



COLLEGE OF
AGRICULTURE &
NATURAL RESOURCES

REVOLUTIONIZING THE FUTURE OF BEER-CENTRIC AGRICULTURE

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Growing Hops in Maryland

A report on the progress of the East Coast Hop Project
A Partnership of the University of Maryland and Flying Dog Brewery

In an effort to support the new and rapidly growing brewing industry in Maryland, 24 varieties of hops have been established at the University of Maryland Agricultural Experiment Station in Keedysville, Maryland. Although not the first hops planting on a research farm, this planting is about ½ acre and contains 24 varieties replicated three times. It is being managed intensively with regard to fertility and irrigation, as well as insect, disease and weed management using IPM principles. Current varieties in the trial are:

Planted May 2016: Alpharoma, Cascade, Centennial, Chinook, Crystal, Mt. Hood, Mt. Ranier, Nugget, Sorachi Ace, Southern Cross, Tahoma, and Ultra.

Planted April 2017: Canadian Red Vine, Galena, Glacier, Amallia, Neo 1, New Port, Multi Head, Southern Brewer, Teamaker VF, Willamette, Vojvodina, and Zeus.

The following information is being generated from what we are learning from the planting in Maryland. This will be a living document and will be updated as we continue to learn about the ins and outs of hop production in Maryland. This document is intended to be less a recipe for production but rather a menu for growers to select what works in your own operation, and ideas for solutions to challenges that limit production in our hot, humid, pest rich environment.

Establishment of the Maryland Hop Yard

Soil/Site preparation: It is critical in our climate that you select the best site possible. This will help to reduce the negative effects of Maryland weather. The site should have well drained soil, full sun, good air circulation, avoid frost pockets, and accessibility. Soil should be tested at least one year in advance of planting to ensure time to develop a nutrient management plan, and for soil amendment to react in the soil to make the proper adjustments. Pay particular attention to pH, P, and K. Be aware of the previous crops, potential herbicide carryover and the existing weed population, i.e. perennials-these absolutely should be controlled prior to planting to help reduce weed challenges in the establishing hop yard. Sod establishment in the fall prior to the year of planting will help facilitate activities in the hop yard, prevent soil erosion and help to suppress weeds. Tall fescue should be planted between rows in spring or fall of previous year. Availability of water is needed for irrigation.

Variety selection: This is the primary goal of the partnership project. We are screening 24 varieties in an effort to identify varieties that might be better suited to be grown in

Maryland, while still processing the characteristics desired for brewers to make high quality beer.

Planting: April-Early May

Fertility: All nutrients and soil pH, except for Nitrogen, should be addressed based on soil test results prior to planting. Nitrogen should be applied the first week after planting, three weeks later, and three weeks later. Total of 75 lbs. Nitrogen per acre.

Weed control: Apply Glyphosate pre-plant to rows to burn down all weeds prior to planting. Use burndown product as needed to control weeds in the row the first season. Avoid burning hops with drift from burndown products.

Irrigation: Regular and consistent watering is essential. Plants can grow 10 inches a day and need water but should not have “wet feet”. This means that you want to maintain adequate moisture in the soil profile but do not want puddling of water on the surface, or for the soil in the hop yard to have a “muddy” texture. Irrigation should be run as often as four days a week during hot dry periods.

Trellis: Able to support a cable 18 feet high to allow the hops to reach their full potential, well anchored posts with a cable at 18’. Posts are 4’ in the ground with plants spaced 3.5’ x 12’. It is important that your row spacing is suited to your equipment and, when the plants are fully mature, operations in the hop yard can continue without damaging the plants.

Training/Pruning: Use one string per plant and encourage all the growth of the plant to climb the string. This will help the plant establish a strong root system and may help to produce a light crop the first season.

Pest Control: Weekly Integrated Pest Management (IPM) scouting is a must for successful hops production in Maryland. Rapid deployment of control measures can make all the difference between success and failure of a new planting. This consists of walking the rows observing overall condition of your plants, looking at vigor, color of foliage, discoloration or browning of leaves and presence of insects or mites. It is important to be examining both the upper and lower surfaces of the leaves with a magnifying glass or hand lens to see mites or early infestations of Leafhoppers. Major pest issues in order of impact on our current planting include: Downy Mildew, Leafhoppers, Mites, Alternaria Cone Disorder, Fusarium Cone Tip Blight, Japanese Beetles

Management of the Established Maryland Hop Yard

Fertility: first week of April, fourth week of April, third week of May, second week of June. Total of 180 lbs. Nitrogen per acre.

