About Us

Mountain View Hops, LLC was established in 2018 with an initial 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.

MVH has trialed over 25 different cultivars to date. We currently have over 15 varieties in production 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.

As MVH has grown over time, we branched out into other markets with our hops that we initially didn't think would be viable. We expanded to selling cones to wineries and kombucha producers, as well as more beer brewers. MVH then began making and selling hop soaps, hop candles, hop ornaments, and other hop related products. We have found that there is a viable market for these products and for selling our cones and plants for other consumers.

We look forward to continuing our experiments in growing hops, but also in marketing and creating unique hop products that will expand the knowledge and understanding of the Mid-Atlantic hops industry.

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.

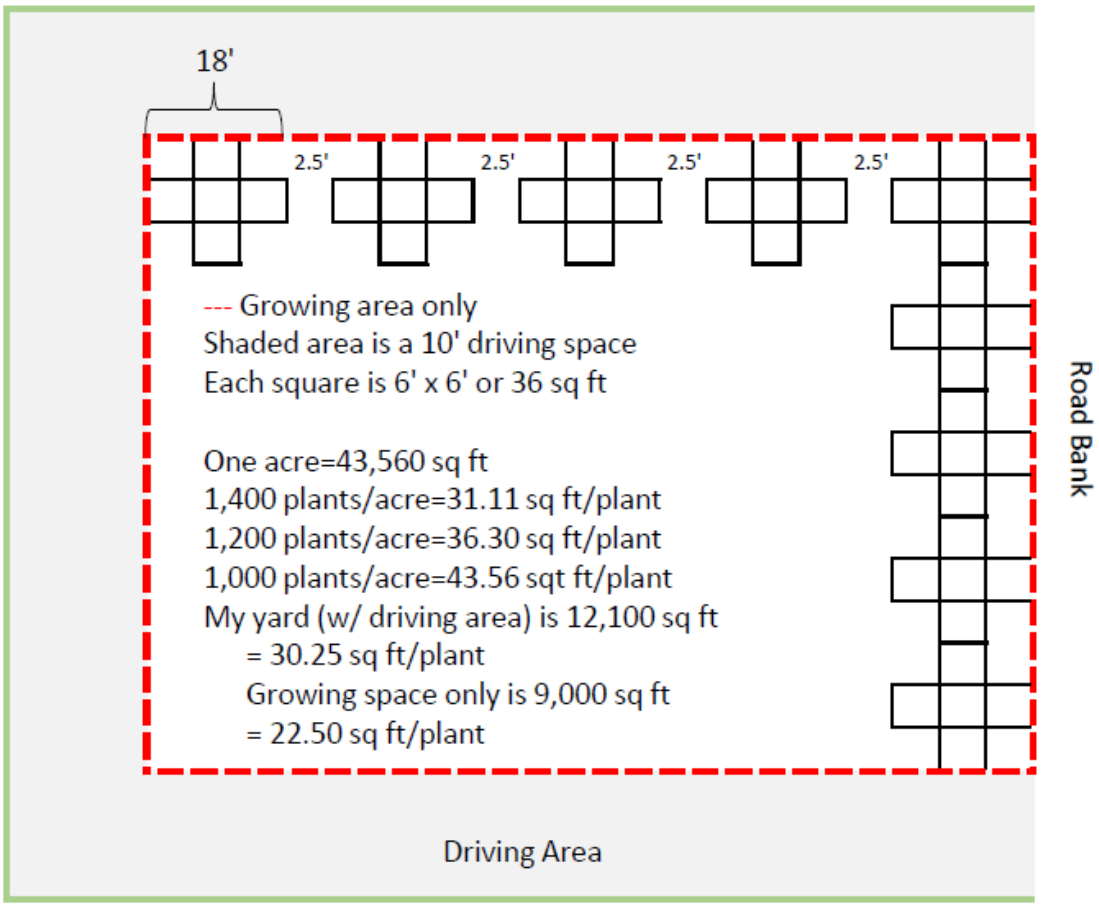
Irrigation is currently performed by hand, using a portable water tank and pump. This is a cost effective system that also enables the mixing of liquid fertilizers within the main tank which can then be metered out to each plant individually to test various fertilizer requirements between cultivars and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

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 (4)	AlphAroma (8)	Challenger (16)	Galena (8)	Canadian Redvine (4)
Newport (4)	Local (4)	Zeus (4)	Multihead (4)	Kirin II (4)
Row 5	4	3	2	1

Currently 176 crowns for 2019
*() Indicate number of crowns

2019 Soil Amendments

Nearly all cultivars began emerging from the ground around March 18th this year. On April 4th, all squares received micro and macro nutrients based on a soil tests conducted prior on February 4th-6th. The soil was tested to a depth of 12", and at a distance of 12"-18" from any single crown. The tests were obtained from each square around each cultivar pole and mixed independently of each other prior to submitting the samples.

Nutrients were then weighed out and applied evenly around each pole/cultivar using the following equations:

How to Calculate "lb/A to Achieve Target"
Step 1: Difference (DIFF.)÷"X" [Found in the Nutrient Level Guidelines where it says, "Y" pounds of ____ per Acre will raise nutrient levels "X" ppm"] = "Z"
Step 2: "Z" x "Y" = lbs per Acre needed to Achieve Target

How to Determine How Much to Remove "From Bag" to Apply Correct Amount of a Nutrient	
Step 1:	lbs per Acre ÷ 43,560 = lbs per sq foot
Step 2:	lbs per sq foot X 36 sq feet (sq ft in a 6 x 6 square) = Total needed per square
Step 3:	Total needed per square X number of squares = Total "NEEDED PER POLE"
Step 4:	Total "NEEDED PER POLE" ÷ percent of nutrient in bag (ie .45 for 45%) = Amount to remove "FROM BAG" to spread around pole

Nutrient Level Guidelines
Zn - 10 lbs of zinc sulfate per acre will raise zinc levels by 1.8 ppm in a clay soil. Max 40 lbs per acre.
Mn - 25 lbs of manganese sulfate will raise manganese levels by 3.5 ppm. Max 200 lbs per acre. Keep Mn levels at 80% of Iron levels.
Fe - 100 lbs of iron sulfate will raise iron levels by 10.5 ppm. Max 400 lbs per acre.
P - 18 lbs or phosphorous will raise P levels by 1 ppm. 300 lbs per acre typical per season.

The following chemicals were used for the micro and macro nutrients:

TYPE	PERCENT	QUANTITY PER BAG
Zinc Sulfate	35.50%	18 lbs/ 50# Bag
Manganese Sulfate	31.50%	13.5 lbs/ 50# Bag
Iron Sulfate	30%	15 lbs/50# Bag
Triple Super Phosphate	45%	20 lbs/ 50# Bag
Sulfate of Potash	50%	25 lbs/50# Bag
Boron	10%	1 lb/ 10# Bag

It was interesting to note the differences in nutrients available in row 5 (which is a much newer row) as compared to rows 1-3 (which are older rows). Another point of interest is the variations among cultivars within a single row (ex. Galena was extremely low in phosphorous as compared to the rest of the row).

These measurements show that variations within a small plot of land can vary significantly even though it is of the same soil type. Furthermore, different cultivars may uptake more of certain nutrients as compared to others. More research is needed to confirm this.

Color Code Designations

The following color code is used to help distinguish the various levels of nutrients and their relationship to the ideal range specified.

BLUE – Indicates the levels are well below the ideal requirements

Green – Indicates the levels are right at the ideal requirements

Yellow – Indicates the levels are close to the ideal requirements

Red – Indicates the levels are well above the ideal requirements

Kirin II

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
KIR2	TRIAL YARD					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	71	334	1840	136	2.8	16.6	0.4	12.8	0.3	
Rating	H	VH	H	M+	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	6.0	6.22	6.6	16.1	83.9	69.1	8.4	6.4	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
Kirin II	P	25 ppm	60 ppm	30 - 40 ppm	35.5 ppm	71
	K		200 ppm		167 ppm	334
	Ca				920 ppm	1840
	Mg				68 ppm	136
	Zn	4 ppm	10 ppm	6-8 ppm	2.8 ppm	
	Mn	15 ppm		30 ppm	16.6 ppm	
	Cu	1.5 ppm	4 ppm		.4 ppm	
	Fe	20 ppm		40 ppm	12.8 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	.3 ppm	
	Soil pH	6	6.5	6.3-6.8	6	
	CEC	5		20's - 30's	6.6	
	Ca Sat.			68% - 72%	69.10%	
	Mg Sat.			12%	8.40%	
	K Sat.	2%		5% - 7%	6.40%	

Amounts Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
Kirin II	P	35.5 ppm	50 ppm	14.5	261 lbs/A	.86 lbs	1.92 lbs
4 Squares	K	167 ppm					
	Ca	920 ppm					
	Mg	68 ppm					
	Zn	2.8 ppm	7 ppm	4.2 ppm	23 lbs/A	.08 lbs	.22 lbs or 100 grams
	Mn	16.6 ppm	30 ppm	13.4 ppm	95 lbs/A	.31 lbs	.45 lbs or 204 grams
	Cu	.4 ppm					
	Fe	12.8 ppm	40 ppm	27.2 ppm	259 lbs/A	.86 lbs	2.85 lbs
	B	.3 ppm					15 grams
	Soil pH	6					
	CEC	6.6					
	Ca Sat.	69.10%					
	Mg Sat.	8.40%					
	K Sat.	6.40%					

MOUNTAIN VIEW HOPS

Canadian Redvine

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
CRV	TRIAL YARD					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	411	662	3258	429	6.9	17.8	0.2	11.8	0.7	
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	6.4	6.30	11.3	5.2	94.8	71.7	15.6	7.5	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
CRV	P	25 ppm	60 ppm	30 - 40 ppm	205.5 ppm	411
	K		200 ppm		331 ppm	662
	Ca				1629 ppm	3258
	Mg				214.5 ppm	429
	Zn	4 ppm	10 ppm	6-8 ppm	6.9 ppm	
	Mn	15 ppm		30 ppm	17.8 ppm	
	Cu	1.5 ppm	4 ppm		0.2 ppm	
	Fe	20 ppm		40 ppm	11.8 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	.7 ppm	
	Soil pH	6	6.5	6.3-6.8	6.4	
	CEC	5		20's - 30's	11.3	
	Ca Sat.			68% - 72%	71.70%	
	Mg Sat.			12%	15.60%	
	K Sat.	2%		5% - 7%	7.50%	

Amounts Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
CRV	P	205.5 ppm					
4 Squares	K	331 ppm					
	Ca	1629 ppm					
	Mg	214.5 ppm					
	Zn	6.9 ppm					
	Mn	17.8 ppm	30 ppm	12.2 ppm	87 lbs/A	.29 lbs	.92 lbs
	Cu	0.2 ppm					
	Fe	11.8 ppm	40 ppm	28.2 ppm	268 lbs/A	.89 lbs	2.97 lbs
	B	.7 ppm					15 grams
	Soil pH	6.4					
	CEC	11.3					
	Ca Sat.	71.70%					
	Mg Sat.	15.60%					
	K Sat.	7.50%					

MOUNTAIN VIEW HOPS

Centennial

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
CENT	TRIAL YARD					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	202	460	2015	224	4.9	19.7	0.3	15.2	0.6	
Rating	VH	VH	H+	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	6.1	6.22	7.6	14.1	86.0	66.1	12.1	7.7	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
Centennial	P	25 ppm	60 ppm	30 - 40 ppm	101 ppm	202
	K		200 ppm		230 ppm	460
	Ca				1007.5 ppm	2015
	Mg				112 ppm	224
	Zn	4 ppm	10 ppm	6-8 ppm	4.9 ppm	
	Mn	15 ppm		30 ppm	19.7 ppm	
	Cu	1.5 ppm	4 ppm		0.3 ppm	
	Fe	20 ppm		40 ppm	15.2 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	0.6 ppm	
	Soil pH	6	6.5	6.3-6.8	6.1	
	CEC	5		20's - 30's	7.6	
	Ca Sat.			68% - 72%	66.10%	
	Mg Sat.			12%	12.10%	
	K Sat.	2%		5% - 7%	7.70%	

Amounts Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
Centennial	P	101 ppm					
16 Squares	K	230 ppm					
	Ca	1007.5 ppm					
	Mg	112 ppm					
	Zn	4.9 ppm	7 ppm	2.1 ppm	12 lbs/A	.16 lbs	.45 lbs or 200 grams
	Mn	19.7 ppm	30 ppm	10.3 ppm	74 lbs/A	.98 lbs	3.11 lbs
	Cu	0.3 ppm					
	Fe	15.2 ppm	40 ppm	24.8 ppm	236 lbs/A	3.12 lbs	10.40 lbs
	B	0.6 ppm					15 grams
	Soil pH	6.1					
	CEC	7.6					
	Ca Sat.	66.10%					
	Mg Sat.	12.10%					
	K Sat.	7.70%					

MOUNTAIN VIEW HOPS

Chinook

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
CHIN	TRIAL YARD					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	149	430	1675	157	4.6	18.7	0.3	18.6	0.4	
Rating	VH	VH	H-	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	6.12	7.0	23.6	76.4	59.4	9.2	7.8	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
Chinook	P	25 ppm	60 ppm	30 - 40 ppm	74.5 ppm	149
	K		200 ppm		215 ppm	430
	Ca				837.5 ppm	1675
	Mg				78.5 ppm	157
	Zn	4 ppm	10 ppm	6-8 ppm	4.6 ppm	
	Mn	15 ppm		30 ppm	18.7 ppm	
	Cu	1.5 ppm	4 ppm		.3 ppm	
	Fe	20 ppm		40 ppm	18.6 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	.4 ppm	
	Soil pH	6	6.5	6.3-6.8	5.6	
	CEC	5		20's - 30's	7	
	Ca Sat.			68% - 72%	59.40%	
	Mg Sat.			12%	9.20%	
	K Sat.	2%		5% - 7%	7.80%	

Amounts Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
Chinook	P	74.5 ppm					
16 Squares	K	215 ppm					
	Ca	837.5 ppm					
	Mg	78.5 ppm					
	Zn	4.6 ppm	7 ppm	2.4 ppm	13 lbs/A	.17 lbs	.48 lbs or 213 grams
	Mn	18.7 ppm	30 ppm	11.3 ppm	81 lbs/A	1.07 lbs	3.40 lbs
	Cu	.3 ppm					
	Fe	18.6 ppm	40 ppm	21.4 ppm	204 lbs/A	2.70 lbs	9 lbs
	B	.4 ppm					15 grams
	Soil pH	5.6					
	CEC	7					
	Ca Sat.	59.40%					
	Mg Sat.	9.20%					
	K Sat.	7.80%					

