

# **Certification Guidelines for Hop Propagation**

- ▶ **Purpose:** To provide propagators and state agricultural departments a set of best management practices to apply in a manner that addresses pathogen concerns specific to an individual state.

# G-level Certification

- ▶ Signifies the generation plant stock is related to the original virus tested plant material.
- ▶ WSU NCPN-Hops Prosser facility is currently the only certified Clean Plant Center in the US for hops.

# G1 propagation and maintenance

- ▶ Foundation material for clean stock programs which has tested negative for all pathogens of concern according to approved methods.
- ▶ Production and maintenance of G1 material must be within a USDA-APHIS approved system.
- ▶ State certifying agency must approve a G1 producer before any G1 material can be accepted into a virus certification program.

Hop Mosaic Virus
Hop Latent Virus
American Hop Latent Virus
Apple Mosaic Virus
Arabis Mosaic Virus
Alfalfa Mosaic Virus
Cherry Leafroll Virus
Cucumber Mosaic Virus
Humulus Japonicus Latent Virus
Tomato Bush Stunt Virus
Tobacco Ringspot Virus
Tobacco Necrosis Virus
Strawberry Latent Ringspot Virus
Hop Stunt Viroid
Citrus Bark Cracking Viroid*

# Will propagators have G1 material?

- ▶ No. Only the USDA certified facility will maintain and propagate G1 material.
- ▶ Once the material leaves the facility for propagation or initiation into tissue culture, this material will be considered G2 (one generation removed from the source material).

# G2 propagation and maintenance

- ▶ Only stock material from a G1 source will be eligible for certification as a G2 block.
- ▶ Prior to an introduction from a G1 source, nurseries must provide a state certifying agency with a list of plants to be introduced.
- ▶ The nursery must maintain records of the origin of source materials used in establishing and expanding a G2.

# G2 propagation and maintenance

Location: Maintained in a screenhouse/greenhouse that has been inspected and approved upon meeting set conditions.

- ▶ Visually inspected twice annually for disease vectors
- ▶ Vector control methods
- ▶ Be at least 10 feet from non-certified *Cannabaceae* species



# G2 propagation and maintenance

- ▶ Double door to the outside and/or a positive pressure system
- ▶ Screens with mesh that excludes vectors
- ▶ Footbath at entrance
- ▶ Block/bench contains only G2 plants





# G2 propagation and maintenance

- ▶ Lockable doors
- ▶ Floor free of debris and weeds
- ▶ Clearly labeled greenhouse sections to indicate status of material
- ▶ Constructed in a way to avoid direct contact of plants with soil.

# G2 propagation and maintenance

- ▶ Plantlets regenerated from tissue culture are considered G2 providing all certification requirements are met. This certification will last 3 years.
- ▶ G2 plants maintained in tissue culture will retain G2 status.
- ▶ Tools and supplies must be maintained in a way to prevent mechanical transmission of pathogens.

# G2 propagation and maintenance

## Maintenance:

- ▶ G2 plants kept in separate, sanitized containers
- ▶ Prevent flowering
- ▶ Sterile planting media
- ▶ Sustained pest monitoring, management, and record keeping



Pathogen(s)	Transmitted by	Management Recommendations
<u>Viroids</u> : Hop stunt viroid, Hop latent viroid, etc.	Mechanical (tools, equipment)	Clean tools with 10% bleach for at least 10 minutes then rinse with water between plants/rows/fields.
<u>Nepoviruses</u> : Arabis mosaic virus, Tobacco ringspot virus, Tomato ringspot virus, etc.	Nematodes (Xiphinema sp.)  Mechanical (tools, equipment)	Fumigate between plantings, remove broadleaf weeds as these can be alternative hosts for these viruses.  Clean tools with 10% bleach for at least 10 minutes then rinse with water between plants/rows/fields.
<u>Illarviruses</u> : Apple mosaic virus, Prunus necrotic ringspot virus	Mechanical (tools, equipment)	Clean tools with 10% bleach for at least 10 minutes then rinse with water between plants/rows/fields.
<u>Carlaviruses</u> : Hop mosaic virus, Hop latent virus, American hop latent virus	Aphids (Green Peach, Hop, and Potato Aphids)  Mechanical (tools, equipment)	Apply insecticides as appropriate to suppress aphid population numbers in field, scout and/or use traps/sticky cards to monitor aphid incidence.  Clean tools with 10% bleach for at least 10 minutes then rinse with water between plants/rows/fields.

