients based on a soil test conducted prior:

- Wood Ash in the form of ash from wood burning fireplaces – 25 lbs per 1000/ sq ft
- Phosphorous in the form of TN Brown phosphate rock – 55 lbs per Acre
- Potassium in the form of Sunflower Ash – 75 lbs per Acre
- Boron in the form of 10% Boron derived from Sodium Calcium Borate – 1 lb per Acre

Based on the age of the square and/or crowns around the pole, as well as in response to the soil testing, the following additional nutrients and liming were applied in varying amounts each:

- Iron in the form of Iron Sulfate
- Zinc in the form of Zinc Sulfate
- Manganese in the form of Manganese Sulfate
- Hi-Calcium Lime

Root/rhizome pruning took place on April 6th. All rhizomes removed appeared to be healthy and pink to white inside and none showed any internal infections of DM (Downy Mildew).

All plants were trimmed to ground level on April 25th and subsequent bines were trained and excess growth trimmed from May 8th -11th. All crowns had only 3-4 bines trained per string.

Nitrogen was applied on May 20th at a rate of 170 lbs per Acre in the form of a generic granular 12-12-12 mix and tilled into the ground on June 4th-6th.

This growing season was difficult due in major part to the weather. We endured a historic cold winter that lasted much longer than usual. At the end of winter, the temperatures went directly from freezing to summertime 80's with no spring-like adjustments. Furthermore, the entire growing season was plagued by high humidity, rain, and heat. The ground only dried out enough to till twice this season.

General Cultivar Observations

Kirin II Row 1, Pole 1	No data available yet for this cultivar.
Canadian Redvine Row 1, Pole 2	Rhizomes grew profusely with most being around ½" in diameter and reaching to 1 foot in length. At full height, it reached 20'-25'+ with sidearm lengths of 2'-3' long. Cone production was very heavy. Sucker and sidearm growth was heavy and it appears to be resistant to DM. This variety possesses thick vegetation that can make it more difficult to obtain complete penetration of foliage when applying sprays. Extra spacing is also required when planting this variety. Overall, this is one of the best growing cultivars we have trialed to date and it is an excellent variety to grow in this region for those interested.

Centennial Row 1, Pole 3	Rhizome growth was light with the maximum being about ½" in diameter and all less than 6" long. At its full height, it reached 10'-14' tall with sidearm's around 12"-18" long. Cone quantity was moderate. Sucker growth is moderate and it is poorly resistant to DM. It starts growing strong and early, but seems to stall out too soon. This cultivar has great brewing characteristics and is popular, but it is a difficult variety to grow in this region.
Chinook Row 1, Pole 4	Rhizome growth was moderate with diameters between ½"- ¾" and lengths all under 12". It reached around 14'-16' tall with 18"-24" sidearms. Cone quantity was fairly heavy. Its sucker growth is also fairly heavy and it appears to have good DM resistance. This cultivar has excellent brewing characteristics and is a good candidate to be grown in this region.
Cascade Row 1, Pole 5	Rhizome growth reached diameters around ½" and all were under a foot long. It obtained a height of 14'-16' with sidearm's of 12"-24". Cone quantity was heavy. Sucker growth is also fairly heavy and DM resistance appears to be very good. No major issues were found on this cultivar this season. This variety is quickly becoming the "Nike" of hop growers in this region and flooding the markets with this cultivar may eventually lead to problems in finding sales outlets that can provide a profit. However, it is currently a popular variety that boasts excellent brewing characteristics and grows well in this region.
Multihead Row 2, Pole 1	No data available yet for this cultivar.
Galena Row 2, Pole 2	Rhizome growth was extreme and more profuse than Canadian Redvine. Multiple rhizomes reached 1"-1 ½" in diameter and several were 1'-2' long. It reached a height of 14'-15' tall with 2'-3' sidearms. Cone quantity was heavy. Sucker growth is very heavy and it has excellent resistance to DM. The biggest issues this year were that the Alpha Acids were half of what they should have been and that the lupulin never turned a golden yellow. This was the only variety to do this and is a stark difference from last year's appearances. It is suspected that nutrient deficiencies, pH levels, and/or this season's weather patterns played a role in this problem. No viruses are suspected at this time. It is an excellent growing cultivar for this region otherwise. More evaluations are needed to diagnose the poor AA% and aroma losses that were incurred this season.
Horizon Row 2, Pole 3	Rhizomes were so few and small that pruning was not conducted on this cultivar this season. Total height reached 10'-12' and sidearm's were 12"-18" long. Cone quantity was light, but much better than last season. Sucker growth is moderate and DM resistance currently appears to be moderate as well. This cultivar shows potential promise, but due to lower than acceptable cone yields, further trialing and testing is needed to determine if a boost in production can be achieved. Until then, it is undetermined if this variety is suitable for this region.
Glacier Row2, Pole 4	Rhizomes were numerous with most around ¾" in diameter and all under a foot in length. It reached 18'-22' tall with 12"-18" sidearms. Cone quantity was quite heavy. Sucker growth was light and DM resistance is very poor. Constant fungicide application is necessary for this cultivar. More testing and evaluations are needed to determine if this variety can be grown in this region. However, if DM continues to be a major issue, than the likelihood of it being a viable option is somewhat limited.

Willamette Row 2, Pole 5	Rhizome growth was moderate with most being around ½”- ¾” in diameter and all were under a foot long. It reached 10’-12’ tall with sidearm’s of 6”-10” long. Cone quantity was miniscule with few cones being produced. Sucker growth was light and DM resistance appears to be excellent. This cultivar displayed some down curled, darker leaves early in the growing season reminiscent of nutrient problems, but quickly grew out of it as the season progressed. Currently, this cultivar cannot be recommended for growing in this region until cone yields can be increased.
Fuggle Row 3, Pole 1	This cultivar was moved from another plot at the beginning of this season and rhizome growth was not observed. This was the shortest growing variety of the entire hop yard, and has been since its planting in 2016. It only reached 6’-10’ tall with small 3”-6” sidearms. Cone production was miniscule with hardly any cones to speak of. Sucker growth was very light and DM resistance is very poor. After 3 years of continuously poor performance, this cultivar will be removed from the hop yard. This variety is completely unsuitable for commercial production in this region.
Challenger Row 3, Pole 2	Rhizome growth was light to moderate at around ½” in diameter and all under a foot long. Plant height reached 10’-12’ tall with 12”-18” sidearms. Even though plant height could be considered short, cone quantity was heavy with large cones. Sucker growth is moderate and DM resistance appears to be high. No major issues were noted with this variety this season. This is a suitable variety for growing in this region and could be considered for short trellising designs.
Zenith Row 3, Pole 3	Rhizome growth was moderate with most being around ½”- ¾” in diameter and all under a foot long. Plant height reached 12’-14’ tall with small 2”-6” sidearms. Unfortunately, cone quantity was light and DM resistance appears to be poor. This cultivar will be trialed one more season in an attempt to increase its productivity, but if improvements are not noted, it will be removed. Until then, recommendations for growing this cultivar in this region cannot be given.
Columbus Row 3, Pole 4	Rhizome growth was moderate to heavy with most being ½”– ¾” in diameter and all under a foot long. Like Challenger, plant height reached 10’-12’ tall with 12”-18” sidearm’s. Cone quantity was also heavy with large cones. Sucker growth was fairly high and DM resistance appears very good even though the literature states otherwise. No major issues were noted on this variety this season. It is a suitable variety for growing in this region and could be another candidate for short trellising designs.
Mt. Hood Row 3, Pole 5	Rhizome growth was heavy with most being ½” – ¾” in diameter and were very close to the crown at only 6” in length. The plant reached 14’-15’ tall with 12”-18” sidearm’s. Cone quantity was very poor. Sucker growth was extremely heavy and DM resistance is poor. Leaf hoppers have loved this variety for the past three seasons. Unless cone quantity and quality can be improved, this cultivar will be removed. No recommendations can currently be made for growing this cultivar in this region.
Local Row 4, Pole 1	This variety was planted locally in Floyd, VA around 100 years ago and is currently being trialed at MVH. Rhizome growth is profuse like CRV, with most being around ½” in diameter and reaching a foot in length. Plant height reached 20’-25’+ and sidearm’s were 2’-3’ long. Cone quantity was very heavy with long, loose cone sets. Sucker growth was moderate to heavy and grew fast. DM resistance appears to be very good. Extra spacing would be needed if growing this cultivar for commercial production. No major issues were found on this variety this season. Until trails are completed, this variety cannot be officially recommended for growing in this region, but it is showing excellent progress and promise.

