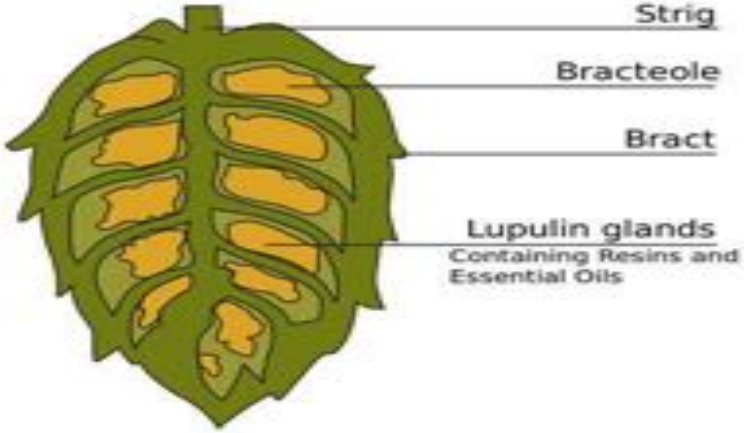
Maryland Hops Team

Hops workshop

March 12th, 2018

Nate Richards
Kent County Extension
nrichard@umd.edu

Presentation adapted from Andrew Ristvey – WyeRec Alternative Crops Specialist



Maryland Hops Production

- Production variables
  - Northwest Produces most hops in the U.S.
    - More summer sunlight (15+ hours)
    - Better climate – less pesticide use
    - Lower cost of production

Maryland Hops Production

- Why hops in Maryland?
  - Maryland is within latitudinal range that hops can be grown
    - Direct sales to local breweries
    - Premium for local hops
    - Access to fresh hops

Hops

Humulus lupulus

- **Cannabinaceae**
  - **Hardy perennial vine (bine)**
  - **Lone lived - >25 yrs**
  - **Established bines can produce 1.5-2 lb/yr (dry) or more depending on variety, cultural conditions, and climate**

Hops

- Hops have male and female flowers on separate plants
  - We grow the female plant from clones
  - Clones are started from the hops rhizomes


Nugget
Magnum
CASCADE

2014 Hops install at Upper Marlboro CMREC

UNIVERSITY OF MARYLAND EXTENSION


University of Maryland
Wye Research and Education Center

Wye Research and Education Center Trial Hops Yard

Objectives

- Response to the local interest in hops production
- Trial varieties for the Eastern Shore
- Trial growing systems
- Develop extension programs for hops management