MOUNTAIN VIEW HOPS

Cascade

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
CASC	TRIAL YARD					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	155	439	1741	187	3.5	13.9	0.2	14.0	0.4	
Rating	VH	VH	H	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	6.0	6.17	7.0	19.4	80.6	61.7	10.9	8.0	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
Cascade	P	25 ppm	60 ppm	30 - 40 ppm	77.5 ppm	155
	K		200 ppm		219.5 ppm	439
	Ca				870.5 ppm	1741
	Mg				93.5 ppm	187
	Zn	4 ppm	10 ppm	6-8 ppm	3.5 ppm	
	Mn	15 ppm		30 ppm	13.9 ppm	
	Cu	1.5 ppm	4 ppm		.2 ppm	
	Fe	20 ppm		40 ppm	14 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	.4 ppm	
	Soil pH	6	6.5	6.3-6.8	6	
	CEC	5		20's - 30's	7	
	Ca Sat.			68% - 72%	61.70%	
	Mg Sat.			12%	10.90%	
	K Sat.	2%		5% - 7%	8.00%	

Amendments Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
Cascade	P	77.5 ppm					
16 Squares	K	219.5 ppm					
	Ca	870.5 ppm					
	Mg	93.5 ppm					
	Zn	3.5 ppm	7 ppm	3.5 ppm	19 lbs/A	.25 lbs	.70 lbs
	Mn	13.9 ppm	30 ppm	16.1 ppm	115 lbs/A	1.52 lbs	4.83 lbs
	Cu	.2 ppm					
	Fe	14 ppm	40 ppm	26 ppm	248 lbs/A	3.28 lbs	10.9 lbs
	B	.4 ppm					15 grams
	Soil pH	6					
	CEC	7					
	Ca Sat.	61.70%					
	Mg Sat.	10.90%					
	K Sat.	8.00%					

MOUNTAIN VIEW HOPS

Multihead

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
MULTI	TRIAL YARD					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	55	172	1782	137	1.9	12.7	0.2	10.3	0.3	
Rating	H-	M+	H	M+	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	6.0	6.20	6.4	18.5	81.5	69.3	8.8	3.4	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
Multihead	P	25 ppm	60 ppm	30 - 40 ppm	27.5 ppm	55
	K		200 ppm		86 ppm	172
	Ca				891 ppm	1782
	Mg				68.5 ppm	137
	Zn	4 ppm	10 ppm	6-8 ppm	1.9 ppm	
	Mn	15 ppm		30 ppm	12.7 ppm	
	Cu	1.5 ppm	4 ppm		.2 ppm	
	Fe	20 ppm		40 ppm	10.3 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	.3 ppm	
	Soil pH	6	6.5	6.3-6.8	6	
	CEC	5		20's - 30's	6.4	
	Ca Sat.			68% - 72%	69.30%	
	Mg Sat.			12%	8.80%	
	K Sat.	2%		5% - 7%	3.40%	

Amounts Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
Multihead	P	27.5 ppm	50 ppm	22.5 ppm	405 lbs/A	1.34 lbs	2.98 lbs
4 Squares	K	86 ppm					
	Ca	891 ppm					
	Mg	68.5 ppm					
	Zn	1.9 ppm	7 ppm	5.1 ppm	28 lb/A	.09 lbs	.25 lbs or 113 grams
	Mn	12.7 ppm	30 ppm	17.3 ppm	124 lbs/A	.41 lbs	1.30 lbs
	Cu	.2 ppm					
	Fe	10.3 ppm	40 ppm	29.7 ppm	283 lbs/A	.94 lbs	3.13 lbs
	B	.3 ppm					15 grams
	Soil pH	6					
	CEC	6.4					
	Ca Sat.	69.30%					
	Mg Sat.	8.80%					
	K Sat.	3.40%					

MOUNTAIN VIEW HOPS

Galena

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
GALEN	TRIAL YARD					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	112	266	1606	206	2.6	12.0	0.3	13.5	0.4	
Rating	VH	H	H-	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	6.0	6.16	6.6	21.5	78.5	60.5	12.8	5.1	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
Galena	P	25 ppm	60 ppm	30 - 40 ppm	5.5 ppm	112
	K		200 ppm		133 ppm	266
	Ca				803 ppm	1606
	Mg				103 ppm	206
	Zn	4 ppm	10 ppm	6-8 ppm	2.6 ppm	
	Mn	15 ppm		30 ppm	12.0 ppm	
	Cu	1.5 ppm	4 ppm		.3 ppm	
	Fe	20 ppm		40 ppm	13.5 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	.4 ppm	
	Soil pH	6	6.5	6.3-6.8	6	
	CEC	5		20's - 30's	6.6	
	Ca Sat.			68% - 72%	60.50%	
	Mg Sat.			12%	12.80%	
	K Sat.	2%		5% - 7%	5.10%	

Amounts Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
Galena	P	5.5 ppm	50 ppm	44.5 ppm	801 lbs/A	10.60 lbs	23.50 lbs
16 Squares	K	133 ppm					
	Ca	803 ppm					
	Mg	103 ppm					
	Zn	2.6 ppm	7 ppm	4.4 ppm	24 lbs/A	.32 lbs	.90 lbs
	Mn	12.0 ppm	30 ppm	18 ppm	129 lbs/A	1.71 lbs	5.43 lbs
	Cu	.3 ppm					
	Fe	13.5 ppm	40 ppm	26.5 ppm	252 lbs/A	3.33 lbs	11.10 lbs
	B	.4 ppm					15 grams
	Soil pH	6					
	CEC	6.6					
	Ca Sat.	60.50%					
	Mg Sat.	12.80%					
	K Sat.	5.10%					

MOUNTAIN VIEW HOPS

Horizon

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
HORIZ	TRIAL YARD					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	283	456	2320	323	4.1	13.1	0.2	12.6	0.6	
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	6.2	6.24	8.7	11.0	89.0	66.9	15.4	6.7	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
Horizon	P	25 ppm	60 ppm	30 - 40 ppm	141.5 ppm	283
	K		200 ppm		228 ppm	456
	Ca				1160 ppm	2320
	Mg				161.5 ppm	323
	Zn	4 ppm	10 ppm	6-8 ppm	4.1 ppm	
	Mn	15 ppm		30 ppm	13.1 ppm	
	Cu	1.5 ppm	4 ppm		.2 ppm	
	Fe	20 ppm		40 ppm	12.6 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	.6 ppm	
	Soil pH	6	6.5	6.3-6.8	6.2	
	CEC	5		20's - 30's	8.7	
	Ca Sat.			68% - 72%	66.90%	
	Mg Sat.			12%	15.40%	
	K Sat.	2%		5% - 7%	6.70%	

Amounts Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
Horizon	P	141.5 ppm					
4 Squares	K	228 ppm					
	Ca	1160 ppm					
	Mg	161.5 ppm					
	Zn	4.1 ppm	7 ppm	2.9 ppm	16 lbs/A	.17 lbs	.48 lbs or 213 grams
	Mn	13.1 ppm	30 ppm	16.9 ppm	121 lbs/A	.40 lbs	1.27 lbs
	Cu	.2 ppm					
	Fe	12.6 ppm	40 ppm	27.4 ppm	261 lbs/A	.86 lbs	2.87 lbs
	B	.6 ppm					15 grams
	Soil pH	6.2					
	CEC	8.7					
	Ca Sat.	66.90%					
	Mg Sat.	15.40%					
	K Sat.	6.70%					

MOUNTAIN VIEW HOPS

Glacier

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
GLAC	TRIAL YARD					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	320	528	2761	378	5.0	15.4	0.2	11.8	0.6	
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	6.5	6.27	9.9	7.8	92.2	69.6	15.7	6.8	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
Glacier	P	25 ppm	60 ppm	30 - 40 ppm	160 ppm	320
	K		200 ppm		264 ppm	528
	Ca				1380.5 ppm	2761
	Mg				189 ppm	378
	Zn	4 ppm	10 ppm	6-8 ppm	5 ppm	
	Mn	15 ppm		30 ppm	15.4 ppm	
	Cu	1.5 ppm	4 ppm		.2 ppm	
	Fe	20 ppm		40 ppm	11.8 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	.6 ppm	
	Soil pH	6	6.5	6.3-6.8	6.5	
	CEC	5		20's - 30's	9.9	
	Ca Sat.			68% - 72%	69.60%	
	Mg Sat.			12%	15.70%	
	K Sat.	2%		5% - 7%	6.80%	

Amounts Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
Glacier	P	160 ppm					
4 Squares	K	264 ppm					
	Ca	1380.5 ppm					
	Mg	189 ppm					
	Zn	5 ppm	7 ppm	2 ppm	11 lbs/A	.04 lbs	.11 lbs or 50 grams
	Mn	15.4 ppm	30 ppm	14.6 ppm	104 lbs/A	.34 lbs	1.08 lbs
	Cu	.2 ppm					
	Fe	11.8 ppm	40 ppm	28.2 ppm	269 lbs/A	.89 lbs	3 lbs
	B	.6 ppm					15 grams
	Soil pH	6.5					
	CEC	9.9					
	Ca Sat.	69.60%					
	Mg Sat.	15.70%					
	K Sat.	6.80%					

MOUNTAIN VIEW HOPS

Willamette

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
WILL	TRIAL YARD					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	260	526	2727	318	5.0	15.8	0.2	12.8	0.6	
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	6.4	6.23	9.8	10.3	89.7	69.5	13.4	6.9	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
Willamette	P	25 ppm	60 ppm	30 - 40 ppm	130 ppm	260
	K		200 ppm		263 ppm	526
	Ca				1363.5 ppm	2727
	Mg				159 ppm	318
	Zn	4 ppm	10 ppm	6-8 ppm	5 ppm	
	Mn	15 ppm		30 ppm	15.8 ppm	
	Cu	1.5 ppm	4 ppm		.2 ppm	
	Fe	20 ppm		40 ppm	12.8 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	.6 ppm	
	Soil pH	6	6.5	6.3-6.8	6.4	
	CEC	5		20's - 30's	9.8	
	Ca Sat.			68% - 72%	69.50%	
	Mg Sat.			12%	13.40%	
	K Sat.	2%		5% - 7%	6.90%	

Amounts Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
Willamette	P	130 ppm					
4 Squares	K	263 ppm					
	Ca	1363.5 ppm					
	Mg	159 ppm					
	Zn	5 ppm	7 ppm	2 ppm	11 lbs/A	.04 lbs	.11 lbs or 50 grams
	Mn	15.8 ppm	30 ppm	14.2 ppm	101 lbs/A	.33 lbs	1.05 lbs
	Cu	.2 ppm					
	Fe	12.8 ppm	40 ppm	27.2 ppm	259 lbs/A	.86 lbs	2.87 lbs
	B	.6 ppm					15 grams
	Soil pH	6.4					
	CEC	9.8					
	Ca Sat.	69.50%					
	Mg Sat.	13.40%					
	K Sat.	6.90%					

MOUNTAIN VIEW HOPS

Zeus

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
ZEUS	TRIAL YARD					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	218	305	2152	248	3.4	13.5	0.2	13.9	0.6	
Rating	VH	H+	H+	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	6.0	6.18	8.1	16.2	83.9	66.4	12.6	4.8	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
Zeus	P	25 ppm	60 ppm	30 - 40 ppm	109 ppm	218
	K		200 ppm		152.5 ppm	305
	Ca				1076 ppm	2152
	Mg				124 ppm	248
	Zn	4 ppm	10 ppm	6-8 ppm	3.4 ppm	
	Mn	15 ppm		30 ppm	13.5 ppm	
	Cu	1.5 ppm	4 ppm		.2 ppm	
	Fe	20 ppm		40 ppm	13.9 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	.6 ppm	
	Soil pH	6	6.5	6.3-6.8	6	
	CEC	5		20's - 30's	8.1	
	Ca Sat.			68% - 72%	66.40%	
	Mg Sat.			12%	12.60%	
	K Sat.	2%		5% - 7%	4.80%	

Amounts Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
Zeus	P	109 ppm					
4 Squares	K	152.5 ppm					
	Ca	1076 ppm					
	Mg	124 ppm					
	Zn	3.4 ppm	7 ppm	3.6 ppm	20 lbs/A	.07 lbs	.19 lbs or 86 grams
	Mn	13.5 ppm	30 ppm	16.5 ppm	118 lbs/A	.39 lbs	1.24 lbs
	Cu	.2 ppm					
	Fe	13.9 ppm	40 ppm	26.1 ppm	249 lbs/A	.82 lbs	2.73 lbs
	B	.6 ppm					15 grams
	Soil pH	6					
	CEC	8.1					
	Ca Sat.	66.40%					
	Mg Sat.	12.60%					
	K Sat.	4.80%					

MOUNTAIN VIEW HOPS

Challenger

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
CHALL	TRIAL YARD					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	118	286	1739	222	2.8	13.0	0.2	13.6	0.4	
Rating	VH	H+	H	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	6.0	6.18	6.9	18.9	81.1	62.7	13.2	5.3	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
Challenger	P	25 ppm	60 ppm	30 - 40 ppm	59 ppm	118
	K		200 ppm		143 ppm	286
	Ca				869.5 ppm	1739
	Mg				111 ppm	222
	Zn	4 ppm	10 ppm	6-8 ppm	2.8 ppm	
	Mn	15 ppm		30 ppm	13.0 ppm	
	Cu	1.5 ppm	4 ppm		.2 ppm	
	Fe	20 ppm		40 ppm	13.6 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	.4 ppm	
	Soil pH	6	6.5	6.3-6.8	6	
	CEC	5		20's - 30's	6.9	
	Ca Sat.			68% - 72%	62.70%	
	Mg Sat.			12%	13.20%	
	K Sat.	2%		5% - 7%	5.30%	

Amounts Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
Challenger	P	59 ppm					
16 Squares	K	143 ppm					
	Ca	869.5 ppm					
	Mg	111 ppm					
	Zn	2.8 ppm	7 ppm	4.2 ppm	23 lbs/A	.30 lbs	.85 lbs
	Mn	13.0 ppm	30 ppm	17 ppm	121 lbs/A	1.60 lbs	5.08 lbs
	Cu	.2 ppm					
	Fe	13.6 ppm	40 ppm	26.4 ppm	252 lbs/A	3.32 lbs	11.07 lbs
	B	.4 ppm					15 grams
	Soil pH	6					
	CEC	6.9					
	Ca Sat.	62.70%					
	Mg Sat.	13.20%					
	K Sat.	5.30%					