Alpharoma Row 4, Pole 2	This cultivar was moved from another plot at the beginning of this season and rhizome growth was not observed. The plant reached 18'-20' tall with 1'-2' sidearm's. Cone quantity was moderate. Sucker growth was also moderate and DM resistance was fair. Due to the transplanting, it is suspected that growth was less than normal. Leaf hoppers also seemed to feed on this cultivar more heavily than any of the other New Zealand varieties we are trialing. No recommendations can currently be made on growing this cultivar in this region.
Southern Cross Row 4, Pole 3	Rhizome growth was profuse, like Galena, with diameters of 1"-1 ½" and total lengths of around a foot. It reached 18'-22' tall with 2'-3' sidearm's. Cone quantity was heavy with long cones. Sucker growth was very heavy and grew fast. DM resistance is fair for a NZ variety. Extra spacing is needed if planting this cultivar for commercial production. This variety has a unique aroma and flavor profile and is a good candidate for growing in this region providing proper fungicide controls are utilized.
Pacific Gem Row 4, Pole 4	Rhizome growth was profuse like Southern Cross with diameters of 1"-1 ½" and just under a foot long. Plant height reached 18'-21' tall with 2'-3' sidearm's. Cone quantity was heavy with long, lupulin-rich cones. Sucker growth was very heavy and grew fast, like Southern Cross. DM resistance is fair for a NZ variety, similar to Southern Cross. This cultivar is a late harvester, and longer than usual fungicide applications must be made in order to properly protect this variety until cones are ready for harvest. However, it is a good candidate for growing in this region and provides a very lupulin-rich cone.
Magnum Row 4, Pole 5	No rhizomes were pruned from this cultivar this season. It reached 14'-16' tall with 12"-18" sidearms. Cone quantity was moderate, but cones were large in size. Sucker growth was moderate and DM resistance appeared to be good. No major issues were noted on this cultivar this season. It is still too early to make any recommendations for growing this variety in this region.
Newport Row 5, Pole 1	No data available yet for this cultivar.
TriplePerle Row 5, Pole 2	No data available yet for this cultivar.
Columbia Row 5, Pole 3	No data available yet for this cultivar.
Comet Row 5, Pole 4	No data available yet for this cultivar.
Cashmere Row 5, Pole 5	No data available yet for this cultivar.

MOUNTAIN VIEW HOPS

Estimated Hop Production Guidelines

Variety	lbs/ acre	1000 plants per acre				1400 plants per acre			
		lbs/ plant normal	avg norm	lbs/ plant 84%	avg 84%	lbs/ plant normal	avg norm	lbs/ plant 84%	avg 84%
Alpha	1100-	1.10-				.79-			
Aroma	2910	2.91	2.01	.18-.47	0.33	2.08	1.44	.13-.33	0.23
CRV	2000 +	2 +	2	.32+	0.32	1.43+	1.43	.23+	0.23
	1667-	1.67-				1.19-			
Cascade	2133	2.13	1.90	.27-.34	0.31	1.52	1.36	.19-.24	0.22
Cashmere	no info	no info	no info	no info	no info	no info	no info	no info	no info
	1420-	1.42-				1.01-			
Centennial	1670	1.67	1.55	.22-.27	0.25	1.19	1.10	.16-.19	0.18
	1013-	1.01-				.72-			
Challenger	1603	1.60	1.31	.16-.26	0.21	1.14	0.93	.11-.18	0.15
	1640-	1.64 -				1.17-			
Chinook	2200	2.2	1.92	.26-.35	0.31	1.57	1.37	.19-.25	0.22
	1707-	1.71-				1.22-			
Columbia	2200	2.20	1.96	.27-.35	0.31	1.57	1.40	.19-.26	0.23
	2090-	2.09-				1.42-			
Columbus	2615	2.62	2.36	.33-.42	0.38	1.87	1.65	.23-.30	0.27
	1700-	1.7-				2.21-			
Comet	2000	2.0	1.85	.27-.32	.29	1.43	1.32	.19-.23	.21
	918-	.92-							
Fuggle	1407	1.41	1.7	.15-.23	0.19	.65-1	0.83	.10-.16	0.13
	1600-					1.14-			
Galena	2000	1.60-2	1.8	.26-.32	0.29	1.43	1.29	.18-.23	0.21
	2270-	2.27-				1.62-			
Glacier	2460	2.46	2.37	.36-.39	0.38	1.76	1.69	.26-.28	0.27
	1800-					1.29-			
Horizon	2000	1.80-2	1.90	.29-.32	0.31	1.43	1.36	.21-.23	0.22
	1887-	1.89-				1.35-			
Kirin II	2500	2.50	2.20	.30-.40	0.35	1.79	1.57	.22-.29	0.26
Local	no info	no info	no info	no info	no info	no info	no info	no info	no info
	1270-	1.27-				.91-			
Magnum	1610	1.61	1.44	.20-.26	0.23	1.15	1.03	.15-.18	0.17
	1353-	1.35-				.97-			
Mt. Hood	1890	1.89	1.62	.22-.30	0.26	1.35	1.16	.15-.22	0.19
Mulithead	no info	no info	no info	no info	no info	no info	no info	no info	no info

Newport	2038-2420		2.04-2.42	2.23	.33-.39	0.36		1.46-1.73	1.60	.24-.27	0.26
Pacific Gem	2040 +		2.04+	2.04	.32+	0.32		1.46+	1.46	.23+	0.23
Southern Cross	1527 +		1.53+	1.53	.24+	0.24		1.09+	1.09	.17+	0.17
Triple Perle	no info		no info	no info	no info	no info		no info	no info	no info	no info
Willamette	1500-1973		1.5-1.97	1.74	.24-.32	0.28		1.07-1.41	1.24	.17-.23	0.20
Zenith	< 2000		<2	2	< .32	0.32		< 1.43	1.43	< .23	0.23
Zeus	2400-3000		2.4-3.0	2.70	.38-.48	.43		1.71-2.14	1.92	.27-.34	.30

1. All "lbs/acre" figures are from three sources (Great Lakes Hops, The Hops List, and the USDA where available) and averaged together.

2. The 1400 and 1000 plants/acre figure is based on an email from Great Lakes Hops.

3. The 84% figure is based on a Virginia Tech article entitled "Hops To The Harvest." It simply means that these figures are 84% less than, or 16% of the normally harvested lbs/plant average.

4. You will notice that the 1000 plants/acre figures are higher than the 1400 plants/acre figures. This is because the pounds/acre weights are spread among fewer plants. We do not know the plant density for each variety; therefore, two figures were created.

MOUNTAIN VIEW HOPS

2018 MVH Harvest

Cultivar	Year	Rank	lbs (Wet)	lbs (Dry)	Oz (Wet)	Oz (Dry)	# of Plants Harvested	Age Distribution per Cultivar
Canadian Redvine	2017	1	8.26	2	132.2	32	4	All were 2 years old
	2018	1	24.29	5.69	388.6	91	4	All were 3 years old
Columbus	2017	4	4.18	0.86	66.9	13.8	4	All were 2 years old
	2018	2	14.22	3.73	227.6	59.7	10	4-3yr old, 8-2yr old, 4-1yr old
Challenger	2017	6	3.91	0.85	62.6	13.6	4	All were 2 years old
	2018	3	10.28	2.67	164.5	42.7	10	4-3yr old, 8-2yr old, 4-1yr old
Local	2017	18	0.16	0.03	2.6	0.59	1	All were 1 year old
	2018	4	7.62	2.39	121.9	38.2	4	1-2yr old, 3-1yr old
Pacific Gem	2017	3	4.83	1.27	77.2	20.3	4	All were 2 years old
	2018	5	9.99	2.22	159.8	35.5	4	4-3yr old, 4-1yr old
Cascade	2017	2	6.93	1.71	110.8	27.4	9	4-2yr old, 8-1yr old
	2018	6	9	2.16	144.1	34.5	12	4-3yr old, 8-2yr old, 4-1yr old
Southern Cross	2017	6	2.18	0.54	34.9	8.6	4	All were 2 years old
	2018	7	9.07	2.09	145.2	33.5	6	4-3yr old, 4-1yr old
Chinook	2017	8	2.91	0.61	46.5	9.8	4	4-2yr old, 8-1yr old
	2018	8	7.51	1.84	120.2	29.5	10	4-3yr old, 8-2yr old, 4-1yr old
Galena	2017	7	3.92	0.83	62.7	13.2	4	4-2yr old, 8-1yr old
	2018	9	6.58	1.62	105.3	25.9	10	4-3yr old, 8-2yr old, 4-1yr old
Centennial	2017	5	2.87	0.86	45.9	13.8	4	4-2yr old, 8-1yr old
	2018	10	2.57	0.64	41.1	10.3	10	4-3yr old, 8-2yr old, 4-1yr old
Horizon	2017	12	0.47	0.12	7.5	1.9	1	All were 2 years old
	2018	11	1.14	0.27	18.3	4.4	4	All were 3 years old
Alpharoma	2017	11	0.6	0.13	9.6	2.1	1	All were 2 years old
	2018	12	0.56	0.11	9	1.8	1	All were 3 years old
Zenith	2017	13	0.44	0.1	7	1.6	1	All were 2 years old
	2018	13	0.64	0.11	7.4	1.8	2	All were 3 years old
Magnum	2017	16	0.13	0.03	2.1	0.5	1	All were 1 year old
	2018	14	0.37	0.1	5.9	1.6	1	1-2yr old, 3-1yr old
Mount Hoood	2017	14	0.3	0.07	4.8	1.1	1	All were 2 years old
	2018	15	0.29	0.08	4.6	1.1	2	All were 3 years old
Willamette	2017	15	0.17	0.04	2.7	0.7	1	All were 2 years old
	2018	16	0.32	0.08	5.1	1.3	2	All were 3 years old
Fuggle	2017	17	0.13	0.03	2	0.5	1	All were 2 years old
	2018	17	0.05	0.01	0.8	0.2	4	All were 3 years old
Glacier	2017	10	0.82	0.22	13.1	3.5	4	All were 2 years old
	2018	18	0	0	0	0	0	All were 3 years old