# G2 propagation and maintenance

Inspection and testing:

- ▶ Each G2 plant must be inspected twice yearly, once during the propagation season and once during another part of the season. Any diseased or unusual growth must be recorded and investigated.
- ▶ Each G2 plant must be tested every 3 years
- ▶ Labeling and location mapping shown to inspector.

# G2 propagation and maintenance

Record keeping:

- ▶ Inventory of all registered plants in G2 blocks
- ▶ List of plants removed, their location, and reason for removal
- ▶ Records of tests and inspections, pest monitoring and management
- ▶ All G3 stock distributed from G2 block

# G3 propagation and maintenance

G3 stock is propagated from G1 or G2 stock and is maintained in tissue culture, greenhouse, or in a field block.



# G3 propagation and maintenance

Screenhouse/screened greenhouse:

- ▶ Same requirements as G2



# G3 propagation and maintenance

## Field:

- ▶ Isolated from non-certified *Cannabaceae* species and blocks at lower G-levels
- ▶ Planting site selected to minimize introduction of soil-borne vectors
- ▶ Sites must test negative for soil-borne vectors for 1 year prior to planting
- ▶ Fumigation if needed
- ▶ Cannot be grown in ground previously planted to non-certified *Cannabaceae* species in past 10 years

# G3 propagation and maintenance

In pots outside:

- ▶ Set on a barrier to prevent direct contact with soil
- ▶ Site inspected and fumigated if needed to control vectors
- ▶ Sterile soil

# G3 propagation and maintenance

## Field planting:

- ▶ Weeds must be kept clear 30 ft around site and controlled within the site
- ▶ Yearly testing for pathogens
- ▶ 500 ft buffer from wild and non-certified *Cannabaceae* species

# G3 propagation and maintenance

## Field planting:

- ▶ Maintained in a manner to keep roots from intermingling with plants from different blocks
- ▶ Tools and supplies maintained in a way to prevent mechanical transmission of pathogens
- ▶ Sustained pest monitoring and management, including buffer zones

# G3 propagation and maintenance

Field planting inspection, testing, and record keeping:

- ▶ Same as for G2
- ▶ Records for all soil and plant treatments
- ▶ Inventory and record of all G4 stock propagated from G3 block

# **G4 propagation and maintenance**

This is likely the generation that would be distributed to the customer, and would be the last level certified by a state inspector.

# **G4 propagation and maintenance**

If G1, G2, or G3 stock is being supplied for use in G4 production by a third party, the nursery must provide documentation from the third party's certifying agency to support the status of all source material obtained.

# G4 propagation and maintenance

The length of time that G4 material can be maintained will vary depending on regional variations and testing results.

Screenhouse/greenhouse:

- ▶ 10 ft buffer zone and adherence to the same restrictions as plants maintained at higher G-levels



# **G4 propagation and maintenance**

Field:

Same requirements as for G3 field plantings.

# Program Costs

- ▶ Determined by each State Dept of Ag while creating the certification program
- ▶ Examples:
  - ▶ X% of revenue from certified plant material sold is collected
  - ▶ A specific amount per plant sold is collected
- ▶ Opportunities:
  - ▶ Continuous funding stream to G1 plant facilities

# Why should the states have certification programs?

- ▶ Ensure a consistent set of BMPs are followed by propagators
- ▶ Mitigate the risk of new yards starting with viruses

*Certification programs are industry driven – talk to your State Dept of Ag*