MOUNTAIN VIEW HOPS

Zenith

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
ZEN	TRIAL YARD					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	246	485	2437	335	4.4	13.5	0.2	12.7	0.7	
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	6.3	6.24	9.0	10.5	89.5	67.3	15.3	6.9	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
Zenith	P	25 ppm	60 ppm	30 - 40 ppm	123 ppm	246
	K		200 ppm		242.5 ppm	485
	Ca				1218.5 ppm	2437
	Mg				167.5 ppm	335
	Zn	4 ppm	10 ppm	6-8 ppm	4.4 ppm	
	Mn	15 ppm		30 ppm	13.5 ppm	
	Cu	1.5 ppm	4 ppm		.2 ppm	
	Fe	20 ppm		40 ppm	12.7 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	.7 ppm	
	Soil pH	6	6.5	6.3-6.8	6.3	
	CEC	5		20's - 30's	9	
	Ca Sat.			68% - 72%	67.30%	
	Mg Sat.			12%	15.30%	
	K Sat.	2%		5% - 7%	6.90%	

Amounts Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
Zenith	P	123 ppm					
4 Squares	K	242.5 ppm					
	Ca	1218.5 ppm					
	Mg	167.5 ppm					
	Zn	4.4 ppm	7 ppm	2.6 ppm	14 lbs/A	.05 lbs	.14 lbs or 64 grams
	Mn	13.5 ppm	30 ppm	16.5 ppm	118 lbs/A	.39 lbs	1.24 lbs
	Cu	.2 ppm					
	Fe	12.7 ppm	40 ppm	27.3 ppm	260 lbs/A	.86 lbs	2.87 lbs
	B	.7 ppm					15 grams
	Soil pH	6.3					
	CEC	9					
	Ca Sat.	67.30%					
	Mg Sat.	15.30%					
	K Sat.	6.90%					

MOUNTAIN VIEW HOPS

Columbus

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
COLUS	TRIAL YARD					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	83	311	1560	206	3.2	13.3	0.2	12.7	0.6	
Rating	H	VH	H-	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	6.0	6.17	6.5	21.0	79.0	59.9	13.0	6.1	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
Columbus	P	25 ppm	60 ppm	30 - 40 ppm	41.5 ppm	83
	K		200 ppm		155.5 ppm	311
	Ca				780 ppm	1560
	Mg				103 ppm	206
	Zn	4 ppm	10 ppm	6-8 ppm	3.2 ppm	
	Mn	15 ppm		30 ppm	13.3 ppm	
	Cu	1.5 ppm	4 ppm		.2 ppm	
	Fe	20 ppm		40 ppm	12.7 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	.6 ppm	
	Soil pH	6	6.5	6.3-6.8	6	
	CEC	5		20's - 30's	6.5	
	Ca Sat.			68% - 72%	59.90%	
	Mg Sat.			12%	13.00%	
	K Sat.	2%		5% - 7%	6.10%	

Amounts Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
Columbus	P	41.5 ppm	50 ppm	8.5 ppm	153 lb/A	2.02 lbs	4.49 lbs
16 Squares	K	155.5 ppm					
	Ca	780 ppm					
	Mg	103 ppm					
	Zn	3.2 ppm	7 ppm	3.8 ppm	21 lbs/A	.28 lbs	.9 lbs
	Mn	13.3 ppm	30 ppm	16.7 ppm	119 lbs/A	1.57 lbs	4.98 lbs
	Cu	.2 ppm					
	Fe	12.7 ppm	40 ppm	27.3 ppm	260 lbs/A	3.44 lbs	11.47 lbs
	B	.6 ppm					15 grams
	Soil pH	6					
	CEC	6.5					
	Ca Sat.	59.90%					
	Mg Sat.	13.00%					
	K Sat.	6.10%					

MOUNTAIN VIEW HOPS

Mount Hood

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
MTHOO	TRIAL YARD					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	221	481	2489	317	4.7	16.6	0.2	12.2	1.1	
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	6.2	6.23	9.1	11.0	89.0	68.0	14.3	6.7	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
Mt. Hood	P	25 ppm	60 ppm	30 - 40 ppm	110.5 ppm	221
	K		200 ppm		240.5 ppm	481
	Ca				1244.5 ppm	2489
	Mg				158.5 ppm	317
	Zn	4 ppm	10 ppm	6-8 ppm	4.7 ppm	
	Mn	15 ppm		30 ppm	16.6 ppm	
	Cu	1.5 ppm	4 ppm		.2 ppm	
	Fe	20 ppm		40 ppm	12.2 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	1.1 ppm	
	Soil pH	6	6.5	6.3-6.8	6.2	
	CEC	5		20's - 30's	9.1	
	Ca Sat.			68% - 72%	68.00%	
	Mg Sat.			12%	14.30%	
	K Sat.	2%		5% - 7%	6.70%	

Amounts Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
Mt. Hood	P	110.5 ppm					
4 Squares	K	240.5 ppm					
	Ca	1244.5 ppm					
	Mg	158.5 ppm					
	Zn	4.7 ppm	7 ppm	2.3 ppm	13 lbs/A	.04 lbs	.11 lbs or 50 grams
	Mn	16.6 ppm	30 ppm	13.4 ppm	96 lbs/A	.32 lbs	1.02 lbs
	Cu	.2 ppm					
	Fe	12.2 ppm	40 ppm	27.8 ppm	265 lbs/A	.88 lbs	2.93 lbs
	B	1.1 ppm					15 grams
	Soil pH	6.2					
	CEC	9.1					
	Ca Sat.	68.00%					
	Mg Sat.	14.30%					
	K Sat.	6.70%					

MOUNTAIN VIEW HOPS

Local

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
LOCAL	TRIAL YARD					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	171	280	1738	309	2.2	10.3	0.2	11.6	0.4	
Rating	VH	H	H	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	6.2	6.18	7.3	18.0	82.1	59.6	17.5	4.9	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
Local	P	25 ppm	60 ppm	30 - 40 ppm	8.5 ppm	171
	K		200 ppm		140 ppm	280
	Ca				869 ppm	1738
	Mg				154.5 ppm	309
	Zn	4 ppm	10 ppm	6-8 ppm	2.2 ppm	
	Mn	15 ppm		30 ppm	10.3 ppm	
	Cu	1.5 ppm	4 ppm		.2 ppm	
	Fe	20 ppm		40 ppm	11.6 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	.4 ppm	
	Soil pH	6	6.5	6.3-6.8	6.2	
	CEC	5		20's - 30's	7.3	
	Ca Sat.			68% - 72%	59.60%	
	Mg Sat.			12%	17.50%	
	K Sat.	2%		5% - 7%	4.90%	

Amounts Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
Local	P	8.5 ppm	50 ppm	41.5 ppm	747 lbs/A	2.47 lbs	5.49 lbs
4 Squares	K	140 ppm					
	Ca	869 ppm					
	Mg	154.5 ppm					
	Zn	2.2 ppm	7 ppm	4.8 ppm	27 lbs/A	.09 lbs	.25 lbs or 113 grams
	Mn	10.3 ppm	30 ppm	19.7 ppm	141 lbs/A	.47 lbs	1.49 lbs
	Cu	.2 ppm					
	Fe	11.6 ppm	40 ppm	28.4 ppm	270 lbs/A	.89 lbs	2.97 lbs
	B	.4 ppm					15 grams
	Soil pH	6.2					
	CEC	7.3					
	Ca Sat.	59.60%					
	Mg Sat.	17.50%					
	K Sat.	4.90%					

MOUNTAIN VIEW HOPS

AlphAroma

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
ALAR	TRIAL YARD					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	81	327	2783	202	3.1	13.3	0.2	11.8	0.5	
Rating	H	VH	VH	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	6.1	6.22	9.3	11.5	88.5	75.0	9.0	4.5	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
AlphAroma	P	25 ppm	60 ppm	30 - 40 ppm	40.5 ppm	81
	K		200 ppm		163.5 ppm	327
	Ca				1391.5 ppm	2783
	Mg				101 ppm	202
	Zn	4 ppm	10 ppm	6-8 ppm	3.1 ppm	
	Mn	15 ppm		30 ppm	13.3 ppm	
	Cu	1.5 ppm	4 ppm		.2 ppm	
	Fe	20 ppm		40 ppm	11.8 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	.5 ppm	
	Soil pH	6	6.5	6.3-6.8	6.1	
	CEC	5		20's - 30's	9.3	
	Ca Sat.			68% - 72%	75.00%	
	Mg Sat.			12%	9.00%	
	K Sat.	2%		5% - 7%	4.50%	

Amounts Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
AlphAroma	P	40.5 ppm	50 ppm	9.5 ppm	171 lb/A	1.13 lbs	2.51 lbs
8 Squares	K	163.5 ppm					
	Ca	1391.5 ppm					
	Mg	101 ppm					
	Zn	3.1 ppm	7 ppm	3.9 ppm	22 lbs/A	.15 lbs	.42 lbs or 191 grams
	Mn	13.3 ppm	30 ppm	16.7 ppm	119 lbs/A	.79 lbs	2.51 lbs
	Cu	.2 ppm					
	Fe	11.8 ppm	40 ppm	28.2 ppm	269 lbs/A	1.78 lbs	5.93 lbs
	B	.5 ppm					15 grams
	Soil pH	6.1					
	CEC	9.3					
	Ca Sat.	75.00%					
	Mg Sat.	9.00%					
	K Sat.	4.50%					

MOUNTAIN VIEW HOPS

Southern Cross

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
SOCR	TRIAL YARD					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	96	237	1444	174	3.0	14.5	0.2	13.1	0.4	
Rating	H+	H	H-	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	5.7	6.12	6.3	26.4	73.6	57.3	11.4	4.8	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
Southern Cross	P	25 ppm	60 ppm	30 - 40 ppm	48 ppm	96
	K		200 ppm		118.5 ppm	237
	Ca				722 ppm	1444
	Mg				87 ppm	174
	Zn	4 ppm	10 ppm	6-8 ppm	3.0 ppm	
	Mn	15 ppm		30 ppm	14.5 ppm	
	Cu	1.5 ppm	4 ppm		.2 ppm	
	Fe	20 ppm		40 ppm	13.1 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	.4 ppm	
	Soil pH	6	6.5	6.3-6.8	5.7	
	CEC	5		20's - 30's	6.3	
	Ca Sat.			68% - 72%	57.30%	
	Mg Sat.			12%	11.40%	
	K Sat.	2%		5% - 7%	4.80%	

Amounts Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
Southern Cross	P	48 ppm					
8 Squares	K	118.5 ppm					
	Ca	722 ppm					
	Mg	87 ppm					
	Zn	3.0 ppm	7 ppm	4 ppm	22 lbs/A	.15 lbs	.42 lbs or 191 grams
	Mn	14.5 ppm	30 ppm	15.5 ppm	111 lbs/A	.73 lbs	2.32 lbs
	Cu	.2 ppm					
	Fe	13.1 ppm	40 ppm	26.9 ppm	256 lbs/A	1.69 lbs	5.63 lbs
	B	.4 ppm					15 grams
	Soil pH	5.7					
	CEC	6.3					
	Ca Sat.	57.30%					
	Mg Sat.	11.40%					
	K Sat.	4.80%					

MOUNTAIN VIEW HOPS

Pacific Gem

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
PAGEM	TRIAL YARD					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	163	340	1812	185	4.2	17.9	0.2	13.7	0.5	
Rating	VH	VH	H	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	5.8	6.11	7.4	23.1	76.9	60.8	10.2	5.9	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
Pacific Gem	P	25 ppm	60 ppm	30 - 40 ppm	81.5 ppm	163
	K		200 ppm		170 ppm	340
	Ca				906 ppm	1812
	Mg				925 ppm	185
	Zn	4 ppm	10 ppm	6-8 ppm	4.2 ppm	
	Mn	15 ppm		30 ppm	17.9 ppm	
	Cu	1.5 ppm	4 ppm		.2 ppm	
	Fe	20 ppm		40 ppm	13.7 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	.5 ppm	
	Soil pH	6	6.5	6.3-6.8	5.8	
	CEC	5		20's - 30's	7.4	
	Ca Sat.			68% - 72%	60.80%	
	Mg Sat.			12%	10.20%	
	K Sat.	2%		5% - 7%	5.90%	

Amounts Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
Pacific Gem	P	81.5 ppm					
8 Squares	K	170 ppm					
	Ca	906 ppm					
	Mg	925 ppm					
	Zn	4.2 ppm	7 ppm	2.8 ppm	16 lbs/A	.11 lbs	.31 lbs or 141 grams
	Mn	17.9 ppm	30 ppm	12.1 ppm	86 lbs/A	.57 lbs	1.81 lbs
	Cu	.2 ppm					
	Fe	13.7 ppm	40 ppm	26.3 ppm	250 lbs/A	1.65 lbs	5.50 lbs
	B	.5 ppm					15 grams
	Soil pH	5.8					
	CEC	7.4					
	Ca Sat.	60.80%					
	Mg Sat.	10.20%					
	K Sat.	5.90%					

MOUNTAIN VIEW HOPS

Magnum

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
MAGNU	TRIAL YARD					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	235	323	1807	271	4.8	14.5	0.2	12.9	0.4	
Rating	VH	VH	H	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	5.9	6.17	7.4	18.4	81.6	60.9	15.1	5.6	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
Magnum	P	25 ppm	60 ppm	30 - 40 ppm	117.5 ppm	235
	K		200 ppm		161.5 ppm	323
	Ca				903.5 ppm	1807
	Mg				135.5 ppm	271
	Zn	4 ppm	10 ppm	6-8 ppm	4.8 ppm	
	Mn	15 ppm		30 ppm	14.5 ppm	
	Cu	1.5 ppm	4 ppm		.2 ppm	
	Fe	20 ppm		40 ppm	12.9 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	.4 ppm	
	Soil pH	6	6.5	6.3-6.8	5.9	
	CEC	5		20's - 30's	7.4	
	Ca Sat.			68% - 72%	60.90%	
	Mg Sat.			12%	15.10%	
	K Sat.	2%		5% - 7%	5.60%	

Amounts Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
Magnum	P	117.5 ppm					
4 Squares	K	161.5 ppm					
	Ca	903.5 ppm					
	Mg	135.5 ppm					
	Zn	4.8 ppm	7 ppm	2.2 ppm	12 lbs/A	.04 lbs	.11 lbs or 50 grams
	Mn	14.5 ppm	30 ppm	15.5 ppm	111 lbs/A	0.37	1.17 lbs
	Cu	.2 ppm					
	Fe	12.9 ppm	40 ppm	27.1 ppm	258 lbs/A	.85 lbs	2.83 lbs
	B	.4 ppm					15 grams
	Soil pH	5.9					
	CEC	7.4					
	Ca Sat.	60.90%					
	Mg Sat.	15.10%					
	K Sat.	5.60%					