Weed control: February Glyphosate plus Chateau, spring burndown

Irrigation: Regular and consistent watering is essential. Plants can grow 10 inches a day and need water but should not have “wet feet”. Irrigation should be run as often as four days a week during hot dry periods.

Spring Pruning: this can be done mechanically or with a desiccant. Either way, the critical objective is to completely remove all green tissue above the soil to encourage the plant to push up new strong bines from the crown.

Training/Pruning: Two strings per plant, select two or three healthy strong undamaged bines per string.

Pest Control: Weekly Integrated Pest Management (IPM) scouting is a must for successful hops production in Maryland. Rapid deployment of control measures can make all the difference between success and failure for the season; Downy Mildew, Leafhoppers, Mites, Alternaria Cone Disorder, Fusarium Cone Tip Blight, Japanese Beetles. Below is a sample schedule based on the IPM scouting and control measures taken in the hop yard at Keedysville.

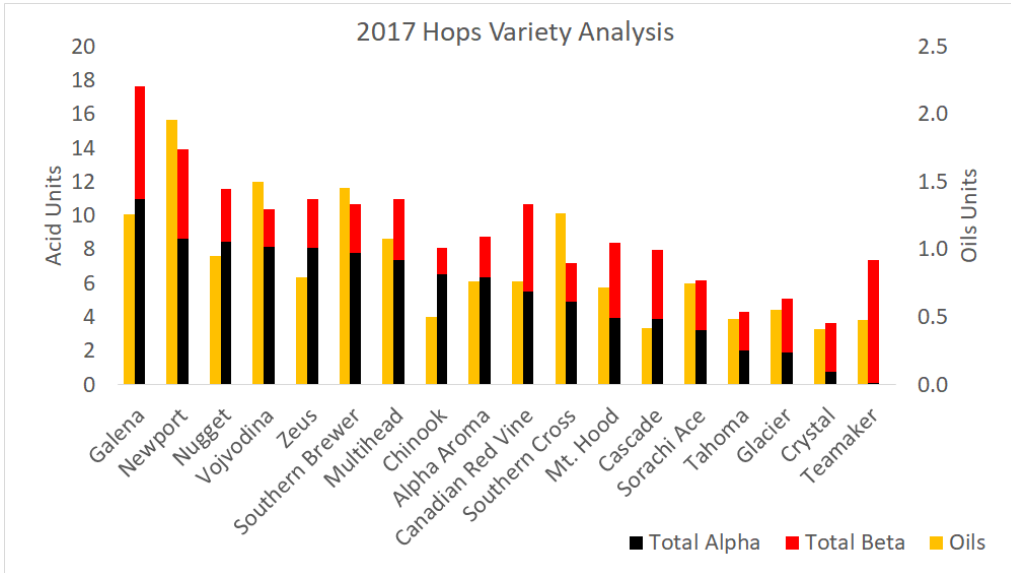
Sample Hop yard Activity Schedule

WMREC Hops Timeline 2017

- 2/15/17 – Chateau (6oz/A) + Gramoxone (1pt/A) on 2016 planting only
- 3/24/17 – Champ (1.3pt/A)
- 3/29/17 – Roundup PowerMax (1qt/A) on new hops yard to kill fescue strips for tillage
- 3/31/17 – 2017 hops arrived, transplanted to larger pots
- 4/03/17 – drenched with Ridomil Gold SL (8oz/A rate - .8oz/10gal, 5 gal treats 50 plants)
Fertilized with urea at a rate of 50lb N/A (each rep 50sq.ft. 1.84oz/rep)
- 4/10/17 – Scythe @ 100gpa @5% solution to burn down early growth
- 4/20/17 – planted 2017 hops trial
- 4/21/17 – strung all hops
Fertilized with urea at a rate of 50lb N/A (2016 & 2017 planting)
- 5/02/17 – Phostrol (2.5pt/A)
- 5/09/17 – Applied Dakota herbicide to 2017 planting
- 5/10/17 – Applied Scythe herbicide spot spray to 2016 planting
- 5/12/17 – Fertilized with urea at a rate of 50lb N/A (2016 & 2017 plantings)
- 5/15/17 – Applied M Pede (2% solution) and Ranman @ 2.5oz/A (2016 & 2017 plantings)
- 5/22/17 – Applied Phostrol (2.5pts/A) (2016 & 2017 plantings)
- 5/25/17 – Applied Scythe herbicide spot spray to 2017 planting
- 5/26/17 – Applied M Pede (2% solution) (2016 & 2017 plantings)
- 6/01/17 – removed lower foliage (2016 planting)
- 6/03/17 – Applied M Pede (2% solution) + Pristine (28oz/A) (2016 & 2017 plantings)
- 6/08/17 – Applied Brigade WSB (16oz/A) + Ranman (2.5oz/A) (2016 & 2017 plantings)
- 6/14/17 – Applied Scythe herbicide spot spray (2016 & 2017 plantings)
- 6/16/17 – Applied M Pede (2% solution) + Pristine (28oz/A) + Acramite 50WS
(1.33lb/A)
- 6/22/17 – Applied M Pede (2% solution) + Phostrol (2.5pt/A) (2016 & 2017 plantings)
- 6/29/17 – Applied Brigade WSB (16oz/A) + Ranman (2.5oz/A) (2016 & 2017 plantings)
- 7/07/17 – Applied Malathion 5 (1pt/A) + Phostrol (2.5pt/A) (2016 & 2017 plantings)
- 7/14/17 - Applied M Pede (2% solution) (2016 & 2017 plantings)
- 7/20/17 - Applied M Pede (2% solution) + Phostrol (2.5pt/A) (2016 & 2017 plantings)
- 7/27/17 - Applied M Pede (2% solution) + Phostrol (2.5pt/A) (2016 & 2017 plantings)

