Hops – a new specialty crop in Connecticut

Dr. Katja Maurer
Department of Valley Laboratory
The Connecticut Agricultural Experiment Station
Profile: Hops

- **Family:** Cannabaceae, hemp family
- **Species:** *Humulus lupulus*, *H. japonicas*, *H. yunnanensis*
- Monoculture
- Perennial climbing plant
- An average growth of 4 inches, up to 12 inches daily
- The height of the trellis system is 16 to 22 feet

Cooper Engraving of *Humulus lupulus* from 1796 (Barth et al. 1994)
Profile: Hops

- Distribution:

  temperate climate

  35th – 55th degrees of latitude
Profile: Hops

- Application: beer, calmatives in medicine, cosmetics, additive to liquors
- Brewing: cones of female hops
- $\alpha$-acids, $\beta$-acids, essential oils: produced in lupulin glands
- Bitterness, aroma, foam, flavor, stability, antimicrobial activity
Profile: Hops

Female inflorescence or burr

Mature hop cones
Profile: Hops

Male inflorescence

http://www.aphotoflora.com/d_humulus_lupulus_hop.html

Fertilized cones

http://www.lfl.bayern.de/ipz/hopfen/108626/index.php

Destroy male hops!
Danger of wild hops!
History

Fossilized hops pollen

Paleolithic times: medicine

5th century: 1st documented hop cultivation in Europe

1880: peak in NY

1872: moved to Washington State

1920: enactment of Prohibition

1950s: half of the world production in Pacific Northwest

Today: Germany and US are the biggest producers (ca. 30,800 t)
How to start

- **Location**
  - Soil quality: soil texture, good drainage, pH 6 – 6.8
  - Sun exposure
  - Wind

- **Size of the hop yard**

- **Choice of varieties:**
  - 80 - 120 different varieties
  - Bittering, aroma, dual purpose

- **Equipment**
Hop yard set up

Hop yard set up

Hedgerow

https://twitter.com/stanhieronymus/status/470550224726155265

http://www.britishhops.org.uk/history-of-hops/
Hop yard set up

Hobby hop yards

Hop yard set up

Hobby hop yards

http://www.growinghops.net/how-to-grow-hops/

Hop yard set up

Hobby hop yards

http://bluebellhopyard.com/photos/hopyard-shots/

http://upknorth.com/blog/brew-your-own-beer-grow-your-own-hops
TO DO: Spring

- Prune the crowns (prevention of diseases, rejuvenation of the rootstock)
- Get the trellis system ready
- Train 2-3 bines per twine, 2-4 twine per plant
- Prune redundant shoots
- Re-train
- Fertilize
- Weed control
Let it grow

- Check the hops weekly
- Scout for diseases and pests weekly
- Check the weather
- Fertilize
- Irrigate
- Weed control
- Strip off the lower leaves (control of diseases and pests)
Diseases and Pests

- Diseases caused by fungi and mildews
  - Downy mildew, powdery mildew, Verticillium wilt…

- Arthropod pests
  - Damson-hop aphids, two-spotted spider mites, leaf hoppers, Japanese beetles…

- Viruses and viroids
  - Carlavirus complex, Apple mosaic virus, Hop stunt viroid…
Diseases and Pests

- Arthropod pests
  - damson-hop aphids, two-spotted spider mites, leaf hoppers, Japanese beetles…
  
Aphids

Spider mites

Potato leafhopper
Diseases and Pests

- Viruses and viroids
  - Carlavirus complex, Apple mosaic virus, Hop stunt viroid...
Knowledge of the diseases and pests
Monitoring weekly (economic threshold)
Biocontrol
Chemical Application
Resistant or tolerant cultivars
Certified rhizomes
Cultivation (tillage, pruning, stripping of the lower leaves, removing diseased leaves or plants…)
Disinfection of the equipment
Weed management
Irrigation and fertilizer management
Weather condition
TO DO: Summer - Fall

- Harvest: cut the bines and separate the cones (21-27% dry matter)
- Mid August to mid September
- Dry the cones, eventually bale or/and vacuum pack, pelletize
Harvest

By hand

- 500 person hours / 1000 plants (1 acre) -> ca. 60 people for 8 hours
- < ¼ acre hop yard

Harvester

- 120 – 1000 bines/hour
- $5,000 – $45,000
Drying

- 8 - 10% moisture
- 120 - 168°F for 4 - 10 hours

Hop kiln

http://www.washingtonbeerblog.com/2012-hop-harvest-pictures-words/
Storage and Pelletizing

- Compression of hops into bales, pellets or plugs

http://www.fwwarehousing.com/brewery-needed-custom-cold-storage-solution-for-warehousing-hops/

http://djcoregon.com/files/2010/03/0308_indie_hops_hubbard_booco_1.jpg
Quality

- $\alpha$- and $\beta$-acids
- Oil content
- Chem. compounds of volatile oil
- HSI (hop storage index)
Pricing - Marketing - Selling

- ½ acre hops: home brewers or a small brewpub
- At least 1 (-10) acre for achieving profit
  - $6 – $12 a pound for pelletized and leaf hops
  - $4 - $8 a pound for wet (fresh) hops
  - $8,000 to $16,200 per acre
- BUT: too early to predict the price for the East

- 10 acres = $400,000 - $500,000 investments
- Min. 5 years to repay the investment

CAES- Plant Science Day 2016  www.ct.gov/caes
TO DO: Fall - Winter

- Cut the bines back after the first frost in November
What’s going on in CT?

- Smokedown Farm, Sharon, 9 acres (9,000 plants)
- Pioneer Hops of CT, South Farms, Morris, 5.5 acres (6,900 plants)
- DeFrancesco Farm, Northford
- CAES: Trial hop yards at the Valley Laboratory in Windsor and Lockwood Farm in Hamden

Small scales:
- Two Roads Brewing Co., Stratford
- Black Hog Brewery, Oxford
- Kent Falls Brewing Company, Kent

Connecticut Hop Growers Association
What’s going on in CT?

- Pioneer Hops of CT, South Farms, Morris
CAES hops

- Valley Laboratory, Windsor
CAES hops

- Lockwood Farm, Hamden
CAES hops

- 5 varieties: AlphAroma, Cascade, Newport, Perle, Summit
- 10 more varieties at Windsor, ca. 50 varieties at Lockwood Farm
- Low and high trellis systems
CAES hops

- **Aim**
  - Is it possible to grow hops successfully in CT?
  - Evaluation of yields, growing characteristics, susceptibility to diseases and pests

- **Results**
  - Best varieties: Cascade (high trellis), Summit (low trellis)
  - High trellis system
  - Perle: smallest growth and lowest yield
  - Diseases: downy mildew (AlphAroma)
  - Pests: potato leafhoppers, spider mites, aphids

- **Conclusion**
  - We have proven the feasibility of hop production in CT.
Thanks to:

- Dr. James LaMondia & team
- James Preste & team
- Richard Cecarelli & team
- American Dwarf Hop Association
- The CT Dept. of Agriculture
Where do you find our hops?
Dr. Katja Maurer
Department of Valley Laboratory
153 Cook Hill Road
P.O. Box 248
Windsor, CT 06095

Phone: 860.683.4985
Email: Katja.Maurer@ct.gov
Website: www.ct.gov/caes