MOUNTAIN VIEW HOPS

Newport

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
NEWPT	TRIAL YARD					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	59	272	1785	132	1.4	14.3	0.2	12.1	0.4	
Rating	H	H	H	M+	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	6.2	6.24	6.3	15.1	84.9	70.8	8.6	5.5	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
Newport	P	25 ppm	60 ppm	30 - 40 ppm	29.5 ppm	59
	K		200 ppm		136 ppm	272
	Ca				892.5 ppm	1785
	Mg				66 ppm	132
	Zn	4 ppm	10 ppm	6-8 ppm	1.4 ppm	
	Mn	15 ppm		30 ppm	14.3 ppm	
	Cu	1.5 ppm	4 ppm		.2 ppm	
	Fe	20 ppm		40 ppm	12.1 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	.4 ppm	
	Soil pH	6	6.5	6.3-6.8	6.2	
	CEC	5		20's - 30's	6.3	
	Ca Sat.			68% - 72%	70.80%	
	Mg Sat.			12%	8.60%	
	K Sat.	2%		5% - 7%	5.50%	

Amounts Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
Newport	P	29.5 ppm	35 ppm	5.5 ppm	99 lbs/A	.33 lbs	.73 lbs
4 Squares	K	136 ppm					
	Ca	892.5 ppm					
	Mg	66 ppm					
	Zn	1.4 ppm	7 ppm	5.6 ppm	31 lbs/A	.14 lbs	.39 lbs or 177 grams
	Mn	14.3 ppm	30 ppm	15.7 ppm	112 lbs/A	.37 lbs	1.17 lbs
	Cu	.2 ppm					
	Fe	12.1 ppm	40 ppm	27.9 ppm	266 lbs/A	.88 lbs	2.93 lbs
	B	.4 ppm					15 grams
	Soil pH	6.2					
	CEC	6.3					
	Ca Sat.	70.80%					
	Mg Sat.	8.60%					
	K Sat.	5.50%					

MOUNTAIN VIEW HOPS

Triple Pearl

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
TRPRL	TRIAL YARD					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	38	266	1683	129	1.6	13.2	0.2	10.4	0.3	
Rating	H-	H	H	M+	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	6.2	6.25	6.0	14.9	85.1	70.4	8.9	5.7	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
Triple Pearl	P	25 ppm	60 ppm	30 - 40 ppm	19 ppm	38
	K		200 ppm		133 ppm	266
	Ca				841.5 ppm	1683
	Mg				64.5 ppm	129
	Zn	4 ppm	10 ppm	6-8 ppm	1.6 ppm	
	Mn	15 ppm		30 ppm	13.2 ppm	
	Cu	1.5 ppm	4 ppm		.2 ppm	
	Fe	20 ppm		40 ppm	10.4 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	.3 ppm	
	Soil pH	6	6.5	6.3-6.8	6.2	
	CEC	5		20's - 30's	6	
	Ca Sat.			68% - 72%	70.40%	
	Mg Sat.			12%	8.90%	
	K Sat.	2%		5% - 7%	5.70%	

Amounts Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
Triple Pearl	P	19 ppm	35 ppm	16 ppm	288 lbs/A	.95 lbs	2.11 lbs
4 Squares	K	133 ppm					
	Ca	841.5 ppm					
	Mg	64.5 ppm					
	Zn	1.6 ppm	7 ppm	5.4 ppm	30 lbs/A	.10 lbs	.28 lbs or 127 grams
	Mn	13.2 ppm	30 ppm	16.8 ppm	120 lbs/A	.40 lbs	1.27 lbs
	Cu	.2 ppm					
	Fe	10.4 ppm	40 ppm	29.6 ppm	282 lbs/A	.93 lbs	3.10 lbs
	B	.3 ppm					15 grams
	Soil pH	6.2					
	CEC	6					
	Ca Sat.	70.40%					
	Mg Sat.	8.90%					
	K Sat.	5.70%					

MOUNTAIN VIEW HOPS

Columbia

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
COLIA	TRIAL YARD					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	39	219	1394	121	1.3	15.0	0.2	9.7	0.3	
Rating	H-	H	M+	M+	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	6.1	6.24	5.2	18.2	81.8	66.8	9.6	5.4	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
Columbia	P	25 ppm	60 ppm	30 - 40 ppm	19.5 ppm	39
	K		200 ppm		109.5 ppm	219
	Ca				697 ppm	1394
	Mg				60.5 ppm	121
	Zn	4 ppm	10 ppm	6-8 ppm	1.3 ppm	
	Mn	15 ppm		30 ppm	15.0 ppm	
	Cu	1.5 ppm	4 ppm		.2 ppm	
	Fe	20 ppm		40 ppm	9.7 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	.3 ppm	
	Soil pH	6	6.5	6.3-6.8	6.1	
	CEC	5		20's - 30's	5.2	
	Ca Sat.			68% - 72%	66.80%	
	Mg Sat.			12%	9.60%	
	K Sat.	2%		5% - 7%	5.40%	

Amounts Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
Columbia	P	19.5 ppm	35 ppm	15.5 ppm	279 lbs/A	.92 lbs	2.04 lbs
4 Squares	K	109.5 ppm					
	Ca	697 ppm					
	Mg	60.5 ppm					
	Zn	1.3 ppm	7 ppm	5.7 ppm	32 lbs/A	.11 lbs	.31 lbs or 141 grams
	Mn	15.0 ppm	30 ppm	15 ppm	107 lbs/A	.35 lbs	1.11 lbs
	Cu	.2 ppm					
	Fe	9.7 ppm	40 ppm	30.3 ppm	289 lbs/A	.96 lbs	3.20 lbs
	B	.3 ppm					15 grams
	Soil pH	6.1					
	CEC	5.2					
	Ca Sat.	66.80%					
	Mg Sat.	9.60%					
	K Sat.	5.40%					

MOUNTAIN VIEW HOPS

Comet

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
COMET	TRIAL YARD					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	39	204	1530	115	1.2	12.0	0.1	9.6	0.3	
Rating	H-	H-	H-	M	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	6.0	6.20	5.7	20.7	79.3	66.5	8.3	4.6	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
Comet	P	25 ppm	60 ppm	30 - 40 ppm	19.5 ppm	39
	K		200 ppm		102 ppm	204
	Ca				765 ppm	1530
	Mg				57.5 ppm	115
	Zn	4 ppm	10 ppm	6-8 ppm	1.2 ppm	
	Mn	15 ppm		30 ppm	12.0 ppm	
	Cu	1.5 ppm	4 ppm		.1 ppm	
	Fe	20 ppm		40 ppm	9.6 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	.3 ppm	
	Soil pH	6	6.5	6.3-6.8	6	
	CEC	5		20's - 30's	5.7	
	Ca Sat.			68% - 72%	66.50%	
	Mg Sat.			12%	8.30%	
	K Sat.	2%		5% - 7%	4.60%	

Amounts Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
Comet	P	19.5 ppm	35 ppm	15.5 ppm	279 lbs/A	.92 lbs	2.04 lbs
4 Squares	K	102 ppm					
	Ca	765 ppm					
	Mg	57.5 ppm					
	Zn	1.2 ppm	7 ppm	5.8 ppm	32 lbs/A	.11 lbs	.31 lbs or 141 grams
	Mn	12.0 ppm	30 ppm	18 ppm	129 lbs/A	.43 lbs	1.37 lbs
	Cu	.1 ppm					
	Fe	9.6 ppm	40 ppm	30.4 ppm	290 lbs/A	.96 lbs	3.20 lbs
	B	.3 ppm					15 grams
	Soil pH	6					
	CEC	5.7					
	Ca Sat.	66.50%					
	Mg Sat.	8.30%					
	K Sat.	4.60%					

MOUNTAIN VIEW HOPS

Cashmere

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
CASH	TRIAL YARD					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	53	215	1611	116	1.4	13.7	0.1	9.8	0.3	
Rating	H-	H	H-	M	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	6.2	6.24	5.7	16.6	83.4	70.3	8.4	4.8	

Calculations Based on Soil Test:

Cultivar	Nutrient	Min	Max	Ideal	Mine (ppm)	Mine (lb/A)
Cashmere	P	25 ppm	60 ppm	30 - 40 ppm	26.5 ppm	53
	K		200 ppm		107.5 ppm	215
	Ca				805.5 ppm	1611
	Mg				58 ppm	116
	Zn	4 ppm	10 ppm	6-8 ppm	1.4 ppm	
	Mn	15 ppm		30 ppm	13.7 ppm	
	Cu	1.5 ppm	4 ppm		.1 ppm	
	Fe	20 ppm		40 ppm	9.8 ppm	
	B	.8 ppm	2 ppm	1.5 ppm	.3 ppm	
	Soil pH	6	6.5	6.3-6.8	6.2	
	CEC	5		20's - 30's	5.7	
	Ca Sat.			68% - 72%	70.30%	
	Mg Sat.			12%	8.40%	
	K Sat.	2%		5% - 7%	4.80%	

Amounts Applied Evenly Around Pole:

Cultivar	Nutrient	Mine (ppm)	TARGET	DIFF.	lb/A to Achieve Target	NEEDED PER POLE	FROM BAG
Cashmere	P	26.5 ppm	35 ppm	8.5 ppm	153 lbs/A	.51 lbs	1.13 lbs
4 Squares	K	107.5 ppm					
	Ca	805.5 ppm					
	Mg	58 ppm					
	Zn	1.4 ppm	7 ppm	5.6 ppm	31 lbs/A	.10 lbs	.28 lbs or 127 grams
	Mn	13.7 ppm	30 ppm	16.3 ppm	116 lbs/A	.38 lbs	1.21 lbs
	Cu	.1 ppm					
	Fe	9.8 ppm	40 ppm	30.2 ppm	288 lbs/A	.95 lbs	3.17 lbs
	B	.3 ppm					15 grams
	Soil pH	6.2					
	CEC	5.7					
	Ca Sat.	70.30%					
	Mg Sat.	8.40%					
	K Sat.	4.80%					

General Cultivar Observations

Kirin II Row 1, Pole 1	This variety grew exceptionally well this season. Main bine thickness was around 3/8". It reached a height of around 16'-20' tall. Lower side arms were around 18"-24" long and produced side arms that maintained a length of at least 12" up to around 14'. Cone yields were high and cones were of moderate size. DM & PM resistance appeared to be moderate, but cones were susceptible to Alternaria.
Canadian Redvine Row 1, Pole 2	CRV grew exceptionally well again. Main bine thickness was around ¼". It reached a height of 20'-25' tall. Lower side arms reached 3'-4' long. It produced prolific cone yields with moderate to long loose cones. It shows very good resistance to DM & PM. Rhizomes are produced extremely fast and a minimum distance of 48" between crowns would need to be maintained.
Centennial Row 1, Pole 3	Centennial only grew to around 12' this year. Main bine thickness was around 3/16". Lower side arms are only 12"-16" long and cease forming around halfway up the plant. Cones tend to stay tight in close to the plant central structure from that point upwards. This is an extremely early producing variety and bronzing of the older leaves tends to begin very early in the season. Cones are small to moderate in size and yields are small. Due to continued poor performance of this variety over the past 4 years, MVH will be removing it from the hopyard.
Chinook Row 1, Pole 4	This variety grew to 14'-15' tall. Main bine thickness was around ¼" thick. Lower side arms reached 12"-20" long, but ceased forming about halfway up the plant. Cones tend to stay tight in close to the plant central structure from that point upwards. Cone yields were high with moderate to larger cones. It has very good resistance to DM & PM. Early season growth tends to come out of this cultivar very fast, but rhizome development is lighter.
Cascade Row 1, Pole 5	Cascade grew to 15'-16' tall. Main bine thickness was around 3/8". Lower side arms were 6"-12" long, but cease forming halfway up the plant. Cones tend to stay tight in close to the plant central structure from that point upwards. Cone yields are moderate to high with smaller to moderate size. It has excellent resistance to DM & PM. Early season growth tends to come out fast, but rhizome development is lighter.
Multihead Row 2, Pole 1	It grew to around 14' tall. Main bine thickness was around 1/8". There were few lower sidearms around 2'-3' long, but ceased at around 8' high. Cones tend to stay tight in close to the plant central structure from that point upwards. Cone yields were moderate and cones were small to moderate sized. It appears to show extreme susceptibility to systemic DM infection. Due to disease issue, MVH will be removing this variety from the hopyard.
Galena Row 2, Pole 2	Galena grew to 13'-15' high. Bine thickness was about 3/8". Lower sidearms were few and only 6"-12" long, but ceased halfway up the plant. Cones tend to stay tight in close to the plant central structure from that point upwards. Cone yields were moderate and of moderate size. This variety produces rhizome prolifically and of large size. It is also very rangy on the bottom growth. It can get systemic DM fairly easily. However, due to continued poor performance of cone alpha acids of this variety over the past 4 years, MVH will be removing it from the hopyard.

Horizon Row 2, Pole 3	This variety grew to 10'-12' tall. Lower sidearms were few and averaged 6"-12" long. Bine thickness was 1/8". Cone quantity was moderate, but cones are small. It shows some moderate resistance to DM & PM. However, due to continued low yields over the past 4 years, MVH will be removing this variety from the hopyard.
Glacier Row2, Pole 4	Glacier grew 22'-25' tall. Lower sidearms averaged 14"-20" long and shortened the higher up the plant. At around 14'-18', the sidearms were around 4"-6" long. Bine thickness was around 3/8". This cultivar seems to have sidearms that are very sensitive to daylight lengths. All of the sidearms have shortened internode lengths that give the appearance of systemic DM, but it is not. It produces a fairly high yield of cones with moderate sizes. Lower growth tends to come out of the ground fast and grow fast in the spring. We have had issues with nitrogen timing on this cultivar over the past 2 years and continue to keep getting leafy cones. It appears that this variety is very sensitive to nitrogen timing.
Willamette Row 2, Pole 5	This variety grew 14'-15' tall. It has very few lower sidearms that are around 6"-12" long and cease halfway up the plant. Cones tend to stay tight in close to the plant central structure from that point upwards. Cone yields are near zero however, and are of moderate size. Bine thickness was 1/8". It shows moderate resistance to DM. However, due to continually poor yields of cones over the past 4 years, MVH will be removing Willamette from the hopyard.
Zeus Row 3, Pole 1	This variety replaced the Fuggle plot. It was planted in late July and did not get high enough or show enough signs for an accurate description. However, preliminary indications seem to show that it will be very similar to Columbus or Challenger in growth characteristics.
Challenger Row 3, Pole 2	It grew to around 10'-12' tall. Lower sidearms are 14"-20", but are very few. Most of the cones tend to stay tight against the main bine structure the entire length of the plant. Bine thickness was around 3/16". DM & PM resistance appears to be very good on this cultivar. Rhizome development is very light. Cone yields are high with very large, fat cones. The cones are also tightly compacted which make it an easy variety to harvest.
Zenith Row 3, Pole 3	It grew to 12'-14' tall. Lower sidearms were very few and averaged 4"-6" long that cease halfway up the plant. Cones tend to stay tight in close to the plant central structure from that point upwards. Very few cones are produced and they are small. Bine thickness was 1/8". It shows moderate resistance to DM & PM, but is highly susceptible to leaf hoppers. Due to continued poor performance and cone yields over the past 4 years, this variety will be removed from the MVH hopyard.
Columbus Row 3, Pole 4	This variety grows identical to Challenger, however it does not display the same aroma characteristics. It does appear to have a little more susceptibility to crown rot in wet ground conditions. It has been reported that this cultivar is susceptible to DM, however we have not seen this issue in our trials yet. All indications seem to be that it has a moderate to good resistance to DM. Cone yields and size are also identical to Challenger.