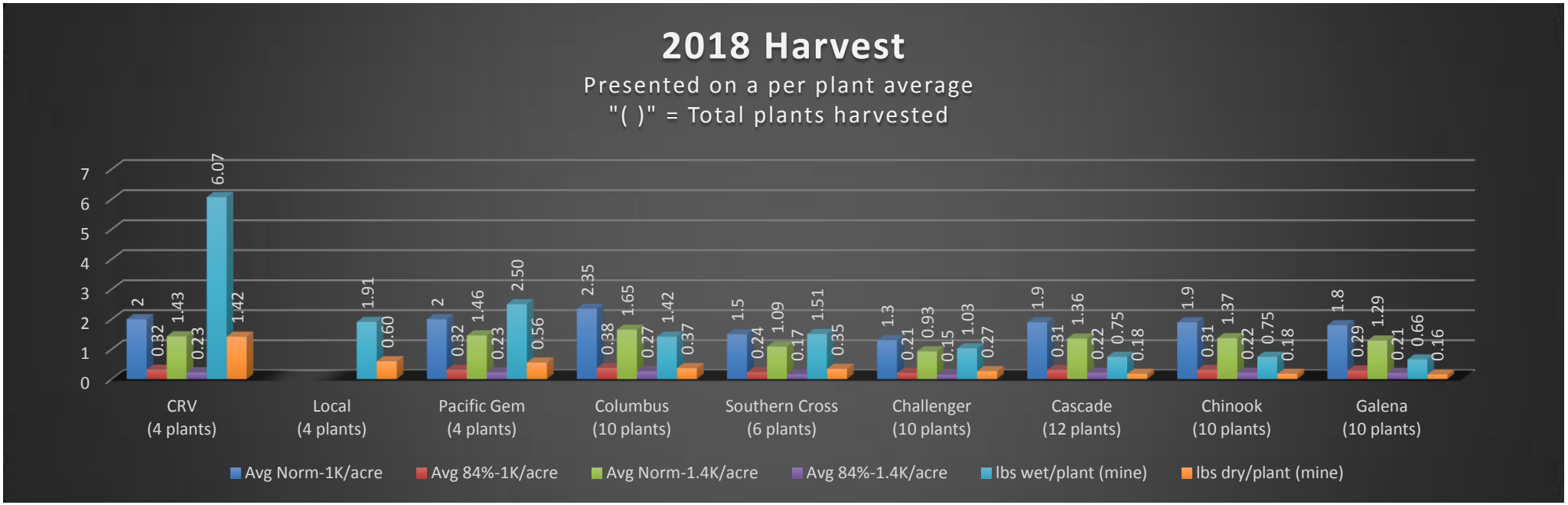
Cultivar	Year	Rank	lbs (Wet)	lbs (Dry)	Oz (Wet)	Oz (Dry)	# of Plants Harvested	Age Distribution per Cultivar
Cashmere	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	2018	N/A	0	0	0	0	0	All 1 year old
Columbia	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	2018	N/A	0	0	0	0	0	All 1 year old
Comet	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	2018	N/A	0	0	0	0	0	All 1 year old
Kirin II	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	2018	N/A	0	0	0	0	0	All 1 year old
Multihead	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	2018	N/A	0	0	0	0	0	All 1 year old
Newport	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	2018	N/A	0	0	0	0	0	All 1 year old
TriplePerle	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	2018	N/A	0	0	0	0	0	All 1 year old

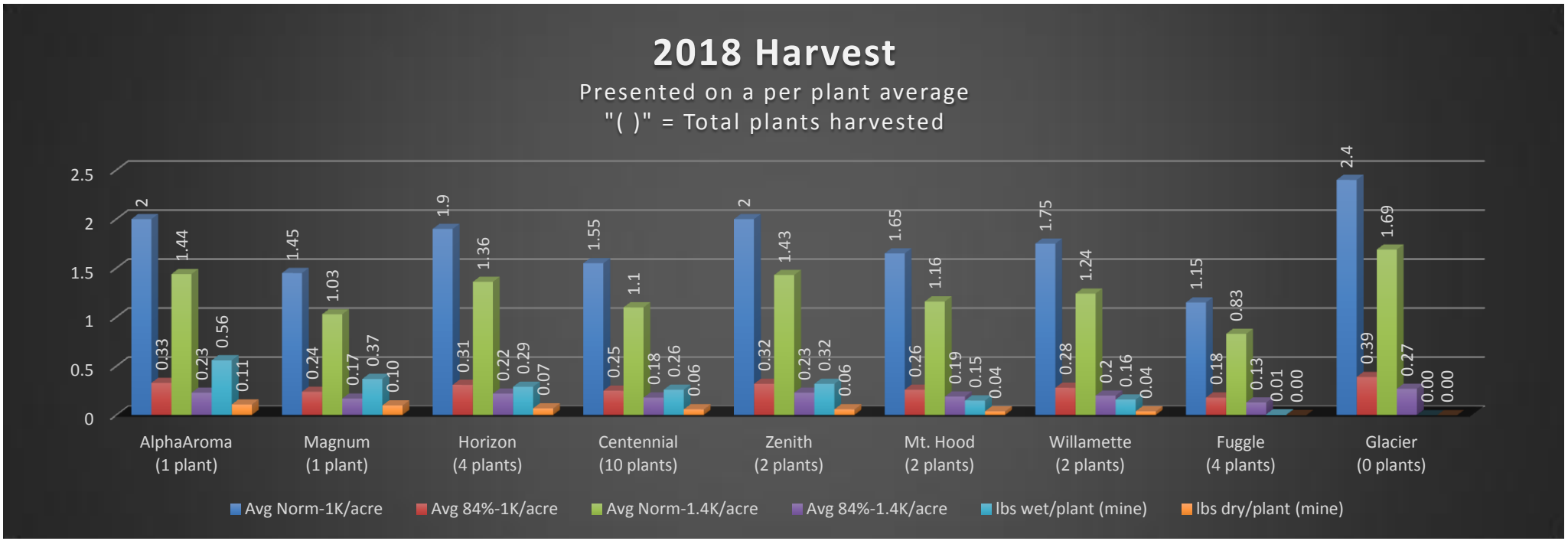
GREEN - Indicates an increase over the previous year

RED - Indicates a decrease from the previous year

Rank is based on “lbs/dry” figure

MOUNTAIN VIEW HOPS





Cone Drying and Packaging Procedures

All cones, immediately after harvest, were spread out on an elevated screen approximately 2'-3' above the floor to an even depth of no more than 1"-2" thick. The room was temperature controlled to 70°-75° and dehumidified to 60%-65%. Box fans continuously blew this air through the layer of cones from underneath.

As the testing data from Virginia Tech will show, our drying times were not long enough and some cones were packaged too moist as a result. It was feared that drying the cones longer would allow too many aromas to be driven off and for excessive oxidation to take place. However, after talking to other experienced individuals, it was found that little chance of either of these problems would happen due to the lower temperatures that were being used to dry them. Drying times were then incrementally increased from 2-3 days to 6-10 days. A significant improvement in final dryness was noticed by the end of the season.