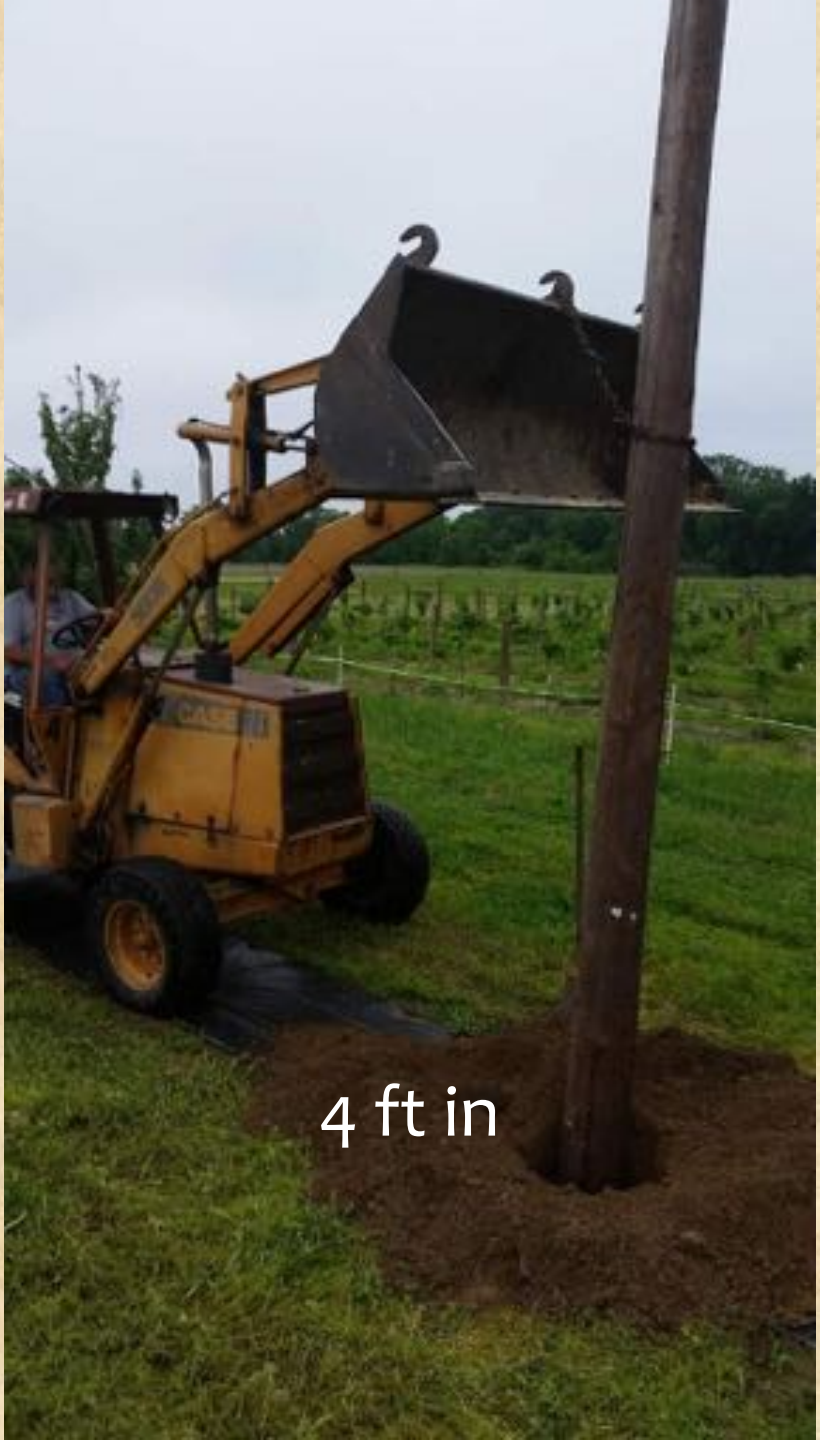
Hops Production
Trellising

La

-
-
-

Trellis Poles at Wye

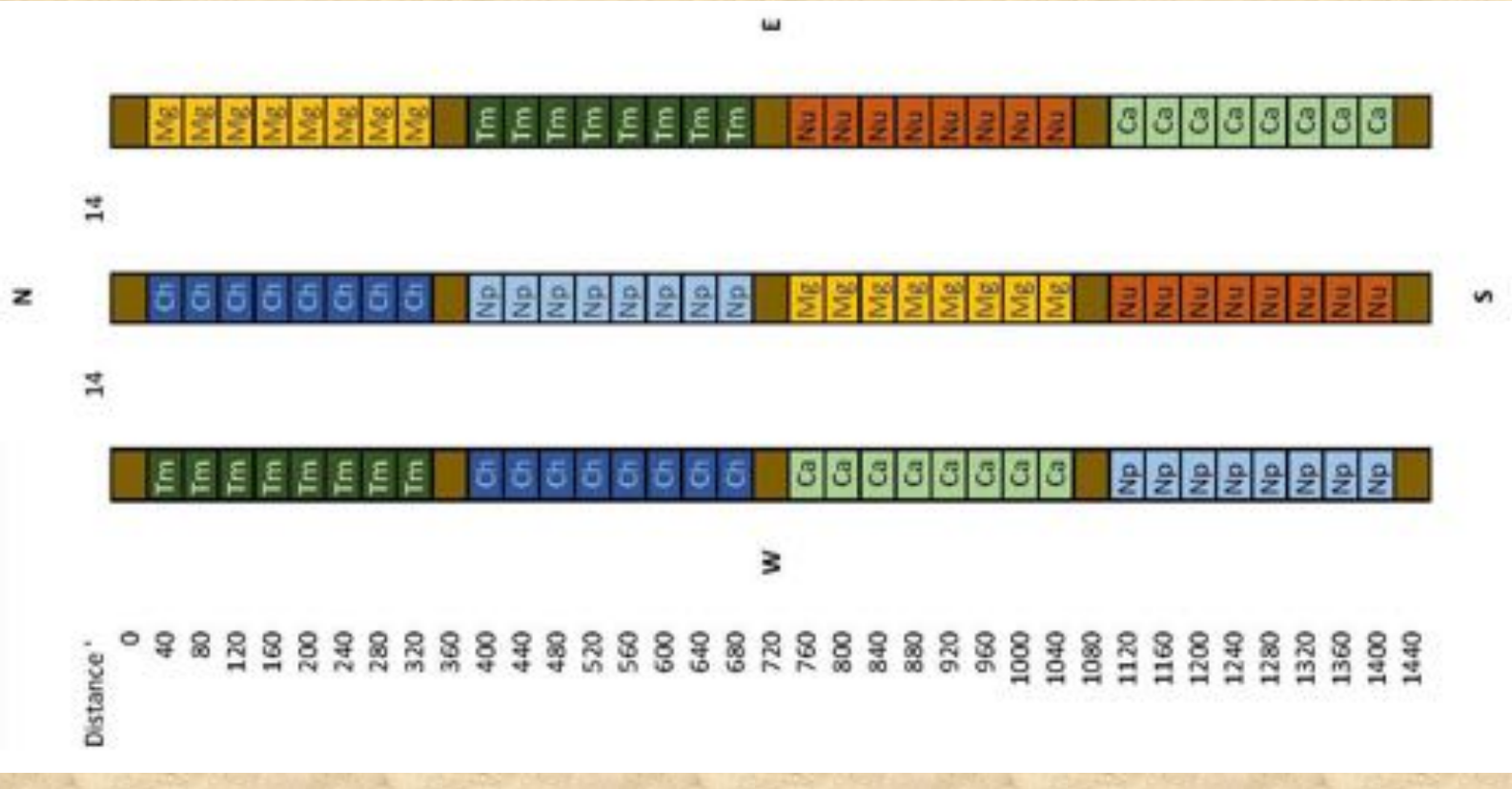
22 ft poles



18 ft out

Wye Research Trial
Hops Yard

Ca	Cascade - Aroma + bittering
Np	Newport - Bittering
Nu	Nugget -Aroma + Bittering
Mg	Magnum - Bittering
Tm	Teamaker - Aroma
Ch	Chinook - Aroma+Bittering



Hops Production
Trellising

WyeRec Layout

- **Single Horizontal cabling**
- **30 feet between poles**
- **3.5ft in row plant spacing**
- **14ft between rows (for equipment and airflow)**
- **Use Coir twine**
- **Plastic ground cover (for establishment)**
- **Trickle irrigation**

Hops Establishment
Soil Prep

- **Hops need well drained soils**
- **Increase organic content to 3-4%**
- **Adjust pH to 6-6.2**
- **Manage other nutrients P, K, Ca based on Soil Tests**

Hops Establishment Fertility Management

- Establishment - 75 lb N / acre
- May require three split applications
- Liquid feed fertilizers or synthetically produced are more readily available nutrients
- Granular organic - maybe less applications

Hops Establishment Fertility Management

- Require between 150 and 200 lb N / acre
- Nutrient Management plans available from Extension office
- Liquid feed fertilizers or synthetic produced - readily available nutrients
- May require three to four split applications