<u>Variety</u>	<u>Total Weight (g)</u>	<u>Total Weight (lbs)</u>	<u># of Bines Harvested</u>	<u>Predicted wt (lbs) / 900 Bines</u>	<u>Weakness/Strength</u>
Glacier	3500	7.7	18	386	Strong pine-like resin, mild fruity notes
Southern Brewer	2850	6.3	18	315	tangerine, citrus, resin
Vojvodina	2000	4.4	18	220	Floral first, then some melon fruit notes, some 'green hop' notes
Southern Cross	1655	3.6	18	182	Fruit Punch, sweet tropical fruits
Mt. Hood	1090	6.6	18	120	Fruity, herbal, mild aroma
Newport	3000	1.3	18	333	Bright fruit notes, Pineapple, green apple, 'fresh' hops
Cascade	1235	2.7	18	136	Nice citrus character, some fruity notes
Crystal	980	2.2	17	114	mild fruit, freezer burnt strawberries
Nugget	815	1.8	17	95	Green, herbal, some citrus
Alpharoma	2385	5.3	18	263	Mild tea, fruity notes
<i>Galena</i>	2800	6.2	18	309	Grassy, green, resin, dill, Onion & Garlic (OG)
<i>Multihead</i>	680	1.5	13	104	Diesel/OG
<i>Zeus</i>	4235	9.3	18	467	Herbal, grassy, dill
<i>Canadian Red Vine</i>	7375	16.3	18	813	Old grass, sweet, freezer burnt berries, 'stale' hop
<i>Tahoma</i>	675	1.5	16	84	Old fridge/Pear, Freezer burnt fruit
<i>Teamaker VF</i>	2060	4.5	18	227	Smells like tea leaves
<i>Centennial</i>	550	1.2	15	73	Low yield
<i>Sorachi Ace</i>	255	0.6	14	36	Low yield
<i>Mt. Ranier</i>	150	0.3	16	19	Low yield
<i>Ultra</i>	150	0.3	18	17	Low yield
<i>Chinook</i>	390	0.9	16	48	Low yield
<i>Williamette</i>	150	0.3	18	17	Low yield
<i>Amallia</i>	270	0.6	15	36	Low yield
<i>Neo 1</i>	0	0	14	0	Low yield

Note: Bolded varieties are showing the most promise to date



Initial investment cost to establish this project

Item	Cost
Hops rhizomes (plants)	\$1,300
Poles	\$4,500
Hardware for poles	\$1,200
Labor (\$20/hr * 320 hrs)	\$6,400
Harvester	\$28,000
Oast (for drying)	\$2,000
Pelletizer	\$5,000
Irrigation	\$1,500
Liquid Nitrogen Cooling System	\$500
Hammer Mill	\$2,000
Cooler/Storage	\$1,000
Seed, Fertilizer, Lime, Chemicals	\$3,500
Total Cost	\$51,500

2017 Seasonal Costs for the 1/2 acre

Item	Cost
Herbicides	\$130
Fungicides	\$550
Insecticides	\$300
Coconut coir	\$175
Fertilizer	\$120
Labor	\$2,400
Total Cost	\$3,675

**In 2017 there was additional cost of laboratory analysis of oil and acid hops panel
contracted through VA Tech for research purposes.**

Item	Cost
Pre-pellitization panels (24 varieties)	\$3,256
Post-pellitization panels (24 varieties)	\$3,256
Total Cost	\$6,512

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