The hop cones were then immediately packaged in vacuum sealed Food Saver® packages and placed directly in a chest freezer. A specialist informed me that even those varieties with higher moisture content upon packaging would not degrade to any significant levels as long as they were kept in the freezer. Virtually the entire harvest was purchased by a local brewery this season (2018) and their feedback from their brewing trials is pending.

Pest and Fungicide Controls

Overall, the Downy/Powdery Mildew problems were relatively small considering the growing season. This was one of the wettest years on record. From April through mid October it was constantly wet, humid, and hot. There was virtually no spring as it went straight from freezing winter temperatures to summer heat.

Fungicide applications were conducted constantly on roughly 4-5 day intervals depending on weather conditions. Fungicide sprays used were Phostrol, Oxidate 2.0, Cueva Copper, and Neem Oil. As a result of constant spraying and removal of lower growth, DM and PM were well controlled in most cultivars. PM started to make an appearance toward the end of the growing season (mid-late September) as spraying regimens declined and weather patterns continued to dump rain on this area. Also, throughout the growing season, Alternaria of the leaves and cones made slight appearances, but did not affect the harvest of cones.

Pest pressures this year were very high in Hop Merchant and Leaf Hoppers. Hop Merchants had an estimated 2-3 generations while the leaf hoppers appeared to be limited to just two. Japanese Beetles were present, but in low numbers. Spider Mites were virtually non-existent this season. Stinkbugs, particularly the Brown Marmorated Stinkbug, were present and in low numbers. Aphids and European Corn Borer were not found this season.

Insect sprays were Neem Oil and Des – X insecticidal soap. Mildew worries overshadowed insect concerns this season and as a result, the spray application records reflect this. Harvest this year was earlier than usual and pest pressures did not appear to affect the cones. This was due in part to the cones being harvested before pest levels reached any economic thresholds.

MVH Testing and Evaluation

Mountain View Hops, LLC is currently testing general hop growing practices and evaluating what varieties grow best and produce relatively well in this region using standard currently acceptable fertilizer and micro-nutrient rates. Tests also include various pesticide/fungicide/herbicide products for proper control of intended targets and evaluating the results. Types of mulches, propagating methods, and other cultural practices from pre-emergence to final packaging and marketing are also being evaluated at MVH.

Our long-term goals include more detailed studies of various fertilizer application rates and disease/pest control measures as they pertain to specific individual varieties. The intent is to take individual varieties that MVH has determined already grew well in this region and further test their reactions to various Nitrogen, Phosphorous, and Potassium application rates, as well as fungicide/pesticide application schedules to determine various disease resistances within each cultivar while maintaining a control group within each cultivar test plot. These tests will take time, but it is hoped that the results from these annual studies will eventually lead to a more solidified understanding of what hop varieties perform well in the mid-Atlantic region and how best to grow these varieties and hops overall.

2018 MVH Research

Experiment 1: Extending the current poles on several high climbing varieties so as to reach 19' instead of the current 14'.

Purpose: To determine the feasibility and design of attaching extension poles to the existing collars of several varieties that can climb over 16'. Currently, the hops are looped on themselves once they reach a certain height. This is done multiple times on some varieties. As a result, the tips are sometimes broken while performing this procedure and thus stop any vertical growth of that bine. It is hoped that by extending the poles to 19', the need to loop the tops of the plants will be unnecessary and that accidental breakage of bines will be significantly reduced, thus increasing and maximizing upper plant cone production.

Result: The extension poles were made of 4' aluminum channel vertically mounted to the existing wooden collars. Holes were drilled at the tops of the channels and wire was run though the holes which created a circle or halo-like effect at the top to prevent splaying out of the extensions and to provide support for the uppermost parts of the extension channels.

It was feared that the aluminum would not provide enough gripping power for the central hop bines to adequately hold tightly to the slick aluminum. However, this was not the case and all cultivars tested with extensions (7 in total) performed marvelously and clung tightly to the aluminum. Furthermore, no abrasions or cutting of the bines from the metal was noticed.

Another fear was that the added height of the extensions might cause the wooden collar to "lock" to the top of the 4"x4" post from any levering action that the extensions, with added vegetation weight, might have from wind or uneven balance. This did not happen to excess, and any "locking" was easily remedied by a very gentle tug on the opposing string.

In their first season of testing, the extensions appear to be a very viable option for extending the normal 14' growing height of our posts to 19', while still maintaining the ability to manually raise and lower the collars.

This raises the question as to how hop bines might cling to metal cabling instead of twine or string which needs replacing every season and is a constant source of expense. 4' of aluminum channel is a short distance that hops must climb and is also a different shape and size than normal round cable. Smaller, round cable could cause difficulty in climbing and cost of initial setup must also be factored in as well.

Experiment 2: Using two strings instead of one to train bines in a similar way the large commercial growers use.

Purpose: Last season (2017), the hop bines were trained using only one string. This resulted in 3-4 or 10+ (experimental) bines being trained up a single string per crown. It is hoped that by having two strings with 3-4 bines each, the cones will be of normal size and that vegetative growth will not inhibit disease and pest control measures. Furthermore, it is hoped that cone yield weights will be higher.

Result: Two sets of baler twine were used on the cardinal directions of eleven cultivars. Five foot T-posts were placed approximately 2'-3' from the central crown and a plastic insulator was attached to the top of each post. String was then run from the crown, outwards and upwards through the insulator and attached to the collar as usual. Another string was then run in the normal fashion from the opposite side of the crown directly to the collar. This created a "floating wire"- like effect but for a teepee designed system.

It was feared that the string might not be far enough from the other string to prevent excessive vegetative massing and that applications of sprays would be inhibited. This fear was half realized, and only on one cultivar (Canadian Redvine). As the strings got closer together towards the top near the collar, the vegetative mass increased significantly and spraying was difficult to reach the inner parts of that mass. All other cultivars appeared to work perfectly with this design adjustment and spraying was not an issue with them.

Another fear was that the weight of the vegetation would pull the T-posts inward toward the central pole as the bine weight increased. This did not happen on any cultivars.

Lastly, it was feared that the angle of the bines at the insulator area at the top of the T-posts would cause bine breakage when lowering the collars. As the bines were lowered, the bends did appear to reach critical points of breakage, but none ever did. All that was observed was some slight water leakage at a few of the stress points on only a few cultivars, but no actual breakage to where the rest of the bine died off.

Overall, this experiment has certain viability if applied correctly. It appeared to increase cone production roughly 50%-60%. Some cultivars will definitely be better suited to this approach more so than others. More testing and data needs to be collected before any solid recommendations can be made.

MOUNTAIN VIEW HOPS

Experiment 3: A small cold frame-style greenhouse will be erected to aid in propagating hop cuttings.

Purpose: A greenhouse will help retain heat and moisture better and longer than open air propagation. Aside from other various benefits, the hop cuttings can be more accurately tested for the best growing conditions immediately after being taken from the parent plants.

Result: The greenhouse helped early in the spring during colder weather and lower sun trajectories. However, as summer took over, it was found that a 30% shade netting and fan were needed to reduce heat and provide air circulation through the greenhouse

Most cultivars rooted and grew better when started in the greenhouse, but after a certain amount of growth, they appeared to level off. It is suspected that nutrient removal over time and inadequate replacement of those nutrients is to blame.

Overall, the greenhouse did help in certain areas, but much more practice, research, and time is needed to obtain more experience in learning best growing conditions for hops and which cultivars respond better to greenhouse conditions.

Experiment 4: Using Sevin® granules, containing Bifenthrin, sprinkled on the mulch around each 4”x4” post to control earwigs.

Purpose: To control the infestation levels of earwigs to a manageable level.

Result: This was a very earwig favorable growing season as temperatures and moisture levels were both high and supported earwig habitation. Seven® granules were spread over the mulch surrounding each 4”x4” post on May 1st. A filled 13.2 ounce dog food can was used for each 6’x6’ mulched square.

Observations taken 30 and 60 days later indicated a significant lessening of earwig levels as compared to the same time the previous year. Leaf damage due to earwig feeding was extremely mild this season and appears to be directly related to the use of the Sevin® granules. This experiment well be conducted again next season and may be expanded to being used around the base of each hop crown as well.

Experiment 5: Testing the use of Sodium Hypochlorite (Bleach) as a weed and grass control.

Purpose: To determine the effectiveness of bleach as a weed burn back control and what effects it might have on hop plants.