- Granular organic - maybe less
- Start in early April
- Stop mid-June

Hops Production
Choosing Varieties

- **Several hundred varieties**
- **Each variety has its own characteristics**
- **Bred for levels of Alpha/Beta acids and oils and for growing in different climates**
- **Choose variety based on site/climate and what is in demand**

- ***Bittering* – High alpha acids/low oil**
- ***Aroma* – low alpha acids high oil**
- ***Nobel* – High oil moderate alpha acid**

Hops Varieties at WyeRec

- 4 varieties planted in June 2016
  - Nugget – Aroma/Bittering
  - Cascade – Aroma/Bittering
  - Newport – Bittering
  - Willamette - Bittering

Hops Varieties at WyeRec

- 3 varieties planted in October 2017
  - Magnum – Bittering
  - Chinook – Aroma/Bittering
  - Teamaker – Aroma

  - *Willamette - was a failed crop and was removed after year 1

Hops Production Growth

Starting

- **Rooted cuttings or rhizomes**
- **Certified clean plants**
- **Plant April-May**
- **First year after planting will grow 6 to 8 feet during establishment**

Hops Production Growth

Second Season Growth

- **Plants begin coming out of dormancy around late March/early April depending on soil temps**

Hops Production Growth

Second Season Growth

- **Second year will grow up to 1 ft per day**
- **In June vertical growth slows**