Mt. Hood Row 3, Pole 5	Mt. Hood grew to 15'-16' tall. It has very few sidearms that are around 6"-12" long and cease halfway up the plant. Cones tend to stay tight in close to the plant central structure from that point upwards. Very few cones are produced and sizes are small. Bine thickness was 3/8". It does appear to have good DM resistance, but it is highly susceptible to leaf hoppers. Due to continued poor performance and cone yields over the past 4 years, this variety will be removed from the MVH hopyard.
Local Row 4, Pole 1	Our local unknown variety grew to 22'-25' tall. Lower sidearms were 3'-4' long and stayed around 12"-18" long up to 14'-15' high. Bine thickness was around 1/4 ". Cone yield is very high like CRV with moderate to long loose cones. Bottom growth is extremely fast and prolific. Every shoot that comes out from the crown looks like a bull shoot. It appears to have very good resistance to DM & PM. It is definitely adapted to these growing conditions.
AlphAroma Row 4, Pole 2	This variety grew to 21'-15' tall. Lower sidearms were around 15"-21" long. Sideamrs shortened to around 4"-6" at the 14' level. Cones stayed tight around main bine structure from that point on. Bine thickness was around ¼". Cone quantity is fairly high but size is very small. It appears to have moderate to good resistance to DM. Much less susceptible to crown rot/decay than Southern Cross or Pacific Gem. However, due to very small cones which significantly reduce final weights, this variety will be removed from the MVH hopyard.
Southern Cross Row 4, Pole 3	Southern Cross grew to 18'-21' tall. Lower sidearms are 2'-3' long and reduced in length just like AlphAroma up to the 14' level. Cone yields are high with moderate to longer cones. It shows a decent resistance to DM on leaves and cones; however it is prone to systemic DM in the crown. Furthermore, this variety is very susceptible to crown rot/decay in wet conditions. Lower growth and rhizome development are fast.
Pacific Gem Row 4, Pole 4	This variety grows identical to Southern Cross except that cones flavor and aroma are different. It does have even more susceptibility to crown rot and decay in wet conditions, as well as poorer systemic DM resistance in the crown.
Magnum Row 4, Pole 5	Magnum grew to 14'-15' tall. Lower sidearms were few and around 12" long. Bine thickness was around 3/8". Cones tended to stay close in to the main bine structure. Cone yields were few with moderate sized cones. It is very susceptible to leaf hopper damage. It appears to have good resistance to DM & PM.
Newport Row 5, Pole 1	This variety appears to be very susceptible to DM and leaf hopper damage. Cone yields for the first year were very small.
Triple Pearl Row 5, Pole 2	Triple Pearl appears to have very good resistance to DM. It grew to at least 15' tall. Cone yields for the first year were very good with moderate sized cones.
Columbia Row 5, Pole 3	This variety grew to around 14'-15' tall. First year cone yields were very good, but cones were smaller. It appears to have decent resistance to DM.
Comet Row 5, Pole 4	Comet grew to around 12'-13' tall. It had a moderate amount of very large cones for the first year. It appears to have moderate resistance to DM.
Cashmere Row 5, Pole 5	This variety grew to around 16' tall. First year cones yields were extremely high with loose cone sets. It appears to show good resistance to DM. PM was not an issue at our hopyard with this variety as others have witnessed.

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
						.91-			
	1270-	1.27-	1.44	.20-.26	0.23	1.15	1.03	.15-.18	0.17
Magnum	1610	1.61							
		1.35-							
	1353-	1.89				.97-			
Mt. Hood	1890		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	1600		1.6	1.6	.25	.25		1.14	1.14	.18	.18
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

2019 MVH Harvest

Cultivar	Year	Rank	lbs (Wet)	lbs (Dry)	Oz (Wet)	Oz (Dry)	# of Plants Harvested	Lbs per Crown (Wet)	Age Distribution per Cultivar
Canadian Redvine	2017	1	8.26	2	132.2	32	4	2.06	All were 2 years old
	2018	1	24.29	5.69	388.6	91	4	6.07	All were 3 years old
	2019	1	20.91	4.17	334.7	66.71	4	5.23	All were 4 years old
Columbus	2017	3	4.18	0.86	66.9	13.8	4	1.05	All were 2 years old
	2018	5	14.22	3.73	227.6	59.7	10	1.42	4-3yr old, 12-2yr old, 4-1yr old
	2019	5	12.57	2.73	201.1	43.67	13	0.97	4-4yr old, 12-3yr old, 4-2yr old
Challenger	2017	4	3.91	0.85	62.6	13.6	4	0.98	All were 2 years old
	2018	6	10.28	2.67	164.5	42.7	10	1.03	4-3yr old, 12-2yr old, 4-1yr old
	2019	7	9.89	2.04	158.3	32.74	14	0.71	4-4yr old, 12-3yr old, 4-2yr old
Local	2017	16	0.16	0.03	2.6	0.59	1	0.16	All were 1 year old
	2018	3	7.62	2.39	121.9	38.2	4	1.91	1-2yr old, 3-1yr old
	2019*	2	12.23	2.79	195.8	44.68	4	3.06	1-3yr old, 3-2yr old
Pacific Gem	2017	2	4.83	1.27	77.2	20.3	4	1.21	All were 2 years old
	2018	2	9.99	2.22	159.8	35.5	4	2.5	4-3yr old, 4-1yr old
	2019	13	1.09	0.25	17.5	4	2	0.5	Crop Failure (Must Replace All)
Cascade	2017	6	6.93	1.71	110.8	27.4	9	0.77	4-2yr old, 12-1yr old
	2018	7	9	2.16	144.1	34.5	12	0.75	4-3yr old, 12-2yr old, 4-1yr old
	2019*	11	9.17	2.09	146.8	33.51	16	0.57	4-4yr old, 12-3yr old, 4-2yr old
Southern Cross	2017	10	2.18	0.54	34.9	8.6	4	0.55	All were 2 years old
	2018	4	9.07	2.09	145.2	33.5	6	1.51	4-3yr old, 4-1yr old
	2019*	10	3.98	0.9	63.7	14.5	6	0.66	Crop Failure (Must Replace All)
Chinook	2017	7	2.91	0.61	46.5	9.8	4	0.73	4-2yr old, 12-1yr old
	2018	8	7.51	1.84	120.2	29.5	10	0.75	4-3yr old, 12-2yr old, 4-1yr old
	2019	15	5.87	1.29	94	20.7	16	0.37	4-4yr old, 12-3yr old, 4-2yr old
Galena	2017	5	3.92	0.83	62.7	13.2	4	0.98	4-2yr old, 12-1yr old
	2018	9	6.58	1.62	105.3	25.9	10	0.66	4-3yr old, 12-2yr old, 4-1yr old
	2019	17	2.54	0.15	40.7	2.4	14	0.18	4-4yr old, 12-3yr old, 4-2yr old
Centennial	2017	8	2.87	0.86	45.9	13.8	4	0.72	4-2yr old, 12-1yr old
	2018	14	2.57	0.64	41.1	10.3	10	0.26	4-3yr old, 12-2yr old, 4-1yr old
	2019	16	2.43	0.53	38.9	8.54	12	0.2	4-4yr old, 12-3yr old, 4-2yr old
Horizon	2017	11	0.47	0.12	7.5	1.9	1	0.47	All were 2 years old
	2018	13	1.14	0.27	18.3	4.4	4	0.29	All were 3 years old
	2019*	18	0.72	0.21	11.5	3.33	4	0.18	All were 4 years old
Alpharoma	2017	9	0.6	0.13	9.6	2.1	1	0.6	All were 2 years old
	2018	10	0.56	0.11	9	1.8	1	0.56	All were 3 years old
	2019	14	3.26	0.77	52.2	12.3	8	0.41	All were 4 years old

Zenith	2017	12	0.44	0.1	7	1.6	1	0.44	All were 2 years old
	2018	12	0.64	0.11	7.4	1.8	2	0.32	All were 3 years old
	2019	21	0.24	0.05	3.8	0.83	4	0.06	All were 4 years old
Magnum	2017	17	0.13	0.03	2.1	0.5	1	0.13	All were 1 year old
	2018	11	0.37	0.1	5.9	1.6	1	0.37	1-2yr old, 3-1yr old
	2019	19	0.63	0.14	10.1	2.26	4	0.16	1-3yr old, 3-2yr old
Mount Hoood	2017	13	0.3	0.07	4.8	1.1	1	0.3	All were 2 years old
	2018	16	0.29	0.08	4.6	1.1	2	0.15	All were 3 years old
	2019	23	0.17	0.03	2.7	0.44	4	0.04	All were 4 years old
Willamette	2017	15	0.17	0.04	2.7	0.7	1	0.17	All were 2 years old
	2018	15	0.32	0.08	5.1	1.3	2	0.16	All were 3 years old
	2019	22	0.17	0.04	2.8	0.6	4	0.04	All were 4 years old
Fuggle	2017	18	0.13	0.03	2	0.5	1	0.13	All were 2 years old
	2018	17	0.05	0.01	0.8	0.2	4	0.01	All were 3 years old
Glacier	2017	14	0.82	0.22	13.1	3.5	4	0.21	All were 2 years old
	2018	18	0	0	0	0	0	0	(Leaves in cones)
	2019	25	0	0	0	0	0	0	(Leaves in cones)
Cashmere	2018	N/A	0	0	0	0	0		All were 1 year old
	2019	4	4.2	0.96	63.3	15.45	4	1.05	1-2yr old, 3-1yr old
Columbia	2018	N/A	0	0	0	0	0		All were 1 year old
	2019	6	1.94	0.4	31.1	6.3	2	0.97	1-2yr old, 3-1yr old
Comet	2018	N/A	0	0	0	0	0		All were 1 year old
	2019	8	1.41	0.31	22.6	5	2	0.7	1-2yr old, 3-1yr old
Kirin II	2018	N/A	0	0	0	0	0		All were 1 year old
	2019	3	7.8	1.8	124.9	28.13	4	1.95	1-2yr old, 3-1yr old
Multihead	2018	N/A	0	0	0	0	0		All were 1 year old
	2019	12	2.23	0.5	35.8	8.06	4	0.55	1-2yr old, 3-1yr old
Newport	2018	N/A	0	0	0	0	0		All were 1 year old
	2019	20	0.12	0.03	1.9	0.55	1	0.12	1-2yr old, 3-1yr old
TriplePerle	2018	N/A	0	0	0	0	0		All were 1 year old
	2019	9	2.02	0.42	32.4	6.72	3	0.67	1-2yr old, 3-1yr old
Zeus	2019	N/A							All were 1 year old

Rank is based on "lbs Per Crown (Wet)"

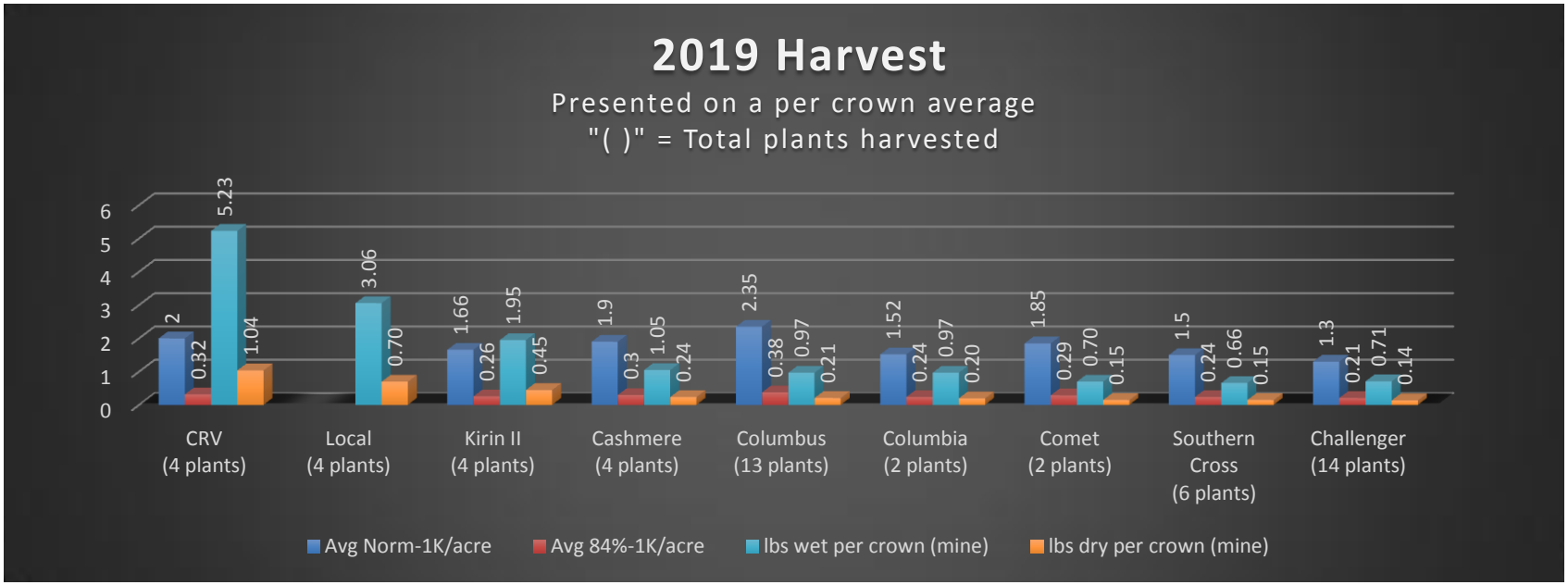
* Indicates that the hops were sold wet and the dry measurements were calculated based on dry matter %, plus 8% estimated final moisture content.