Result: First and foremost, bleach is not intended for, nor approved for use as a vegetation controlling agent in any way. Using bleach for this purpose has been many home gardeners' remedy for controlling weeds in small gardens or flower beds and can be reviewed online. Our research was conducted solely for research purposes and to test this products effectiveness on the aforementioned targets and other considerations for those home gardeners who might be using this product for this specific purpose on their hops.

Several water/bleach ratios were utilized to include 3%, 6%, and 8.25% bleach throughout the testing. It was found that the weakest solution that still provided adequate control of weeds and certain grasses was a 3:1 mixture containing 3 parts 6% bleach, to 1 part water. Weeds were immediately burned back and leaves desiccated within 24-48 hours.

As an additional test, several hop plants were intentionally sprayed with this optimal ratio in the same manner that approved products such as Aim EC and Scythe would be used to control sucker and lower vegetative growth. The effects were stellar in the control of the intended target area and no hop plants died as a result. However, it was found that the hop plants began showing chlorine toxicity within a two week period following the application. Plants that had not been directly sprayed, or were only slightly hit with drift from the spraying solution, did not appear to show any symptoms of chlorine toxicity.

It should also be noted that spraying with sodium hypochlorite on the ground can increase certain salts to unhealthy levels, as well as killing beneficial soil and airborne organisms. Due to federal regulations, as well as the deleterious effects that bleach has on the environment within a garden, it is not recommended to use this product as a burn back agent.

Future (2019) Experiments

Experiment 1: Increasing nitrogen rates, sources (Urea, Ammonium Sulfate, etc.), and forms (liquid or granular) from those currently employed.

Purpose: To test and evaluate the use of one or more liquid nitrogen fertilizers, as well as fertilizer sources (Urea, Ammonium Sulfate, etc.) and compare their effectiveness versus granular applied products.

Experiment 2: Increasing the quantity of T-posts and thus "floating" strings around certain cultivars.

Purpose: To test the congestion, strength, and ultimate feasibility of increasing "floating" strings around individual poles.

Experiment 3: Training "bull shoots" next to regular shoots within certain cultivars.

Purpose: It was noticed this season and last that several cultivars had been unintentionally trained using "bull shoots". These more aggressive shoots appeared to produce more cones that were larger than the regular shoots. This experiment is to determine if this observation was real or imagined.

Experiment 4: Using approved chemical defoliant(s) to control sucker and vegetative growth on the lower portions of bines rather than continuous manual mechanical methods.

Purpose: To determine how effective (cost and time) chemical controls are at removing the lower leaf, sucker, and sidearm growth from hop bines during active growth.

Additional Notes of Importance for the 2018 Season

Early Spring Growth and Acclimation Observations

The following observations were made in very late February to mid-April. Three different types of plants were observed. They were: 2-3 year old central crowns, <1 year old central crowns that were planted the previous season (2017), and 8”-12” rhizomes extending from the 2-3 year old crowns.

The rhizomes and very young crowns started sprouting shoots in very late February, and by mid to late March were showing significant growth (8”-10” tall shoots) across multiple cultivars. Meanwhile, the more established 2-3 year old cultivars did not start sprouting shoots on most varieties until early to mid April. Examples of this include Galena, Glacier, Horizon, CRV, and Cascade in which the very young plants and rhizomes started growing first and early while their respective 2-3 year old counterparts were delayed. In some cultivars across the hop yard, this was as much as 30+ days.

It is interesting to note that even though the rhizomes were still attached to the 2-3 year old crowns, and that the very young plants were originally propagated from those same 2-3 year old crowns, these connections appeared to have had no correlation on the acclimatization of the newer plants, or the rhizomes coming off of the 2-3 year old plants. These findings seem to indicate that acclimatization of crowns to a particular geographic region should definitely be taken into consideration when deciding how to set up and/or manage a hop yard, especially in weed management and herbicidal timing.

It should also be noted that plants grown in and sold from a greenhouse may not be acclimated to any other growing region as these plants are acclimated to specific growing conditions found within the greenhouse that they were propagated in. Once the plant is sold, it may require re-acclimatization to its new environment.

The preliminary findings at MVH thus far indicate that hop plants need a minimum of 2-3 years to properly acclimate to our environment. This may not necessarily be true for other growing regions and/or environments. Yearly observations are ongoing and cultivar specific growth characteristics will be provided in the future.

MOUNTAIN VIEW HOPS

Soil Stratification of Nutrients

Prior to applying any soil amendments or tilling of the soil at the beginning of this season, two soil tests were performed in an "X" pattern throughout the yard. The samples were taken first at a depth of 2"-4", while the second samples were taken from the same holes, but at a depth of 4"-10" deep. Samples were kept separate and dried prior to submission to the Virginia Tech Soil Testing Laboratory.

Our yard has been continually fertilized and limed for the past two growing seasons. Regular deep tilling has been performed during the spring and shallow tilling done during the growing season. The differences on the two soil sample test results (shown below) show stark differences between the two depths.

Since hop roots grow to a very deep depth as compared to most crops, it is wondered if the differences between the two samples could indicate a potential reduction in overall hop yields and plant vigor due to reduced nutrients at the deeper soil depths (even though most nutrient uptake is performed at the 2"-4" depths). It may also be possible that some nutrients are blocking the uptake of other nutrients due to their high levels. This will be a constant area of observation to see if the nutrients at the shallower layer will eventually be transferred to the deeper depths as more tilling and water action carry them through the soil.

SAMPLE HISTORY

Sample ID	Field ID	LAST CROP		LAST LIME APPLICATION		SOIL INFORMATION				
		Name	Yield	Months Prev.	Tons/Acre	SMU-1 %	SMU-2 %	SMU-3 %	Yield Estimate	Productivity Group
MAR18	FLD01HOPS			7-12	3.0+	22C 100				

LAB TEST RESULTS (see Note 1)

Analysis	P (lb/A)	K (lb/A)	Ca (lb/A)	Mg (lb/A)	Zn (ppm)	Mn (ppm)	Cu (ppm)	Fe (ppm)	B (ppm)	S.Salts (ppm)
Result	385	1194	5789	424	12.1	30.0	0.2	6.2	1.3	
Rating	VH	VH	VH	VH	SUFF	SUFF	SUFF	SUFF	DEF	

Analysis	Soil pH	Buffer Index	Est.-CEC (meq/100g)	Acidity (%)	Base Sat. (%)	Ca Sat. (%)	Mg Sat. (%)	K Sat. (%)	Organic Matter (%)
Result	6.8	6.35	18.0	1.7	98.4	80.2	9.7	8.5	

SAMPLE HISTORY

Sample ID	Field ID	LAST CROP		LAST LIME APPLICATION		SOIL INFORMATION				
		Name	Yield	Months Prev.	Tons/Acre	SMU-1 %	SMU-2 %	SMU-3 %	Yield Estimate	Productivity Group
MAR18	FLD01HOPS			7-12	3.0+	22C 100				

LAB TEST RESULTS (see Note 1)

Analysis	P (lb/A)	K (lb/A)	Ca (lb/A)	Mg (lb/A)	Zn (ppm)	Mn (ppm)	Cu (ppm)	Fe (ppm)	B (ppm)	S.Salts (ppm)
Result	19	387	1134	179	1.0	7.0	0.1	13.3	0.4	
Rating	M-	VH	M	H	SUFF	SUFF	SUFF	SUFF	DEF	

Analysis	Soil pH	Buffer Index	Est.-CEC (meq/100g)	Acidity (%)	Base Sat. (%)	Ca Sat. (%)	Mg Sat. (%)	K Sat. (%)	Organic Matter (%)
Result	5.6	6.11	5.8	29.8	70.2	48.9	12.8	8.6	

(Top sample shows the 2"-4" depth. Bottom sample shows the 4"-10" depth.)

Fusarium Canker Observations

Fusarium Canker (Fig 1) made an appearance this season in the MVH hop yard during the early spring months. After consulting the previous season's records and continually observing the issues, multiple reasons were believed to be the cause of this pathogen.

Poor choice of mulch type and mulch amount over the hop crowns the previous winter created a situation where the crowns became constantly wet and could never dry out. This started the conditions favoring the disease.

Once the mulch problem was discovered and the mulch removed, it was discovered that the crowns had been trying to send up shoots for some time. Due to the continual freezing temperatures of this season's spring, it is theorized that the shoots, buds, and bine attaching points may have been damaged and allowed entry of this disease into the wounds. Furthermore, even after the mulch was removed, the wet weather continued to persist and little drying time was ever present which exacerbated the problem.

Every cultivar was affected to some degree, but Centennial, Chinook, Cascade, Alpharoma, and Glacier appeared to be affected the most. At least one to two crowns per cultivar showed the symptoms, even after three trimmings (once in April and two in May).