Hops Production Growth

- **Plants flower late June/ early July depending on variety and climate**

Hops Production Growth

- **Plants fill-out over summer and flowers/cones mature**

Hops Major Pests

Potato Leaf Hopper

- **Scout two or three times weekly**
- **Economic threshold – 2-3 per leaf**
- **Control Options**
  - ✓ **Pyrethroids**
  - ✓ **Neonicotinoids**
  - ✓ **Spinosyns**
  - ✓ **Soaps**

Hops Major Pests

Potato Leaf Hopper

- **Scout two or three times weekly**
- **Economic threshold – 2-3 per leaf**
- **Control Options**
  - ✓ **Pyrethroids**
  - ✓ **Neonicotinoids**
  - ✓ **Spinosyns**
  - ✓ **Soaps**

Hops Major Pests

Potato Leaf Hopper

- **Scout two or three times weekly**
- **Economic threshold – 2-3 per leaf**
- **Control Options**
  - ✓ **Pyrethroids**
  - ✓ **Neonicotinoids**
  - ✓ **Spinosyns**
  - ✓ **Soaps**

Hops Major Pests

Spider Mites

- **Scout in May**
- **Thrive in hot conditions**
- **Pyrethroid use kills beneficials, promotes population**
- **Control Options**
  - ✓ **Miticides**
  - ✓ **Biologicals**
  - ✓ **Soaps – discontinue at Burr phase**

Hops Major Pests

Spider Mites

- **Scout in May**
- **Thrive in hot conditions**
- **Pyrethroid use kills beneficials, promotes population**
- **Control Options**
  - ✓**Sulfur**
  - ✓**Azadirachtin**

Hops Major Pests

Japanese Beetles

- **Scout after mid-June**
- **Economic threshold - as soon as you seen them!**
- **Control Options**
  - ✓ **Pyrethroids**
  - ✓ **Neonicotinoids**
  - ✓ **Azadirachtin**

Diseases

Downy Mildew

- **Plant resistant varieties**
- **Manage early in the season**
  - ✓ **Spring pruning of new growth**
  - ✓ **Cleanliness**
  - ✓ **Timely fungicide applications are needed with wet weather**
  - ✓ **Weekly oil and soap applications**

Diseases

Powdery Mildew

- **Plant resistant varieties**
  - **Usually susceptible to PM**
- **Manage early in the season like PM**

Diseases

Fusarium Canker

- **Reducing free moisture near the crown**
- **Increase pH near the crown**
- **Avoiding use of acidifying fertilizers**
- **Minimizing injury to bines gain entry into the plant**
- **No fungicides are registered for control of Fusarium canker**

Hops Production
Cultural Management

Pruning

- **Match growth with flowering**
- **Typically prune crowns in early spring**
- **Goal is to have the bines reach the top at summer solstice (most sunlight for flowering)**

Hops Production
Cultural Management

- **Maintaining understory**

Hops Production
Cultural Management

- **Maintaining understory**

Hops Production Cultural Management

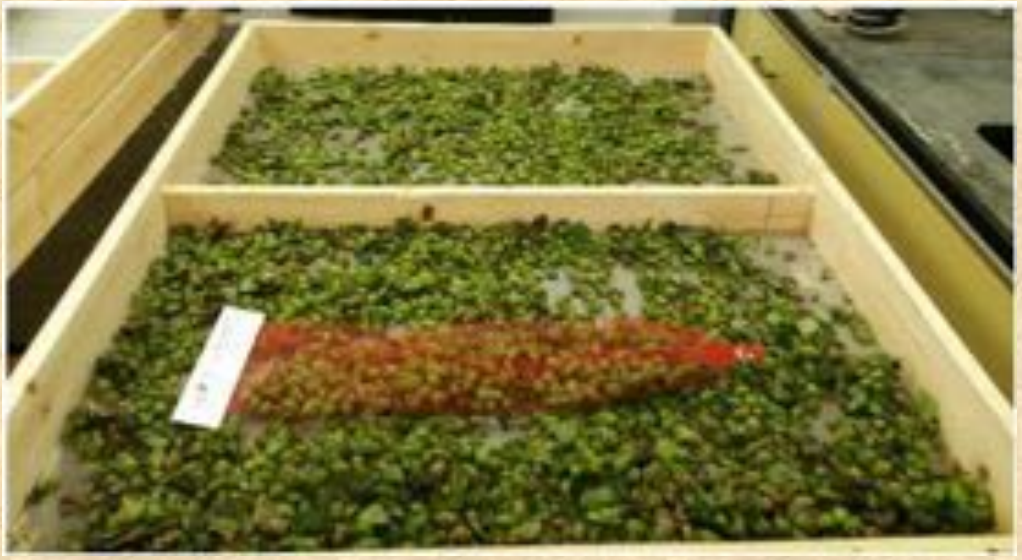
- **Maintaining understory**

Hops Production
Harvests

- **Determined by cone ripening**
  - **Bracts begin to dry – papery feel**
  - **Lupulin resin turn from bright yellow to golden**
  - **Some bracts edges turn brown**