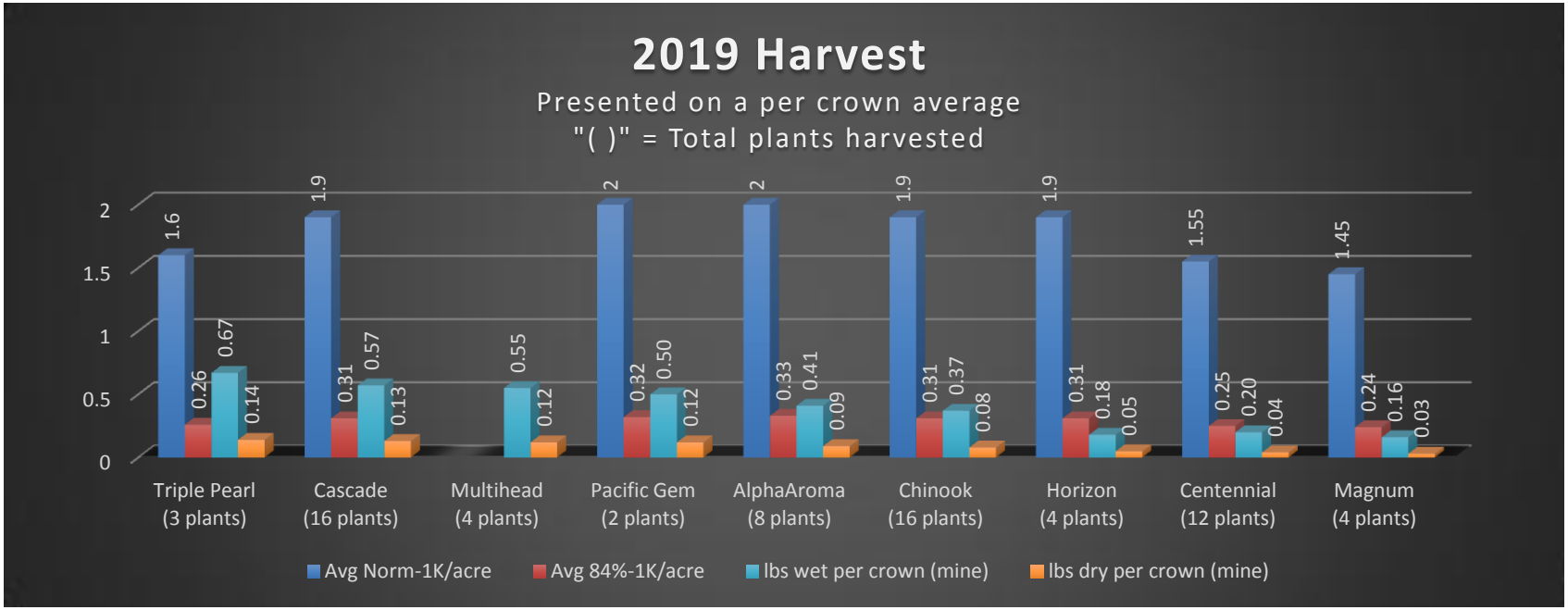
GREEN - Indicates an increase over the previous year

RED - Indicates a decrease from the previous year

Rank is based on “lbs/dry” figure

MOUNTAIN VIEW HOPS





Hop Harvest Data by Cultivar

The following data was collected during the harvest of 2019. This is not a complete account of the entire harvest for this season. It serves as a baseline for many of the cultivars we are currently growing so as to allow for future predictions for growth characteristics, yield amounts, infrastructure design & costs, and for other hop yard related management practices.

MOUNTAIN VIEW HOPS

Cultivar (Date Harvested)	Plot Number	Age of Crown	Average Bine Length	Strings per Crown	# of Bines Harvested	Weight of Total Material	Weight of Cones Only
Centennial (July 5, 2019)	2	3 Yr	15', 8"	1	2	1.8 lb	1 oz
	3	4 Yr	13'	2	7	3.6 lb	3 oz
	4	3 Yr	15', 7"	1	3	2.8 lb	3.9 oz
	6	3 Yr	11'	1	1	.4 lb	0
	7	4 Yr	15', 10"	2	5	5.6 lb	8.1 oz
	8	3 Yr	15', 5"	1	3	1.8 lb	3.5 oz
	10	3 Yr	18', 6"	1	3	2.8 lb	4.1 oz
	11	4 Yr	13' 6"	2	6	4 lb	5.4 oz
	12	3 Yr	15', 6"	1	2	1.4 lb	1.5 oz
	14	3 Yr	15', 8"	1	2	2.2 lb	2.9 oz
	15	4 Yr	15'	2	5	3.8 lb	5.4 oz
	16	3 Yr	14', 3"	1	2	.4 lb	.1 oz
Chinook (July 5, 2019)	1	2 Yr	8', 6"	1	4	1.2 lb	1.6 oz
	2	2 Yr	12', 6"	1	3	1.4 lb	4.8 oz
	3	4 Yr	13', 6"	2	5	3.4 lb	8.8 oz
	4	2 Yr	13', 2"	1	2	2.4 lb	5.1 oz
	5	2 Yr	8', 6"	1	3	1.6 lb	2.1 oz
	6	2 Yr	14', 5"	1	3	3.6 lb	8 oz
	7	3 Yr	10', 11"	2	8	7.2 lb	12 oz
	8	2 Yr	13'	1	1	3.4 lb	2.4 oz
	9	2 Yr	12', 1"	1	4	3.4 lb	3.2 oz
	10	2 Yr	11', 8"	1	3	2.4 lb	3.4 oz
	11	3 Yr	15', 8"	2	7	8 lb	19.7 oz
	12	2 Yr	10', 6"	1	3	1.4 lb	3.1 oz
	13	2 Yr	11', 1"	1	2	1.6 ib	3.9 oz
	14	2 Yr	10'	1	3	1.8 lb	2.6 oz
	15	3 Yr	13', 9"	2	3	3.4 lb	6.4 oz
	16	2 Yr	12', 1"	1	3	1.4 lb	6.9 oz

MOUNTAIN VIEW HOPS

Cultivar (Date Harvested)	Plot Number	Age of Crown	Average Bine Length	Strings per Crown	# of Bines Harvested	Weight of Total Material	Weight of Cones Only
Willamette (July 9, 2019)	3	3	14', 9"	1	4	1.4 lbs	.5 oz
	7	4	14', 7"	1	4	1.4 lbs	.7 oz
	11	3	14', 9"	1	3	2 lbs	1.2 oz
	15	3	14', 8"	1	3	1.2 lbs	.4 oz
Mount Hood (July 9, 2019)	3	3	17', 2"	1	3	2.6 lbs	1.6 oz
	7	4	15', 2"	1	2	2.2 lbs	0
	11	3	16'	1	2	2.6 lbs	.9 oz
	15	3	15', 6"	1	2	1 lbs	.2 oz
Zenith (July 9, 2019)	3	3	13', 9"	1	2	1 lbs	1.1 oz
	7	4	14'	1	1	1 lbs	1.1 oz
	11	3	14', 4"	1	2	.7 lbs	.6 oz
	15	3	13'	1	1	.4 lbs	1 oz
Cascade (July 10, 2019)	1	2	11', 3'	1	3	1.3 lbs	3 oz
	2	3	13', 9"	1	3	2.3 lbs	8.6 oz
	3	4	14', 6"	2	7	6.1 lbs	21.2 oz
	4	3	14', 4"	1	3	1.9 lbs	7 oz
	5	2	11', 1"	1	4	.5 lbs	2.2 oz
	6	3	14', 2"	1	3	2.1 lbs	9.6 oz
	7	3	14', 5"	2	7	4.3 lbs	15.6 oz
	8	3	13', 8"	1	4	1.1 lbs	7.8 oz
	9	2	13', 10"	1	4	1.1 lbs	9 oz
	10	3	13', 4"	1	1	1.5 lbs	3.5 oz
	11	3	13', 6"	2	8	4.4 lbs	17.8 oz
	12	3	14', 1"	1	3	1.6 lbs	9.3 oz
	13	2	12', 2"	1	3	1.1 lbs	6.2 oz
	14	3	13', 1"	1	2	1.4 lbs	6 oz
	15	3	15', 2"	2	7	5.4 lbs	17.9 oz
	16	3	13', 7"	1	2	1 lbs	2.1 oz

MOUNTAIN VIEW HOPS

Cultivar (Date Harvested)	Plot Number	Age of Crown	Average Bine Length	Strings per Crown	# of Bines Harvested	Weight of Total Material	Weight of Cones Only
Challenger (July 12, 2019)	1	2	9', 7"	2	4	2.4 lbs	7.5 oz
	2	3	8', 6"	1	2	1.8 lbs	6.3 oz
	3	3	13', 1"	2	4	4.6 lbs	22 oz
	4	3	9', 8"	1	1	1.6 lbs	2.3 oz
	5	2	8', 8"	2	5	2.8 lbs	14.6 oz
	6	3	9', 9"	1	3	2 lbs	8.7 oz
	7	4	10', 9"	2	4	4.4 lbs	11.3 oz
	8	3	10', 1"	1	4	2.6 lbs	10.3 oz
	9	2	9', 7"	2	4	2.3 lbs	12 oz
	10	3	11'	1	2	1.8 lbs	3.6 oz
	11	3	10', 10"	2	4	5 lbs	22.7 oz
	13	2	10', 7"	2	5	2.8 lbs	9 oz
	14	3	10', 6"	1	2	2.2 lbs	8.1 oz
	15	3	10', 7"	2	5	4.8 lbs	19.9 oz
Galena (July 12, 2019)	1	2	9', 3"	1	2	1 lbs	1.9 oz
	2	3	10', 9"	1	1	.4 lbs	1.6 oz
	3	3	13', 11"	2	6	4 lbs	11.1 oz
	4	3	9', 3"	1	1	.8 lbs	.5 oz
	5	2	9'	1	3	.9 lbs	1.2 oz
	6	3	11', 2"	1	2	1.4 lbs	3 oz
	7	4	10', 6"	2	6	3.4 lbs	3.5 oz
	8	3	11', 1"	1	4	2 lbs	3.7 oz
	9	2	10', 7"	1	2	1.2 lbs	1.8 oz
	10	3	11'	1	2	1.2 lbs	.8 oz
	13	2	9', 1"	1	2	.4 lbs	.9 oz
	14	3	12', 3"	1	1	.8 lbs	3.1 oz
	15	3	10', 11"	2	6	4.2 lbs	6.3 oz
	16	3	8', 7"	1	1	.8 lbs	1.3 oz
Horizon (July 12, 2019)	3	3	12', 8"	1	2	3.8 lbs	4.3 oz

MOUNTAIN VIEW HOPS

Cultivar (Date Harvested)	Plot Number	Age of Crown	Average Bine Length	Strings per Crown	# of Bines Harvested	Weight of Total Material	Weight of Cones Only
Columbus (July 14, 2019)	1	2	9', 10"	1	1	1.4 lbs	3.6 oz
	2	3	11', 4"	1	3	3 lbs	12.7 oz
	3	3	11', 10"	2	7	9.4 lbs	42 oz
	5	2	10', 4"	2	3	3 lbs	10.4 oz
	7	4	10', 4"	2	7	5 lbs	21.6 oz
	8	3	10'	1	3	2.6 lbs	9.2 oz
	9	2	10', 1"	2	3	3.4 lbs	13.4 oz
	10	3	9', 4"	1	2	1.8 lbs	8.1 oz
	11	3	11', 10"	2	8	8.6 lbs	38.3 oz
	13	2	10', 3"	2	4	2.6 lbs	12.9 oz
	14	3	10', 6"	1	2	1.5 lbs	9.8 oz
	15	3	12', 8"	2	2	3 lbs	13.2 oz
	16	3	10', 1"	1	2	1.8 lbs	5.9 oz
Magnum (July 14, 2019)	3	2	13', 1"	1	3	1.2 lbs	3 oz
	7	3	15', 4"	1	2	2.2 lbs	1.6 oz
	11	2	13', 3"	1	2	1.6 lbs	3.2 oz
	15	2	15', 6"	1	2	1.1 lbs	2.3 oz
Local Unknown (July 26, 2019)	3	3	23'	2	5	11.5 lbs	60.7 oz
	7	2	22'	2	6	8.5 lbs	46.5 oz
	11	2	22'	2	6	7.7 lbs	48.1 oz
	15	2	25'	2	4	9.3 lbs	40.5 oz
Southern Cross (july 29, 2019)	5	2	15', 1"	1	1	2 lbs	7.4 oz
	7	3	18'	2	4	2 lbs	4.5 oz
	9	2	18', 5"	1	4	3.2 lbs	12.6 oz
	11	3	15', 6"	2	4	6.2 lbs	17.8 oz
	13	2	16', 6"	1	3	5.2 lbs	11.5 oz
	15	3	16', 8"	2	3	3.2 lbs	9.9 oz

MOUNTAIN VIEW HOPS

Cultivar (Date Harvested)	Plot Number	Age of Crown	Average Bine Length	Strings per Crown	# of Bines Harvested	Weight of Total Material	Weight of Cones Only
Horizon (July 29, 2019)	7	3	11', 10"	1	2	1.8 lbs	4.9 oz
	11	3	11'	1	2	1 lbs	1.8 oz
	15	3	10', 3"	1	2	.5 lbs	.5 oz
Canadian Redvine (Aug 3, 2019)	3	4	24', 4"	1	2	15.6 lbs	71.3 oz
	7	3	25', 8"	1	3	15.9 lbs	76.3 oz
	11	3	25', 2"	1	2	19.4 lbs	102.4 oz
	15	3	24', 2"	1	4	18 lbs	84.7 oz
AlphAroma (Aug 14, 2019)	1	2	20', 2"	1	1	2.25 lbs	3.18 oz
	3	3	18', 8"	2	3	8 lbs	4.8 oz
	5	2	20', 3"	1	3	4.4 lbs	5.7 oz
	7	3	18', 4"	1	1	9.8 lbs	7.2 oz
	9	2	18', 2"	1	1	2.2 lbs	4.88 oz
	11	3	19', 6"	2	4	7.2 lbs	7.2 oz
	13	2	16', 1"	1	2	3.5 lbs	9.3 oz
	15	3	19', 8"	2	5	11.2 lbs	10.1 oz

Cone Drying and Packaging Procedures

Cones that were harvested fresh for brewers, or took multiple hours to harvest, were placed in a chest freezer on a pickup truck. A temperature controller was used to maintain consistent temperatures of 34-36 degrees F. A portable generator was used to power the freezer and temperature controller when traveling between the hopyard and the drying facility or brewer to maintain cone freshness.

All other 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 85-95 degrees and dehumidified to 35%-40%. Box fans continuously blew this air through the layer of cones from underneath.

This season's drying methods were a large improvement over last season, but resulted in some over drying of the hop cones. Better precision and timing is needed to obtain 8%-10% moisture content.

The hop cones were then immediately packaged in vacuum sealed Food Saver® packages and placed directly in a chest freezer. Virtually the entire harvest was purchased by two local breweries this season (2019) and their feedback from their brewing trials is pending.

(Fig. 1 – Chest freezer and generator combo used to keep freshly picked hops cold until delivery)

Pest and Fungicide Controls

Pest problems this year were relatively light on some pests, but heavier on other ones as compared to previous seasons. The 2019 season saw a large infestation of yellow poplar weevils (also known as “tick bugs”). This was a new pest that we have not seen in the past and presented itself during harvest in mid to late July. More information about this pest is presented further along in this report. We also saw an increase in flea beetles from the previous year.

