Hops Variety Trials in Maryland: The First Three Years

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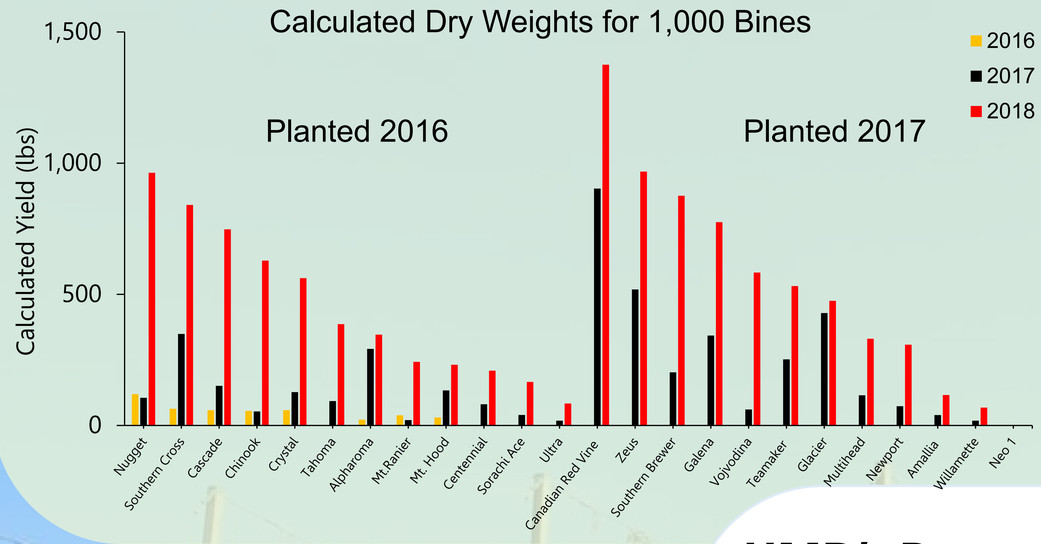
University of Maryland Extension, in partnership with Flying Dog Brewery, established a ½ acre hop yard at the Agricultural Experiment Station in Keedysville, Maryland.
Twenty-four hops varieties were selected in consultation with local growers and brewers for Maryland's hot and humid climate.
Hops were managed for fertility, irrigation, and insect, disease, and weed pests using IPM principles.
Trials were performed to identify varieties best suited for production in Maryland and potential challenges from growing to pelletization to final product.

24 Varieties

selected by Maryland growers, brewers, and academics were planted in 2016 or 2017. Varieties already being grown in the state in small quantities or that anecdotally performed well in Maryland's climate were . Plugs were planted 3.5' apart, with 10' between varieties to maximize airflow, a priority in Maryland's humid climate. The two lowest performing varieties, Neo 1 (no yield) and Multihead (low plant survival) were removed after the 2018 growing season, and will be replaced with two prospective local heirloom varieties.



Horticultural Practices

Fertility – Nitrogen was applied as 6 banded applications of sulfur coated urea for a target of 240 lbs/acre per growing season. Soil potassium and phosphorus were managed for levels optimum for corn in Maryland.

Stringing – Wires were run parallel to posts to maximize airflow. One and two year old plants were strung with two bines per string; three year old plants were strung with 2 bines on two strings in a 'V' arrangement.

Crowning – In 2016 and 2017 plants reached the top wire long before the optimal date, June 21st, indicating final crowning was too early. In 2018 the final crowning was delayed until May 16th, and yields improved dramatically, even in the younger plantings.

Floor management – Planted rows were maintained as 42" wide bare ground, with 12.5' alleys of tall fescue between rows. Tall fescue suppresses weeds while allowing equipment use despite Maryland's frequent heavy rains.

UMD's Partnership with Flying Dog Brewery

Flying Dog Brewery is the largest brewery in Maryland, and their financial and intellectual contributions have made them an indispensable partner to University of Maryland Extension.

Flying Dog Brewery

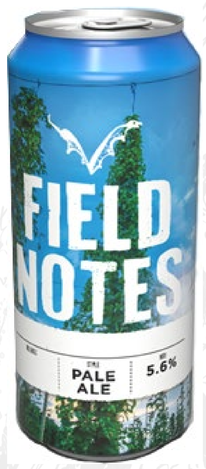
-Provided guidance on industry standards and expectations

-Advocated for research

-Produced Maryland Hops Growers Guide

-Funded harvester, labor, and yard expansion

-Produced and marketed a limited edition proof of concept beer with 100% Maryland hops



"Because there's no better way to test an ingredient than putting it in a beer"

Aroma Evaluations

Flying Dog conducted industry standard blind aroma evaluations on all varieties in 2017 and 2018 (see below). Each variety was steeped in a base light lager and ranked for a number of smell categories.

Aroma evaluations to help identify desirable varieties beyond yield and ensures post harvest handling meets industry standards for quality.

Pest Management

Arthropods

Potato leafhoppers and subsequent spider mite outbreaks are the primary early-season pests.

Japanese beetles are difficult to control with labelled products.

Products used:
Brigade, Azaguard, M-Pede, Malathion 5, Zeal, Acramite

Weeds

Our major weeds of concern are bindweed and horsenettle.

Dormant	Scythe and Pendimethalin
In-season *plants >6'*	Goal, Scythe, Aim, and Chateau

Label restrictions and pre-harvest interval are major hindrances.

Disease

Downy mildew is our primary concern, with 18 applications for disease control in 2018.

- Ridomil Gold SL
- Ranman
- Phostrol
- Tanos
- Champ Formula 2
- Revus
- Oxidate

Fusarium cone tip blight (minor, 2017 only)

Pesticide applications are made targeting a dilution rate to achieve 100 gallons of water per acre

Post Harvest Handling, Analysis, & Evaluation

Cones are harvested at 20% moisture, and immediately after harvesting were transferred to the oast and dried to 8% moisture within 24 hours, then vacuum sealed and frozen. In 2018, harvest lasted for 12 days

Frozen hops are processed with a hammer mill and pelletized on site in batches by variety and refrozen. Flying Dog takes ownership of the pellets within a week of processing.

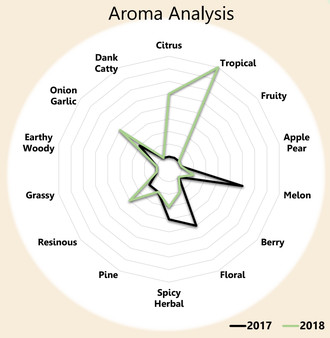
Samples of dried cones and final pellets of each variety are sent to Virginia Tech for complete analysis of oils and acids. Pre- and post-pelletization comparison allows evaluation of potential loss due to the pelletization process. The complete analysis of the variety Vojvodina is shown here as a demonstration.

Vojvodina

Content Analysis

	Cones	Pellets
Moisture	11.6%	11.9%
Cohumulone	25.5%	25.4%
HSI	0.23	0.27
Alpha Acids	11.96	9.26
Beta Acids	2.87	2.52
Oils (ml/100g)	2.58	1.70

Aroma Analysis



Oils Analysis