WyeRec year 2 Harvest dates

- **Cascade – August 8th/Sept 1st**
- **Newport – Sept 1st**
- **Nugget – Sept 15th**



Hops Production Harvests

- After Harvest the hops must be dried to between 8 and 12% moisture
- Dry at a temp of less than 135F with active air flow
- Dry in an insulated room with low humidity
- The quicker, the better

Hops Production Harvests

Hops Production

Yield

- 1st year hops will have a negligible yield
- 2nd year hops will yield 50%
- 3rd year hops will yield 75%
- 4th year (and beyond) will yield 100%

WyeRec Yield for 2nd year Cascade

- Close to 0.5lbs per plant (dried to 10% moisture)
- Target yield for 2nd year Cascade in Pacific Northwest is 0.75lbs per plant (1.5lbs at full maturity)

Wye Chemical Testing for 2nd year Cascade

Cascade 2017 (1st Harvest)	
Alpha Acids (%)	4.98
Cohumulone (%)	1.30
Humulone (%)	3.68
Beta Acids (%)	7.32
Colupulone (%)	2.96
Lupulone(%)	4.36

Cascade 2017 (2nd Harvest)	
Alpha Acids (%)	4.58
Cohumulone (%)	1.29
Humulone (%)	3.29
Beta Acids (%)	5.77
Colupulone (%)	2.48
Lupulone(%)	3.28

Cascade

U.S.
Aroma Hop

Cascade was developed in the U.S.D.A. breeding program in Oregon and released as a U.S. aroma variety in 1972. It is characterized by a dark green elongated cone with an aroma that is of medium strength with very distinct floral notes and is often described as having grapefruit-like character. Cascade is the definitive hop for American craft brews.

Pedigree	Cross of English Fuggle with male originating from Russian variety Serebrianka
Aroma	Unique floral, citrus
Alpha Acids*	4.5 - 7.0 %
Beta Acids	4.8 - 7.0 %
Cohumulone	33 - 40 % of alpha acids
Total Oil	0.7 - 1.4 ml/100g
Myrcene	45 - 60 % of total oil
Humulene	8 - 13 % of total oil
Caryophyllene	3 - 6 % of total oil
Farnesene	3 - 7 % of total oil
Storage Stability	Very poor

VirginiaTech

Invent the Future

VT Enology Analytical Services Laboratory

Ken Hurley M.S. - TTB Certified Wine / Beer / Distilled Spirits Chemist
Ann Sandbrook - Enology Laboratory Specialist

View Data

Invoice Number	W766	
Received	09/09/2016	
Analyzed	09/09/2016	
Vintage	2016	
Varietal	Alpharoma	
Result	Test	Results
	Moisture (%)	9.2
	Dry Matter(%)	90.8
	Cohumulone (% of Alpha)	21.1
	Hops Storage Index	0.57
	As Received:	
	Alpha Acids (%)	1.16
	Cohumulone (%)	0.24
	Humulone (%)	0.91
	Beta Acids (%)	0.96
	Colupulone (%)	0.36
	Lupulone(%)	0.60
	Dry Weight Basis:	
	Alpha Acids (%)	1.27
	Cohumulone (%)	0.27
	Humulone (%)	1.00
	Beta Acids (%)	1.06
	Colupulone (%)	0.40
	Lupulone(%)	0.66
Comment	For more information visit our website www.vtwines.info, the Enology Notes Archive, and our Online Publications	

Questions?

UNIVERSITY OF MARYLAND EXTENSION

The University of Maryland Extension programs are open to any person and will not discriminate against anyone because of race, age, sex, color, sexual orientation, physical or mental disability, religion, ancestry, national origin, marital status, genetic information, political affiliation, and gender identity or expression.

Nate Richards
Kent County Extension Office
nrichard@umd.edu