Future mulching will be limited to small amounts of Cyprus chips around the crowns and not on top. All crowns will be hilled and dirt positioned to promote better drainage of excess water and crown development. However, the soil is normally an excellent drainer, but due to so much rain this season even the best draining soils can only do so much.

(Fig 1) Notice the swollen and needle thin bases restricting nutrient flow indicative of Fusarium Canker.

Water and Sidearm Dieback

In April and May we had over 12 inches of rain. It fell almost every day, and on days that didn't rain, it was cloudy and prevented the ground from drying. As a result, the bines on many cultivars grew thick and lush. Canadian Redvine was most affected by soaking up so much water that it split a bine open and was still able to survive and keep growing. This variety's sidearm's grew very long and it grew very tall.

However, starting around June 1st, the rain stopped and the sun came out and it got hot which began drying the ground out. For 2 weeks we had no rain and our irrigation setup was not ready due to the previous two months of rain. We were essentially playing "catch-up" for those two weeks (tilling, trimming, spraying, planting, etc.).

As the water quickly dried up, the sidearm's of the CRV began dying back from the ends towards the central bines (Fig 2). Originally it was thought that this was damage from the extremely long sidearm's whipping in the wind, but even on calm days, it was still ongoing. Upon closer inspection, it was found that when the good portion of a dying sidearm was broken off, no water droplet formed on the end still attached to the central bine (Fig 3 and Fig 4). This appeared to indicate a lack of water reaching these portions of the plant and it was starting to go into "survival" mode by keeping the available water closer to the central bines and letting the sidearm's die off. Furthermore, this die-off appeared to start on the lowest sidearm's first and worked upwards.

The irrigation system was immediately assembled and watering begun. It was undetermined if the irrigation stopped the problem, as it began raining again shortly after, and adequate moisture came from rain without additional irrigation. Other cultivars appeared only slightly affected, but not near to the degree as the CRV. Those other varieties were Southern Cross, Pacific Gem, and the Local variety.

(Fig 2) Sidearm dying back

(Fig 3) Notice there is no water droplet formed when the damaged sidearm is broken about a foot back from the dying portion

(Fig 4) Notice the water droplet formed at the end of a healthy broken sidearm

Bine Splitting Observation

As previously noted, there was an over abundance of water this spring and many cultivars experienced very large main central bines. Cultivars affected included Canadian Redvine, Galena, Glacier, Chinook, Pacific Gem, Magnum, and Centennial. Canadian Redvine and Galena were the largest. CRV became so large that around mid-May one bine split open (Fig 5). This did not cause the bine to cease vertical growth at all and it continued to climb the string normally.

This splitting did leave the interior part of the bine open to disease and pest damage. However, it did not appear that anything found its way into the core of the affected bine. These bine size and splitting issues have not been witnessed in previous seasons and it will be continually monitored in the future to determine if it is actually linked to weather patterns and water amounts.

(Fig 5) Main bine splitting on Canadian Redvine

Improper Application of Granular Fertilizer

All plants were pruned to ground level on April 25th. Fifteen days later, on May 10th, they were trimmed again and bines were trained. On May 20th, ten days after training and twenty days after pruning to ground level, the nitrogen was applied as one big dose using a general 12-12-12 granular fertilizer and lightly scratched in with a forked hoe. Only five days after that, on May 25th, burrs began forming on some cultivars. Between ground level pruning and the first signs of burrs forming, only 20 days passed.

Due to weather patterns, tilling of the granular fertilizer did not occur until June 4th-6th, approximately sixteen days after application and eleven days after burrs began forming. Judging by the excessive leafy growth coming out of the cones on multiple cultivars (Fig 6), to include Glacier and Alpharoma, the nitrogen did not get applied at the correct time to properly distribute it in the soil, nor was it properly incorporated into the soil after application.

A timeframe of only three weeks feels significantly compressed when compared to what is known about hop growth characteristics from the more northern latitudes. This same compressed timeline was also noticed during the 2017 growing season and is appearing to signify that nitrogen timing, application amounts, and form of nitrogen used might be more crucial than initially perceived.

During the 2019 growing season, other forms of nitrogen that can be quickly disseminated to the plant root will be utilized, as well as timing those applications to coincide with the plants' compressed growing schedules. This means that liquid forms of nitrogen such as Urea or Ammonium Sulfate must be used in place of granular forms.

(Fig 6) Vegetative growth coming out of Glacier cones.
Entire plants were covered with this kind of cone growth.

Shading of Interior Cones Due to Vegetative Mass

Canadian Redvine was the single most lush and prolific growing cultivar this season. Also, the "floating" string method was used on this variety as well which aided in creating an extremely thick mass of bines, leaves, and cones at the top of the pole and around the extensions.

It was found that many cones in this region of the canopy were buried deep in the thick vegetative mass and were not exposed to sunlight. This rendered the cones small, at approximately half the size of their sunlight-exposed counterparts, and they were so pale in color as to be almost white. These same cones also felt much more moist that the exposed ones.

These observations would seem to indicate that not only do the leaves of hop plants need to be fully exposed to sunlight for proper development, but also the cones. Furthermore, light and wind exposure is crucial for proper drying of the cones, and those that are not exposed to these elements appeared to remain moister than those that were. Lastly, these factors (based in part on these observations) are important considerations when determining if, how, and which cultivars a grower might choose to plant at a higher density within their hop yard.

Vegetative Weight Considerations When Using a Collar and Teepee Design

Two cultivars this growing season (Galena & Canadian Redvine) highlighted a flaw in the Teepee designed system. Specifically, the flaw was found in the ability of a person to manually raise and lower the collars with the full weight of vegetation that a hop plant can produce.

It was found that lowering could easily be performed by wrapping the raising/lowering ropes around the cleats one time and using them like a block and tackle. However, if the bines were not to be immediately cut down and removed, subsequent manual raising of the collar required two people to perform. It was also found that when trying to manually raise these heavy collars, a thicker rope should be used instead of the 550 cord that MVH is currently trialing. This smaller diameter chord, while strong, can bite into a person's hands due to the amount of weight being controlled, even with gloves.

This problem can easily be solved by the addition of a hand winch attached to the central pole where manual cranking would take the place of brute pulling strength. However, this does add to the cost of initial set-up, and depending on cultivar selection, yard design, and number of plants around a pole, this may not be completely necessary.

Use of Baler Twine as a Climbing Medium

Baler twine can be used as a substitute for coconut coir or jute string for the climbing media of hops. Multiple types of baler twine and different lengths are offered. Types include synthetic, sisal (treated), and sisal (non-treated). The two most common lengths are 9000 foot bales and 16,800 foot bales. The 9000 foot bales are the same weight as the 16,800 foot bales, but are much thicker twine.

MVH has found that the 9000 foot treated sisal twine is the best choice. It has survived high winds, constant moisture, and heavy bines for an entire growing season (roughly 4 months for us) with very minimal to no maintenance. The smaller diameter 16,800 foot treated twine continually begins to break in our hop yard within a few weeks to a month after installation, especially if exposed to moisture and heavy bines.

Sisal offers the ability to be composted with the rest of the bine material when it is cut down. It also has the added benefit of being cheaper than most other choices of hop climbing media. MVH has been using the 9000 foot baler twine bales for three seasons now and is completely satisfied with its use and benefits.

MOUNTAIN VIEW HOPS

MVH Research on Various Forms of Mulch

Grass clippings (Fig 7) - Poor suitability as a mulch for hops. It can easily blow away with hard winds and must be constantly reapplied. It can harbor disease and molds, especially as it decomposes. As it compacts down over time, it forms a hard cap on top of the crown that holds in excess moisture. When lifted off of the hop crown, excessive moisture can be found along with significant mold development and possibly crown rot/decay (Fig 7).

Hay/Straw (Fig 8) - Poor suitability as mulch for hops. It easily blows away and must be constantly reapplied. The decay process can also create mold and spread disease in a similar manner as grass clippings. If too much is applied, a hard cap can be created and produce the same problems as grass clippings.

(Fig 7) Left: Compacted grass clippings as mulch. Right: Mold development from grass clippings

(Fig 8) Hay/Straw as mulch

Cedar Chips (Fig 9) - Fair suitability as a mulch for hops. It takes more wind to blow them away, but they still can blow away fairly easy and must be regularly reapplied. It was found that drenching the chips at the time of application helped compact them down enough to last a little longer on hills before reapplication was necessary. Cedar contains natural oils that can help repel some pests. No adverse affects from those oils were noted in any hop plants or varieties. Furthermore, they did not create a situation where too much moisture was retained on top of the crown. However, it remains uncertain what effects cedar chip decomposition may have hop crowns, or how long decomposition takes. Cedar chips can be expensive as well. Finally, if cedar chips are covered with any other form of mulch, they tend to retain and hold excess moisture and can create disease and hop crown decay problems.