We again spread Sevin® granules on the mulch around our poles which help to keep the earwig infestations much lower. The question mark butterfly and comma butterfly larvae infestations this season were less severe as compared to last year. Leaf hoppers were a regular appearance also, as well as a two-spotted spider mites (late in the season). For all of these soft bodied pests, we used insecticidal soap.

Japanese beetles were once again fairly low this season. Even though our hopyard is surrounded by hay fields on all sides, it is odd to note how relatively few Japanese beetles are found on our hops. It is theorized that due to the direction of the winds and their strength, that many of the beetles are blown away from the hops instead of towards them.

We found that many of the pests were removed by the simple action of spraying for Downy Mildew, as well as by using chemical burn back to remove all the lower vegetation and weeds. This aided in keeping infestation levels fairly low throughout most of the growing season.

Downy Mildew was actively controlled for, but was much less pronounced this season to to much dryer weather. Powdery Mildew was not an issue until the very end of the season when the leaves began to die back for fall. Our spray schedule for all pests is listed towards the bottom of this report.

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.

2019 MVH Research

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.

Result: It was found that using liquid Ammonium Sulfate was a very successful tool in our nitrogen program. However, it we still need to work on proper timing and application rates. Since our hops growing season runs so much shorter than the normal hops growing regions, we must adjust our nitrogen rates and application times accordingly. This may mean applying only two doses of around 75 lbs per acre within only a few weeks window.

We have witnessed over the last 4 years that our hops tend to begin flowering in late May to early June. Our harvest is separated into two blocks of early varieties and later varieties. The first block is ready to harvest around July 1-15, while the other block matures around July 20-August 15. This may indicate a need to segregate our nitrogen applications to four applications total (two for the early block and two for the later block).

The liquid nitrogen allows for quick and immediate transfer of nitrogen to the plant which in turn allows for the ability to supply nitrogen within a compressed growing timeframe. However, if applied too late or too much, the nitrogen will cause a hops plant to produce very leafy cones that are not usable. We again found this out on our Glacier variety this season in the same manner as last season.

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 (Fig 2).

Result: It was found that increasing the floating strings and T-posts did not cause any congestive issues, nor were any strength problems found in the poles or their related hardware regardless of number of crowns (ie: 4 vs 16 crowns around a single pole). This appears to be a viable way to increase the number of strings on a teepee designed layout. However, it is variety dependent and some cultivars may not be able to be double strung using our current method of 16 foot poles and extensions attached to the collars.

(Fig. 2 – T-posts used to double string a teepee designed trellising system)

Experiment 3: 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 (Fig 3).

Result: We used AimEC this season as a chemical burn back agent and found it to be very effective. It is somewhat expensive, but very little is needed to control weeds and suckers. MVH will be using this chemical from now as a control for lower growth and weeds in our hopyard.

(Fig. 3 - AimEC herbicide used for control of lower foliage. Several applications were needed throughout the growing season).

Experiment 4: Acquiring temperature readings from mature hop leaves on a sunny hot summer day.

Purpose: To determine how hot the leaves may actually get and determine if this could cause any plant growth issues (Fig 4 & 5).

Result: We had heard from other sources that in the hot summer sun the hops leaves can get to be much hotter than the atmospheric temperatures. This can cause the plant to essentially shut down cone producing functions in an effort to battle the heat. We found that on August 14, 2019 at 4:07 PM (Fig we recorded an outdoor temperature of 93 degrees. When a laser heat gun was used on a hop leaf located directly in the sun, the temperature of the leaf was 107.2 degrees F. We then did another test on September 4, 2019 at 2:23 PM with an outdoor temperature of 97 degrees. An exposed leaf at this temperature read 116 degrees F. These results appear to indicate that a dark green hop leaf in the heat of summer can indeed be much hotter than atmospheric temperatures.

(Fig. 4 - Aug 14, hop leaf temperature)

(Fig. 5 - Sept 4, hop leaf temperature)

Experiment 5: Test our ability to effectively breed hops at a separate site.

Purpose: To slowly grow and expand our new breeding program and eventually produce cultivars of hops that will grow well in the Mid-Atlantic region.

Result: We found that it is fairly easy to breed hops. We started with two male plants and two females (all of unknown origin) and placed them next to each other for open pollination. Our breeding site is located at a separate location far away from our hopyard so as not to produce seeds in our cones for brewers.

At the end of the season, we harvested the cones once they dried some on the bines and would up with quite a few seeds. Next season, we will begin breeding several known varieties from our hopyard with the males.

Future (2020) Experiments

Experiment 1: Increase several varieties to full double string capabilities around entire poles.

Purpose: To see what, if any, adverse affects might happen when a full complement of 16 double strung crowns are attached to one pole.

Experiment 2: Apply only two doses of nitrogen (Ammonium Sulfate) at rates of 75 lbs per acre next season. One dose will be applied at final pruning in late April, and the second dose at training in early May.

Purpose: To endeavor to find the best nitrogen application rates and timing for our growing area.

Experiment 3: Remove and install two 6”X6”, 20 foot treated poles around CRV and the Local varieties.

Purpose: To allow for increased growing height, as well as the ability to possibly double string these taller growing varieties using a teepee design while reducing the congestion issues at the top of the pole that were found in the 2018 growing season.

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Experiment 4: Construct a micro hop plucker

Purpose: To aid in harvesting our hopyard. This plucker will be a fraction of the cost of a current small-scale harvester and will hopefully be just right for harvesting hopyards under 1 acre.

Experiment 5: String shorter growing varieties to only 10' tall on their respective poles

Purpose: To determine if the shorter growing varieties might be able to be trellised using 4'x4'x12' poles instead of the current 16' poles thus saving initial startup costs for individuals wishing to grow these cultivars.

Experiment 6: Apply a pre-emergent herbicide

Purpose: To test the viability of weed control using a pre-emergent herbicide

Experiment 7: Perform pruning of the hop plants until around April 25-28 and train around May 12-14

Purpose: To better time these key tasks in an effort to produce the best crop of hops

Additional Notes of Importance for the 2019 Season

The 7 Plagues of 2019

This season's harvest yields were reduced compared to last year and the growth characteristics of the entire yard were also poorer. There are seven key factors that MVH believes attributed to this season's lower performances.

Problem 1 – Last fall (2018), two separate hurricane systems came through and released almost two feet of rain within a two month period in September and October. This was after a very wet and rainy season that saw few dry days the entire year. The plants were already going dormant and could not uptake the amount of moisture needed to help dry the soil out around the crowns. This started a problem of crown rot and decay.

Problem 2 – The winter of 2018/2019 was fairly mild and saw many days above 32 degrees. The moisture rarely froze solid in the ground and remained saturated throughout the winter months. These higher temperatures may also have adversely affected the hop plants' ability to properly vernalize during the winter months. This, combined with the first problem, created a situation in which we found many rotted/decayed crowns in the early spring, as well as some systemic Downy Mildew issues (notably on Southern Cross and Pacific Gem). We believe that many more crowns throughout the yard were damaged to some degree because of all the access moisture.

Problem 3 – Due to warming temperatures in the spring, we decided to perform a final pruning on April 18th instead of waiting till the end of the month as we did last season. We then trained around the same date as last year (May 8-9). This two week earlier final pruning appeared to have an adverse affect on some varieties. These affected cultivars had slower than normal growth and lower final heights on the plants.

Two years ago, we did a final pruning and training around the first of April and found the same situation, but much more exaggerated. Some varieties only reached 4'-6' tall and began flowering in early to mid May. It would appear then, that a final pruning date around the last week in April, followed by a training date just before the middle of May is best suited for our hopyard.

Problem 4 – Early June saw very high winds on a constant basis. These winds, which are normally found in the spring, came at a time when the plants were reaching their full height with lots of vegetation, and lasted for days on end. This caused a lot of breakage of bine tips, sidearms, and trellising twine which ultimately lowered production. It was also too late in the season to re-train any bines.

Problem 5 – The winds were immediately followed by very high temperatures well into the 90's that is usually not seen until July and August. We believe these high temperatures assisted in slowing the plants' ability to grow and produce cones. Furthermore, these high temps did not cease throughout the summer causing an early harvest due to cones drying on the bines.

Problem 6 – A drought began in June and quickly escalated throughout July and beyond. This required much more irrigation. While irrigation helped, it never could substitute for real rain and some later maturing varieties suffered as a result. Between mid July through the end of September, we only saw 3 inches of rain.

Problem 7 – The harvest numbers indicated in the above reports are slightly skewed. This season, we did harvest from some 2 year old and a few 1 year old plants in many of the cultivars. This reduced the total average yields for many of the cultivars as compared to last season's harvest. As an example, we harvested .75 pounds per crown on 12 crowns last season for Cascade, but only got .57 pounds per crown on 16 crowns this season. While a reduction in overall yields was expected based on the other issues discussed above, harvesting younger crowns and averaging them together with the fully mature ones must also be taken into account.

Yellow Poplar Weevil

As stated earlier, the 2019 season saw a large infestation of yellow poplar weevils (also known as “tick bugs”)(Fig 6). This was a new pest that we have not seen in the past and presented itself during harvest in mid to late July. The bugs were up inside the cones where they could not be seen. Once the cones were harvested and placed in a refrigerator for use as fresh wet hops, the bugs began crawling out of the cones in search of warmth.

Infestation levels for these bugs can increase every 4-5 years. According to many reports from the Mid-Atlantic, this was a very active year for this pest. After investigating further, we learned that yellow poplar weevils are attracted to the colors of bright green, white, and yellow. All hops growers know that lupulin is whiter at the beginning and yellows as the green cones mature. We believe that these colors helped to attract the pests and the cones themselves kept them hidden from us.

Flea beetles were another pest that was seen in much higher levels this season (Fig 7). These beetles were also found hiding under the leaves of cones. While they did not cause any major plant growth issues, their presence in hop cones can be a problem when hops are used wet or fresh.

(Fig. 6 - Yellow Poplar Weevil)

(Fig. 7 – Flea Beetle)

Hypothesis on Growth Reductions in Hops for the Mid-Atlantic Region

MVH has experienced over the last four years, and in conjunction with regional hops growers' experiences and local researchers' notes, that many cultivars do not grow as well in our region as they do in the more northern latitudes. This hypothesis that MVH is about to present is based on our observational experiences at our hopyard, the information presented by various universities' and their staff and from conversations from other hops growers. This is just a working hypothesis and has not been tested in any known controlled study to produce a theory.

The hypothesis is based on the two main factors of hops being photoperiod sensitive, and on growing degree days. While other hopyard maintenance issues such as fertilizing rates, weed control, soil management, etc. also play a role in hop plant growth and cone development, we will assume that these aspects of hops growing are being performed properly for the basis of this hypothesis.

Around March 18th every year, the higher latitude hop growing regions begin receiving longer day lengths of sunlight as compared to the Mid-Atlantic region. This crossing happens again around September 23rd when the Mid-Atlantic region begins receiving more sunlight and the more northern latitudes begin receiving less. At the end of June, places like Yakima, Washington are receiving over 33 more hours of sunlight per month than our hopyard in Virginia. This does not take into account pre-sunrise and post-sunset light conditions that occur for longer lengths of time in the northern growing regions.

Growing degree days are also different, in that our temperatures in Virginia begin warming much more quickly than they do in the northern latitudes. As an example, we may be experiencing 50 and 60 degree days in mid to late April, while the northern latitudes are still at, or just above freezing temperatures. It has been postulated in some reports that while daylight lengths mostly control the flowering aspect of the hop, temperature or growing degree days may also have an impact.

Therefore, it is our hypothesis that hops grow so much better in the northern regions mainly because the increased sunlight allows for longer periods of vertical growth while lower growing degree days assist in the suppression of the later stages of development. However, here in our region, we experience warmer temperatures much earlier, as well as reduced sunlight amounts. This creates a confusing situation for the hop plant in that the temperatures and light conditions are signaling the plant to begin flowering before sidearm development has fully progressed, and before terminal height has been reached. This appears to be genotype specific since not all cultivars express this same characteristic to the same degree among all cultivars within our hopyard.

We have tried multiple final pruning and training dates at our hopyard, as have other growers, and we have found that there is a very finite amount of time that these procedures can be performed here at our location and still receive a relatively decent crop. At our hopyard, we continually experience many cultivars developing burrs while the plants are still growing and before many sidearms have developed. This leads to these cultivars keeping their cones tight in close to the main bine structure and not on sidearms, as well as reduced height. Cones from these varieties are typically ready for harvest around early to mid July, which is much earlier than the northern growing latitudes. Cultivar characteristics can be found in the "General Cultivar Observations" section above.

In an effort to add credence to this hypothesis, we have been growing an unknown variety of cultivar at our hopyard that was found in our county and that had been growing, expanding, and adapting over the course of around 80 to 100 years (Fig 8). This variety is not known and does not look like any others we have trialed or seen, but does grow similar to Canadian Redvine and several New Zealand varieties, with some minor differences. Throughout the entire season, every shoot that emerges from the crown looks and grows like a "bull shoot" and grow extremely fast (similar to Pacific Gem or Southern Cross). This variety also produces good sidearms with lots of long, loose-leafed cones all the way to its maximum height of around 25 feet and is harvestable around early to mid August (similar to Canadian Redvine).

The aroma/flavor characteristics of this hop are prominent floral, rose-like flavor and aroma with a hint of underlying pine essence like Chinook. One brewer noted bubble gum flavor. While these characteristics cannot identify the heritage of this hop by themselves, we have assumed that based on its age and aroma/flavor compounds, as well as alpha acid levels, it was most likely a British or Continental variety. Some of these aroma/flavor characteristics may also be a result of its adaptation to this environment. Therefore, it is our presumption that this cultivar has adapted to this growing region and managed disease loads by sending up shoots quickly to gain as much height as possible so as to have enough time for normal sidearm development and later burr & cone formation.

To our knowledge, no known comparisons currently prove the relationship between photoperiod and growing degree days for hops between the northern growing regions and our Mid Atlantic growing region; much less on a per cultivar basis. If this information can be obtained, it may help in theorizing some of the growth characteristic differences in the various hops growing regions, as well as the differences between individual cultivars within these regions.

Another area of potential exploration is the relationship between winter temperatures at different latitudes and the differences of these temperatures on hops vernilization between cultivars. This direction of study may, along with other areas of study, produce a hypothesis in connecting differences in vernilization between latitudes and the following season's growth characteristics.

