HOPS INDUSTRY OVERVIEW, INSPECTION/CERTIFICATION PANEL

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Panel Discussion on Hops

- The US hop industry & how it is changing
- Disease issues affecting hops-viruses & mildews
- Challenges of visual inspection and the need for certification
- What is planting stock certification?
  - NCPN
  - State pathogen-tested certification programs under development
- Questions? Please ask as we go along
Hops in the United States

- One of the oldest North American crops, grown since colonial times
- East Coast of US used to be main hop-producing area
- 1900s prohibition and disease wiped out traditional growing areas- downy & powdery mildew
- Hop production moved west
HOW TO PROPAGATE HOPS

- Propagated from rhizomes or soft root cuttings
- Tissue culture propagation is becoming more popular
- Grown for 1 season in greenhouse before being transplanted into the hopyard

Matousek et al., 2011; www.homebrew.com
Cuttings to cones in 1 season
**Hop Production Requirements**

- Perennial crop
- Requires long days to flower and cone
- Requires a specific chilling requirement (<40 F 1-2 months)
- Most commercial production occurs at 35-50 degrees latitude

*US Hop Production Areas - 2014*
2015 North American Commercial Hop Production

45,488 Total Acres

2018
PNW: 55,000
104 million lbs

MI: 900 acres

Everyone else:
1,000 acres

Worth $618 million
Why?

- BEER!!!
• Challenges to Clean Plant Production in MI:
  • New and inexperienced growers trying to enter the market
  • Trying to find the next niche variety to satisfy the brewing companies
  • Limited varieties available through the Clean Plant Center
  • Testing is expensive and can take time
  • Humidity (increases disease pressure!!)
Hops Pests & Diseases of Concern

- Powdery Mildew (*Podosphaera macularis*)
- Downy Mildew (*Pseudoperonospora humuli*)
- Verticillium Wilt (*Verticillium albo-atrum*)
- Viruses and viroids
- Crown gall (*Agrobacterium tumefaciens*)
- Nematodes (*Heterodera humuli, Xiphinema spp.*)
**Virus-like Organisms of Concern for Hops**

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* Included in current testing protocol at NCPC-NW

List from S. Harper, Clean Plant Center Northwest; Images D. Gent
PNW Hop Disease Quarantine

• Creates a regional protected three state area of hop production (Washington, Idaho, Oregon)
• Includes powdery mildew, *Hop stunt virus*, *Arabis mosaic virus*, and ilarviruses.
• NO hop plants or propagative parts allowed in from all other states;
  • Exceptions vetted through hop commission (none allowed in WA/OR to date)
  • Cones, DNA, and extract can move freely

Quarantine + disease tested ‘certified’ stock =
*High yields, quality and disease free cones*
**Michigan Hops Inspection**

**Frequency:**
- Two times per season
  - Early season to look for mildew
  - Late season to look for virus

**All visual inspection**
Michigan (NE) Hops Inspection
Michigan (NE) Hops Inspection
State level cert programs are the ‘Stay Clean’ part of clean plants

Hops since 1964

Relies on NCPN G1 foundation plants
NCPN funds 28 clean plant centers around the US

NCPN Supported Clean Plant Centers and Programs

35 Initiatives at 28 Centers in 19 States from 2008-2016

http://nationalcleanplantnetwork.org/
NCPN Clean Plant Center - NW at WSU Prosser, Washington

• Maintains G1 (virus free) Foundation collections of Fruit trees, grapevines & hops

• Retest G1 plants every year, therapeutics - now have HTS capabilities

• Import cultivars from programs outside the U.S. - (Fruit trees & Hops) - *WSU is the ONLY hop G1 source in the country*
State Planting Stock Certification Programs -

- At least 17 states have active virus/pathogen tested certification programs:
  - WA, OR, CA, MI, NY, PA, WI, AZ, TX, MO, LA, SC, NC, FL...
- This is not SANC, but it could be a module in a SANC-certified nursery
‘Certification’ Basic Principles

- Virus-tested G1 foundation Source (NCPN)
- Limited generations - Now G1 / G2 / G3 / G4
  - Replacing ‘Foundation, Registered & Certified’
- Held in a way to prevent re-infection
  - Isolation from non-certified plants,
  - Exclusion of virus vectors
- Visual Inspections (backed up by testing of symptoms to confirm status)
- Identity Preservation to G1 source plant
- Mandatory rotational testing of G2 mother plants
- Removal of infected plants
Summary of Plant Generations in Certification

Clean Plant Centers (NCPN)

G1 level – tested for all known pathogens

State Level Certification:
G2/G3 level – all registered hops tested for virus presence

Nurseries produce G4 Level nursery stock for sale to hopyards
established 1964, last amended in 2009 - voluntary program

No participants, needs rewriting

What changes needed?

- Adopt NCPN ‘Generation level’ terminology,
- Specify NCPN centers as the G1 source
- Add TC and greenhouse production of G2 plants.
- Now based on visual inspection only - add required G2 testing?
Harmonization of State Certification Programs -

- 2008 & 2014 Farm Bills fund a new era of cooperation between states-
  - Regional grapevine standards for OR/WA/ID
  - Hop certification project to create a model standard for states
  - Fruit tree harmonization effort in WA/OR/CA
  - A nursery cert standards working group - MI, NY, PA, OR, WA, CA collaborating with USDA

- Ohm........
Current Farm Bill-funded effort to develop model hop certification standard

- Other states developing certification rules- harmonizing these standards regionally and nationally benefits everyone
  - Could allow freer interstate movement of certified planting stock;
  - What does ‘Certified’ mean?
- Similar harmonization effort for grapevines & fruit trees is happening now
Ways to help certification programs:

• Drink more beer!

• Any questions?