(Fig 9) Cedar chips as mulch

Cyprus Mulch (Fig 10) - Good suitability as a mulch for hops. It takes very strong winds to blow this material off of the hop hills, depending on the brand and its shred consistency. It provides adequate cover for moisture retention in soil without creating a problem of crown rot or decay. Periodic applications may be necessary throughout the season, but Cyprus mulch appears to be very cost effective. Like Cedar chips, it remains uncertain what effects Cyprus mulch decomposition can have over a hop crown, or how long decomposition takes. Also, Cyprus mulch does not harbor disease like some forms of mulch and has been shown to be disease and pest resistant.

(Fig 10) Shredded cypress as mulch

Shredded Hardwood Mulch from local sawmill company (Fig 11)- Poor suitability as a mulch for hops. Initially this product showed promise like Cypress mulch. It does not blow away in hard winds and at first provided very good water permeability without leaving the crown hills water logged. However, as the wood decayed over 3 to 4 months, it became hard packed and resembled the hard caps that grass clippings created. This situation created areas for mold and crown decay to form. Furthermore, some types of deciduous trees can harbor the Verticillium wilt pathogen which could then be transferred to the hop plant.

(Fig 11) Left: local hardwood mulch. Right: Mold under local mulch.

Landscape Fabric/Black Plastic/Cardboard (Fig 12) - Poor Suitability as a mulch for hops. While MVH has not experimented with these forms of cover, we have observed its results elsewhere. Black plastic prevents water from reaching the roots. It also deteriorates within 2 to 3 years and is easily cut up by mowers and weed eaters. Similar problems with deterioration and maintenance impediments can occur with landscape fabric and cardboard. Furthermore, all forms of this kind of mulch or weed preventative create a situation in which the ground below the mat warms up and forces the hop roots and rhizomes to grow right at, or on top, of the ground surface. Moisture retention produced by these mats then creates a prime situation for crown rot, disease development and soil compaction.

(Fig 12) Example of black landscape fabric

Plain Dirt - Fair suitability as a mulch for hops. In denser hop yards where the plant canopy can shade the ground, and/or rain events during the growing season rarely exist, plain soil as a covering can be fine. However, in regions and yards where the plant canopy is not as thick or it rains a lot, the soil can easily dry out between rains and erode away to expose the crowns. For the winter months, plain soil may be the best source for protection for over-wintering buds.

While no single form of mulch appears to be an all around excellent choice for weed prevention, cold protection, soil erosion control or moisture retention, a combination of products appear to work well at MVH. Our choice is to use Cyprus mulch for moisture retention and ground erosion control during the growing season. If further protection is needed for winter, the Cyprus may be removed and plain soil used to lightly cover the crown buds. We do not use, nor recommend using compost to cover hop crowns. The nitrogen content that many types of compost possess or may create from decomposing can cause an increase in disease presence and pressure, especially if applied at a time when the hop plant(s) cannot take up and utilize the excess nitrogen. Furthermore, if the compost is not heated to the proper temperatures during its decomposition, diseases may not be destroyed and can then be spread to the hop crown.

Key Dates for 2018

2/6-3/21	Shoots began poking through the ground around Feb 6th and most all cultivars were completely through by Mar 21st.
4/6	Pruned all rhizomes
4/14	Applied all micro nutrients and tilled into soil
4/25	Pruned all hop crowns back down to ground level so as it looked as though they had not started growing yet.
5/4-5/7	Installed climbing string to all poles
5/8-5/11	Trained and trimmed all crowns
5/20	Trimmed all crowns a second time and fertilized with 12-12-12 granular fertilizer and hand cultivated in with a small forked hoe.
5/25-6/11	Some cultivars began burring around May 25th and the latest cultivars began burring around June 11th.
6/4-6/6	Tilled hop yard for the second time this season. Ground was too wet the rest of the year to till anymore.
6/8-6/30	Cones began forming on June 8th and the later cultivars began showing cones around June 30th.
7/2	Harvested Centennial
7/5	Harvested Zenith, Willamette, Mt. Hood, Magnum, Fuggle, and Galena
7/7	Harvested Cascade and Chinook
7/8	Harvested Columbus
7/9	Harvested Horizon
7/10	Harvested Challenger
7/14	Trimmed hop yard a third time
7/18	Harvested Southern Cross
7/23	Harvested Alpharoma
7/29	Harvested Canadian Redvine
8/6	Harvested the Local cultivar

9/15 Hop yard began showing signs of fall dormancy in leaf deterioration such as yellowing and spotting of the leaves.

9/26 Lots of buds are forming at the base of the bines around the central crown structures of all cultivars. Leaf decay is significantly increasing at this point across most all cultivars.

10/18 Weather is getting near freezing at nights and some cultivars (NZ varieties in particular) have lost most all of their leaves. Many others are quickly turning brown.

By late October, the frost had killed off most of the upper bine growth on all cultivars. This material will be removed and the pole collars lowered in preparation for wintering.

MOUNTAIN VIEW HOPS

2018 MVH Hop yard Spray Record

Date	Brand/Type of Control Used	Dosage Rate	Primary Pest/Pathogen Being Controlled	Total Mixed Gallons Used	Time of Application	Notes
02/26/18	Oxidate 2.0	.32 Fl oz/gal (1:100 Ratio)	Downy Mildew	20 Gallons	Mid-Day	Soil Drench
03/29/18	Oxidate 2.0	.48 Fl oz/gal (1:150 Ratio)	Downy Mildew	20 Gallons	Mid-Day	Soil Drench
04/14/18	Phosphorous Acid (Phostrol)	3 tsp/gal	Downy Mildew	3.5 Gallons	Mid-Day	Shoot Application
04/21/18	Phosphorous Acid (Phostrol)	3 tsp/gal	Downy Mildew	7 Gallons	Afternoon	Foliar Application
04/26/18	Oxidate 2.0	.64 Fl oz/gal (1:200 Ratio)	Downy Mildew	4 Gallons	Mid-Day	Foliar Application
05/04/18	Neem Oil	2 Fl oz/gal	Downy Mildew	7.5 Gallons	Afternoon	Foliar Application
05/08/18	Phosphorous Acid (Phostrol)	5 tsp/gal	Downy Mildew	8 Gallons	Afternoon	Foliar Application
05/11/18	Copper Soap (Cueva)	2 Fl oz/gal	Downy Mildew	9 Gallons	Afternoon	Foliar Application

2018 MVH Hop yard Spray Record

Date	Brand/Type of Control Used	Dosage Rate	Primary Pest/Pathogen Being Controlled	Total Mixed Gallons Used	Time of Application	Notes
05/12/18	Copper Soap (Cueva) w/ sticker/spreader	2 Fl oz/gal & ½ tsp/4 gal sticker	Downy Mildew	9.5 Gallons	Afternoon	Foliar Applictaion
05/16/18	Oxidate 2.0	.64 Fl oz/gal (1:200 Ratio)	Downy Mildew	13 Gallons	Afternoon	Foliar Application
05/20/18	Copper Soap (Cueva) w/ sticker/spreader	2 Fl oz/gal & ½ tsp/4 gal sticker	Downy Mildew	14.5 Gallons	Afternoon	Foliar Application
05/23/18	Phosphorous Acid (Phostrol) w/ sticker/spreader	6 tsp/gal & 1 tsp/4 gal sticker	Downy Mildew	12 Gallons	Afternoon	Foliar Application
05/29/18	Copper Soap (Cuava) & Neem Oil	1 Fl oz/gal & 2 Fl oz gal	Downy Mildew & Leaf Hoppers	17 Gallons	Afternoon	Foliar Application
06/08/18	Oxidate 2.0	.64 Fl oz/gal (1:200 Ratio)	Downy Mildew	34 Gallons	Morning	Foliar Application
06/12/18	Copper Soap (Cueva)	1 Fl oz/gal	Downy Mildew	27 Gallons	Afternoon	Foliar Application