(Fig. 8 -Local hop plant of unknown variety with cones at harvest time)

Support for the Teepee Design of Trellising

The Teepee design, as a permanent trellising structure for growing hops, has its pros and cons. However, MVH believes that the pros outweigh the cons when this type of trellising system is applied correctly. A collar that can be raised and lowered on the pole is a key design feature for this type of trellising system (Fig 9).

This type of trellising is best suited for micro scale (< ½ acre) and hobby growers, or for those growers who are on steep hillsides. Teepee trellising is ideally suited for ground level trellising work by allowing the grower to raise and lower a collar to string and harvest the hops. This eliminates the need for tall farm equipment, and possible worker injuries, from potential roll over's on the side of a hill due to very high centers of gravity.

Tilling can be done in a straight line so long as the hop plants have been planted in a square pattern around the pole or in a straight line format down the length of poles. Distances between crowns, if planted properly, will be similar to those found in commercial hopyards. Irrigation lines can also be set up easier by locating the crowns in a straight line. This allows for hands free irrigation and fertigation that can also be found in commercial settings.

Finally, this design allows for a much cheaper initial investment cost for trellising setup. A grower has the ability to expand their yard as slow or fast as they desire by simply adding poles one at a time. Also, some cultivars do not grow as tall as others and while some may only reach 10-12 feet, other varieties may reach 14-16 feet, and still others may grow to over 20 feet. This system allows for varying heights of poles to be planted within the same yard to accommodate different cultivars thus reducing wasted money and materials.

(Fig. 9 - MVH trellising design. Notice the hop crowns in a row format. T-posts are used to double string the teepee trellising system. The brown at the base is a result of a burn-back herbicide for control of lower foliage.

MVH Will Be Removing Some Varieties

In an effort to increase yard profitability, we will be removing several more varieties that are not producing adequately and increasing others. The Fuggle variety was removed early this spring. Other varieties that will be removed before next season due to poor relative performance will be:

Centennial
Multihead
Galena
Horizon
Willamette
Zenith
AlphAroma
Magnum

Varieties that we will be increasing, and the total numbers of crowns for these varieties we intend to have are:

Local – from 4 to 8 crowns
Cascade – from 16 to 64 crowns
Challenger – from 16 to 48 crowns
Columbus – from 16 to 48 crowns
Southern Cross – from 8 to 16 crowns
Comet – from 4 to 16 crowns
Cashmere – from 4 to 16 crowns
Zeus – from 4 to 16

Key Dates for 2018

Feb 15 – Took soil samples from hopyard and had them analyzed

March 14 – Tightened hardware and inspected hopyard poles and enfrastructure

March 18 – Hop shoots began elongating and growing

April 4 – Applied all soil amendments and worked into soil

April 17 – Root pruned and removed rhizomes

April 18 – Pruned the hopyard back to ground level

May 1-2 – Lightly tilled the top soil in the hopyard

May 7-8 – Installed growing twine on poles and trained and trimmed all plants

May 13 – Applied Nitrogen at 75 lbs per acre

May 20 – Applied Nitrogen at 150 lbs per acre

- Noticed a lot of cultivars were showing well developed burrs at this date

July 5 – Aug 14 – Harvested hops and re-strung to produce cones for secondary markets

Oct 24 – Cut down all secondary growth material in preparation for winter

2019 MVH Hop yard Spray Record

Date	Location	Product	Target Pest	Application Rate
April 10, 2019	Hop Yard	Phostrol (Phos Acid)	Downy Mildew	3 tsp per gallon
"	Greenhouse	Cueva (Copper)	Downy Mildew	2 fl oz per gallon
April 17, 2019	Hop Yard	Aim EC	Weed Control	1.4 ml per gallon (2 oz/Acre)
April 18, 2019	Hop Yard	Phostrol (Phos Acid)	Downy Mildew	4 tsp per gallon
"	Greenhouse	Cueva (Copper)	Downy Mildew	2 fl oz per gallon
April 24, 2019	Hop Yard	Clethodim	Grass	.5 fl oz per gallon
"	Hop Yard	Oxidate 2.0	Downy Mildew	.64 fl oz per gallon (1:200 Rate)
April 30, 2019	Hop Yard	Aim EC	Downy Mildew Spikes	1.4 ml per gallon (2 oz/Acre)
"	Greenhouse	Cueva (Copper)	Downy Mildew	2 fl oz per gallon
"	Hop Yard	Cueva (Copper)	Downy Mildew	2 fl oz per gallon
May 9, 2019	Hop Yard	Phostrol (Phos Acid)	Downy Mildew	6 tsp per gallon
"	Greenhouse	Cueva (Copper)	Downy Mildew	2 fl oz per gallon
"	Hop Yard	Aim EC	Downy Mildew Spikes	1.4 ml per gallon (2 oz/Acre)
May 15, 2019	Hop Yard	Curzate & Cueva	Downy Mildew	.64g/gal Curzate (3.2 oz/Acre) & 2 oz Cueva
May 22, 2019	Hop Yard	Aim EC	Weeds & Suckers	1 ml per gallon (1.8 oz/Acre)
May 23, 2019	Greenhouse	Oxidate 2.0	Downy Mildew	.64 fl oz per gallon (1:200 Rate)
"	Hop Yard	Oxidate 2.0	Downy Mildew	.64 fl oz per gallon (1:200 Rate)
May 27, 2019	Hop Yard	Cueva (Copper) & Des-X (Insect. Soap)	DM & Soft Bodied Pests	1.5 fl oz per gallon of each
"	Greenhouse	Cueva (Copper) & Des-X (Insect. Soap)	DM & Soft Bodied Pests	1.5 fl oz per gallon of each
May 30, 2019	Hop Yard	Aim EC	Weeds & Suckers	1 ml per gallon (1.8 oz/Acre)
June 4, 2019	Hop Yard	Cueva (Copper) & Des-X (Insect. Soap)	DM & Soft Bodied Pests	1.75 fl oz per gallon (Cueva) & 2 fl oz per gallon (Des-X)
"	Greenhouse	Cueva (Copper) & Des-X (Insect. Soap)	DM & Soft Bodied Pests	1.75 fl oz per gallon (Cueva) & 2 fl oz per gallon (Des-X)
June 11, 2019	Hop Yard	Oxidate 2.0	Downy Mildew	.64 fl oz per gallon (1:200 Rate)
"	Greenhouse	Oxidate 2.0	Downy Mildew	.64 fl oz per gallon (1:200 Rate)
June 20, 2019	Hop Yard	Oxidate 2.0	Downy Mildew	.64 fl oz per gallon (1:200 Rate)
"	Greenhouse	Oxidate 2.0	Downy Mildew	.64 fl oz per gallon (1:200 Rate)
June 21, 2019	Hop Yard	Clethodim & Aim EC	Grass, Weeds, & Suckers	.65 fl oz/gal of Clethodim & 1.4 ml per gal of Aim EC
June 23, 2019	Hop Yard	Cueva (Copper)	Downy Mildew	2 fl oz per gallon

2019 MVH Hop yard Spray Record

"	Greenhouse	Cueva (Copper)	Downy Mildew	2 fl oz per gallon
July 3, 2019	Hop Yard	Cueva (Copper) & Des-X (Insect. Soap)	DM & Soft Bodied Pests	1 fl oz per gallon (Cueva) & 1 fl oz (Des-X) w/ Sticker
"	Greenhouse	Cueva (Copper) & Des-X (Insect. Soap)	DM & Soft Bodied Pests	2 fl oz per gallon (Cueva) & 1 fl oz (Des-X) w/ Sticker
July 9, 2019	Hop Yard	Oxidate 2.0	Downy Mildew	.64 fl oz per gallon (1:200 Rate)
"	Greenhouse	Oxidate 2.0	Downy Mildew	.64 fl oz per gallon (1:200 Rate)
July 17, 2019	Hop Yard	Curzate & Cueva (Harvested plants only)	Downy Mildew	.64g/gal Curzate (3.2 oz/Acre) & 2 oz Cueva
"	Greenhouse	Cueva (Copper)	Downy Mildew	2 fl oz per gallon
"	Hop Yard	Oxidate 2.0	Downy Mildew	.64 fl oz per gallon (1:200 Rate)
July 24, 2019	Hop Yard	Cueva (Copper)	Downy Mildew	1.5 fl oz per gallon of each
August 5, 2019	Hop Yard	Oxidate 2.0	Downy Mildew	.64 fl oz per gallon (1:200 Rate)
"	Greenhouse	Oxidate 2.0	Downy Mildew	.64 fl oz per gallon (1:200 Rate)
Sept. 25, 2019	Hop Yard	Clethodim & Aim EC	Weeds	1.4 ml per gallon (2 oz/Acre)

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

Cashmere

Challenger

Chinook

Columbus

Galena

Kirin II

Unknown (Local)

Cascade

Received	08/08/2019
Analyzed	08/08/2019
Vintage	2019
Varietal	Cascade

Result

Test	Results
Moisture (%)	5.2
Dry Matter(%)	94.8
Cohumulone (% of Alpha)	32.4
As Received:	
Alpha Acids (%)	4.63
Cohumulone (%)	1.50
Humulone (%)	3.13
Beta Acids (%)	4.48
Colupulone (%)	2.18
Lupulone(%)	2.30
Dry Weight Basis:	
Alpha Acids (%)	4.89
Cohumulone (%)	1.58
Humulone (%)	3.30
Beta Acids (%)	4.73
Colupulone (%)	2.30
Lupulone(%)	2.43

Canadian Redvine

Received	08/08/2019
Analyzed	08/08/2019
Vintage	2019
Varietal	Canadian Red Vine

Result

Test	Results
Moisture (%)	5.9
Dry Matter(%)	94.1
Cohumulone (% of Alpha)	41.8
As Received:	
Alpha Acids (%)	3.03
Cohumulone (%)	1.27
Humulone (%)	1.77
Beta Acids (%)	4.46
Colupulone (%)	2.96
Lupulone(%)	1.50
Dry Weight Basis:	
Alpha Acids (%)	3.22
Cohumulone (%)	1.35
Humulone (%)	1.88
Beta Acids (%)	4.74
Colupulone (%)	3.14
Lupulone(%)	1.60

Cashmere

Received	08/08/2019
Analyzed	08/08/2019
Vintage	2019
Varietal	Cashmere

Result

Test	Results
Moisture (%)	9.4
Dry Matter(%)	90.6
Cohumulone (% of Alpha)	21.7
As Received:	
Alpha Acids (%)	3.58
Cohumulone (%)	0.77
Humulone (%)	2.80
Beta Acids (%)	5.55
Colupulone (%)	1.99
Lupulone(%)	3.56
Dry Weight Basis:	
Alpha Acids (%)	3.95
Cohumulone (%)	0.85
Humulone (%)	3.09
Beta Acids (%)	6.12
Colupulone (%)	2.20
Lupulone(%)	3.93

Challenger

Received	08/08/2019
Analyzed	08/08/2019
Vintage	2019
Varietal	Challenger

Result

Test	Results
Moisture (%)	5.5
Dry Matter(%)	94.5
Cohumulone (% of Alpha)	27.5
As Received:	
Alpha Acids (%)	14.04
Cohumulone (%)	3.87
Humulone (%)	10.17
Beta Acids (%)	4.89
Colupulone (%)	2.63
Lupulone(%)	2.27
Dry Weight Basis:	
Alpha Acids (%)	14.86
Cohumulone (%)	4.09
Humulone (%)	10.76
Beta Acids (%)	5.18
Colupulone (%)	2.78
Lupulone(%)	2.40

Chinook

Received	08/08/2019
Analyzed	08/08/2019
Vintage	2019
Varietal	Chinook

Result

Test	Results
Moisture (%)	8.5
Dry Matter(%)	91.5
Cohumulone (% of Alpha)	31.8
As Received:	
Alpha Acids (%)	9.84
Cohumulone (%)	3.13
Humulone (%)	6.71
Beta Acids (%)	2.97
Colupulone (%)	1.67
Lupulone(%)	1.31
Dry Weight Basis:	
Alpha Acids (%)	10.76
Cohumulone (%)	3.42
Humulone (%)	7.33
Beta Acids (%	3.25
Colupulone (%)	1.82
Lupulone(%)	1.43

Columbus

Received	08/08/2019
Analyzed	08/08/2019
Vintage	2019
Varietal	Columbus

Result

Test	Results
Moisture (%)	8.6
Dry Matter(%)	91.4
Cohumulone (% of Alpha)	28.7
As Received:	
Alpha Acids (%)	14.22
Cohumulone (%)	4.08
Humulone (%)	10.14
Beta Acids (%)	4.60
Colupulone (%)	2.57
Lupulone(%)	2.03
Dry Weight Basis:	
Alpha Acids (%)	15.55
Cohumulone (%)	4.46
Humulone (%)	11.09
Beta Acids (%)	5.03
Colupulone (%)	2.81
Lupulone(%)	2.22

Galena

Received	08/08/2019
Analyzed	08/08/2019
Vintage	2019
Varietal	Galena

Result

Test	Results
Moisture (%)	7.8
Dry Matter(%)	92.2
Cohumulone (% of Alpha)	41.7
As Received:	
Alpha Acids (%)	1.75
Cohumulone (%)	0.73
Humulone (%)	1.02
Beta Acids (%)	1.60
Colupulone (%)	1.06
Lupulone(%)	0.53
Dry Weight Basis:	
Alpha Acids (%)	1.90
Cohumulone (%)	0.79
Humulone (%)	1.11
Beta Acids (%)	1.73
Colupulone (%)	1.15
Lupulone(%)	0.58

Kirin II

Received	08/08/2019
Analyzed	08/08/2019
Vintage	2019
Varietal	Kirin II

Result

Test	Results
Moisture (%)	15.4
Dry Matter(%)	84.6
Cohumulone (% of Alpha)	44.9
As Received:	
Alpha Acids (%)	3.10
Cohumulone (%)	1.39
Humulone (%)	1.71
Beta Acids (%)	4.00
Colupulone (%)	2.77
Lupulone(%)	1.23
Dry Weight Basis:	
Alpha Acids (%)	3.67
Cohumulone (%)	1.65
Humulone (%)	2.02
Beta Acids (%)	4.73
Colupulone (%)	3.28
Lupulone(%)	1.45

Local (Unknown Origin)

Received	08/08/2019
Analyzed	08/08/2019
Vintage	2019
Varietal	Local

Result

Test	Results
Moisture (%)	7.6
Dry Matter(%)	92.4
Cohumulone (% of Alpha)	40.3
As Received:	
Alpha Acids (%)	5.84
Cohumulone (%)	2.35
Humulone (%)	3.49
Beta Acids (%)	5.09
Colupulone (%)	3.21
Lupulone(%)	1.88
Dry Weight Basis:	
Alpha Acids (%)	6.32
Cohumulone (%)	2.55
Humulone (%)	3.78
Beta Acids (%)	5.51
Colupulone (%)	3.47
Lupulone(%)	2.04