2018 MVH Hop yard Spray Record

Date	Brand/Type of Control Used	Dosage Rate	Primary Pest/Pathogen Being Controlled	Total Mixed Gallons Used	Time of Application	Notes
06/17/18	Des-X Insecticidal Soap & Dr. Bronners soap (Peppermint scent)	.5 Fl oz/gal & .5 Fl oz/gal	Leaf Hoppers, Catapillars, and Spider Mites	25 Gallons	Mid-Day	Foliar Application
06/20/18	Copper Soap (Cueva)	1 Fl oz/gal	Downy Mildew	25 Gallons	Afternoon	Foliar Application
06/22/18	Clethodim	.5 Fl oz/gal	Grass Control	20 Gallons	Mid-Day	Foliar Application
06/29/18	Neem Oil	2 Fl oz/gal	Leaf Hoppers	25 Gallons	Mid-Day	Foliar Application
07/03/18	Oxidate 2.0	.64 Fl oz/gal (1:200 Ratio)	Downy Mildew	30 Gallons	Afternoon	Foliar Applicatioin
07/14/18	Copper Soap (Cueva) w/ sticker/spreader	1 Fl oz/gal & 1 tsp/5 gal sticker	Downy Mildew	27 Gallons	Afternoon	Foliar Application
07/15/18	Chethodim	.5 Fl oz/gal	Grass Control	3 Gallons (Spot Treatment)	Afternoon	Foliar Application

2018 MVH Hop yard Spray Record

Date	Brand/Type of Control Used	Dosage Rate	Primary Pest/Pathogen Being Controlled	Total Mixed Gallons Used	Time of Application	Notes
07/20/18	Oxidate 2.0	.64 Fl oz/gal (1:200 Ratio)	Downy Mildew	21 Gallons	Evening	Foliar Application
07/30/18	Copper Soap (Cueva)	2 Fl oz/gal	Downy Mildew	30 Gallons	Afternoon	Foliar Application
08/13/18	Oxidate 2.0	.64 Fl oz/gal (1:200 Ratio)	Downy Mildew	25 Gallons	Mid-Day	Foliar Application
08/25/18	Phosphorous Acid (Phostrol)	5 tsp/gal	Downy Mildew	27 Gallons	Mid-Day	Foliar Application
08/25/18	Clethodim	.5 Fl oz/gal	Grass Control (Spot Treatment)	8 Gallons	Morning	Foliar Application

The following section contains the analyses performed by the Virginia Tech Department of Food Science and Technology, Enology Analytical Services Laboratory on multiple cultivars post harvest and post packaging.

Cultivars Analyzed:

Cascade

Canadian Redvine

Challenger

Chinook

Columbus

Galena

Pacific Gem

Southern Cross

Unknown (Local)

MOUNTAIN VIEW HOPS

Cascade

Received	07/20/2018
Analyzed	07/20/2018
Vintage	2018
Varietal	Cascade

Result

Test	Results
Moisture (%)	20.9
Dry Matter(%)	79.1
Cohumulone (% of Alpha)	32.7
As Received:	
Alpha Acids (%)	4.70
Cohumulone (%)	1.54
Humulone (%)	3.17
Beta Acids (%)	4.35
Colupulone (%)	2.07
Lupulone(%)	2.28
Dry Weight Basis:	
Alpha Acids (%)	5.94
Cohumulone (%)	1.94
Humulone (%)	4.00
Beta Acids (%)	5.50
Colupulone (%)	2.62
Lupulone(%)	2.88

Canadian Redvine

Received	08/07/2018
Analyzed	08/07/2018
Vintage	2018
Varietal	Canadian Red Vine

Result

Test	Results
Moisture (%)	17.3
Dry Matter(%)	82.7
Cohumulone (% of Alpha)	43.3
As Received:	
Alpha Acids (%)	3.52
Cohumulone (%)	1.52
Humulone (%)	2.00
Beta Acids (%)	4.63
Colupulone (%)	3.08
Lupulone(%)	1.55
Dry Weight Basis:	
Alpha Acids (%)	4.26
Cohumulone (%)	1.84
Humulone (%)	2.42
Beta Acids (%)	5.60
Colupulone (%)	3.73
Lupulone(%)	1.87

Challenger

Received	07/20/2018
Analyzed	07/20/2018
Vintage	2018
Varietal	Challenger

Result

Test	Results
Moisture (%)	22.8
Dry Matter(%)	77.2
Cohumulone (% of Alpha)	29.0
As Received:	
Alpha Acids (%)	11.09
Cohumulone (%)	3.21
Humulone (%)	7.88
Beta Acids (%)	3.37
Colupulone (%)	1.86
Lupulone(%)	1.51
Dry Weight Basis:	
Alpha Acids (%)	14.32
Cohumulone (%)	4.16
Humulone (%)	10.21
Beta Acids (%)	4.36
Colupulone (%)	2.41
Lupulone(%)	1.95

Chinook

Received	07/20/2018
Analyzed	07/20/2018
Vintage	2018
Varietal	Chinook

Result

Test	Results
Moisture (%)	16.8
Dry Matter(%)	83.2
Cohumulone (% of Alpha)	28.7
As Received:	
Alpha Acids (%)	11.14
Cohumulone (%)	3.20
Humulone (%)	7.94
Beta Acids (%)	2.85
Colupulone (%)	1.49
Lupulone(%)	1.36
Dry Weight Basis:	
Alpha Acids (%)	13.38
Cohumulone (%)	3.85
Humulone (%)	9.54
Beta Acids (%)	3.43
Colupulone (%)	1.79
Lupulone(%)	1.64

Columbus

Received	07/20/2018
Analyzed	07/20/2018
Vintage	2018
Varietal	Columbus

Result

Test	Results
Moisture (%)	26.6
Dry Matter(%)	73.4
Cohumulone (% of Alpha)	18.7
As Received:	
Alpha Acids (%)	18.66
Cohumulone (%)	3.49
Humulone (%)	15.17
Beta Acids (%)	3.45
Colupulone (%)	1.95
Lupulone(%)	1.50
Dry Weight Basis:	
Alpha Acids (%)	25.42
Cohumulone (%)	4.75
Humulone (%)	20.67
Beta Acids (%)	4.70
Colupulone (%)	2.65
Lupulone(%)	2.04

Galena

Received	07/20/2018
Analyzed	07/20/2018
Vintage	2018
Varietal	Galena

Result

Test	Results
Moisture (%)	20.9
Dry Matter(%)	79.1
Cohumulone (% of Alpha)	38.7
As Received:	
Alpha Acids (%)	5.26
Cohumulone (%)	2.04
Humulone (%)	3.23
Beta Acids (%)	3.67
Colupulone (%)	2.37
Lupulone(%)	1.30
Dry Weight Basis:	
Alpha Acids (%)	6.65
Cohumulone (%)	2.58
Humulone (%)	4.08
Beta Acids (%)4.64	4.64
Colupulone (%)	3.00
Lupulone(%)	1.64

Pacific Gem

Received	09/05/2018
Analyzed	09/05/2018
Vintage	2018
Varietal	Pacific Gem

Result

Test	Results
Moisture (%)	9.8
Dry Matter(%)	90.2
Cohumulone (% of Alpha)	31.6
As Received:	
Alpha Acids (%)	15.23
Cohumulone (%)	4.81
Humulone (%)	10.42
Beta Acids (%)	6.33
Colupulone (%)	4.05
Lupulone(%)	2.28
Dry Weight Basis:	
Alpha Acids (%)	16.87
Cohumulone (%)	5.33
Humulone (%)	11.55
Beta Acids (%)	7.02
Colupulone (%)	4.49
Lupulone(%)	2.53

Southern Cross

Received	09/05/2018
Analyzed	09/05/2018
Vintage	2018
Varietal	Southern Cross

Result

Test	Results
Moisture (%)	16.1
Dry Matter(%)	83.9
Cohumulone (% of Alpha)	21.2
As Received:	
Alpha Acids (%)	11.95
Cohumulone (%)	2.53
Humulone (%)	9.41
Beta Acids (%)	3.77
Colupulone (%)	1.92
Lupulone(%)	1.84
Dry Weight Basis:	
Alpha Acids (%)	14.23
Cohumulone (%)	3.02
Humulone (%)	11.21
Beta Acids (%)	4.49
Colupulone (%)	2.29
Lupulone(%)	2.20

Unknown (Local)

Received	08/13/2018
Analyzed	08/13/2018
Vintage	
Varietal	Unknown (Local)

Result

Test	Results
Moisture (%)	17.4
Dry Matter(%)	82.6
Cohumulone (% of Alpha)	41.9
As Received:	
Alpha Acids (%)	5.67
Cohumulone (%)	2.38
Humulone (%)	3.29
Beta Acids (%)	33
Colupulone (%)	2.76
Lupulone(%)	1.56
Dry Weight Basis:	
Alpha Acids (%)	6.86
Cohumulone (%)	2.88
Humulone (%)	3.98
Beta Acids (%)	5.24
Colupulone (%)	3.34
Lupulone(%)	1.89