Plant Certification Programs: Enhancing Trade in Plants and Minimizing Trade of Plant Viruses

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Harmonizing Certification Programs

• Goal is to develop a single program that each state would use
• Use information from multiple programs, EPPO, NAPPO, existing State Programs
• Develop list of ‘Targeted Pathogens’ and diseases based on published literature
• The Proposed Certification Standard developed by Scientists, Regulators and Industry
• Pilot projects to evaluate effectiveness and costs
• Vaccinium, Rubus
Virus Management 101

• Nothing is more important in virus control than starting with CLEAN PLANTS
• Second is vector management
• Isolation from infected sources reduces risk
• These factors are what the BMPs for Certification are based on
Certification – BMPs with Testing

In **nurseries** virus control is the primary objective, virus disease control is not the goal (START CLEAN)

BMPs plus testing to minimize risk of infection during plant increase (STAY CLEAN)

In **production fields**, disease control is the objective. Virus infection that does not cause disease is not important to a fruit grower
Certification Scheme

G1
Material tested for all targeted pathogens, source for all further propagation
Protected Culture

G2
Propagated from G1 stock, source for all further propagation
Protected Culture

G3
Propagated from G2 stock, source for all further propagation
Protected Culture or Field

G4
Propagated from G2 or G3 stock, sold to producers
Protected Culture or Field
Developing a G1 Plant

- Negative for target pathogens
  - Bioassays
- Detection
  - Large scale sequencing
  - PCR, ELISA, etc
- Positive for target pathogens
  - Thermal therapy, meristem tip-culture, regeneration whole plants
  - Laboratory testing for detected targeted pathogen(s)
- G1 plant
  - Enters certification scheme
NCPN Funding

- NCPN helps funds G1 blocks
- Testing and therapy for new additions to G1 blocks from breeding programs or other sources
- Limited development/adaptation of new tools to enhance testing of G1 blocks
- In retesting of the G1 block for all targeted viruses on a regular schedule
- Retest entire G1 block if a new virus is identified in the crop

http://ncpnberries.org
http://nationalcleanplantnetwork.org
Targeted Pathogens - Blueberry

- Blueberry latent spherical virus
- Blueberry leaf mottle virus
- Blueberry mosaic assoc. virus
- Blueberry green mosaic assoc. virus
- Blueberry necrotic ring blotch virus
- Blueberry red ringspot virus
- Blueberry scorch virus
- Blueberry shock virus
- Blueberry shoestring virus
- Blueberry virus A
- Blueberry fruit drop asso. virus
- Cherry leaf roll virus
- Peach rosette mosaic virus
- Strawberry latent ringspot virus
- Tobacco ringspot virus
- Tomato ringspot virus
- Blueberry stunt phytoplasma
- Crown gall organisms
- Xylella

Not Blueberry latent virus, cryptic virus
A. Introduction
B. General Provisions
C. Scope
D. Common Definitions, Abbreviations and Acronyms
E. Program Responsibilities
   a. G1 Blueberry Plants
   b. Responsibilities of G2 Nurseries
   c. Responsibilities of G3 and G4 Nurseries
   d. Responsibilities of Participating State Departments of Agriculture
F. Eligibility Requirements
   a. G1 Block
   b. G2 Block
   c. G3 Block
   d. G4 Block
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G. References and Websites for National Blueberry Certification Guidelines
II. Appendices

Appendix A. National Vaccinium Certification Pathogen List and recommended testing procedures
Appendix B. Site Requirements for National Vaccinium Certification Standard for Blueberries
Appendix C. Nursery Sanitation and Pest Management Guidelines for National Vaccinium Certification Standard
Appendix D. Sampling Protocols for National Vaccinium Certification Standard
Appendix E. Visual Inspection Guidelines for National Vaccinium Certification Standard
Appendix F. Blueberry Pests of Concern in Nursery Stock, Their Symptoms, Reported Distribution, Diagnostic Tests, and Nutrient Deficiency Symptoms
Appendix G. Protocols for Testing for National Vaccinium Certification Standards
Appendix H. Containerized Plants
Appendix I. Pest Management Plan
Appendix J. Nursery Field Map and Inventory
Appendix K. Documentation, Identification and Tagging
Appendix L. Forms and Labels
# Common Viruses by Growing Region

To Inform Testing Priority for Certification Programs

<table>
<thead>
<tr>
<th>Virus</th>
<th>PNW</th>
<th>NE</th>
<th>SE</th>
<th>MW</th>
<th>S-Cent</th>
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<td>Organism</td>
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<td>Pacific NW</td>
<td>Upper MW</td>
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*1 – moves in the environment, 2 – present at low levels, 3 – reported to occur, 4 – not known to occur, 5 – no data available, these ratings refer to the presence of the pathogen in
Number of Rubus viruses and their vectors in SE USA – certification all plant propagation stages would need to be in protected culture
## Viruses isolated from BYVD plants

<table>
<thead>
<tr>
<th>Virus</th>
<th>Genus</th>
<th>Vector</th>
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<tr>
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<td>Emara</td>
<td>Eriophyid mites?</td>
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<td>Bramby</td>
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<td>Tospo</td>
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<td>GSyV-1</td>
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<tr>
<td>ToRSV</td>
<td>Nepo</td>
<td>Nematode</td>
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</table>
Draft Standards Include:

Two inspections annually
Testing requirements at each G level
Testing included at the G4 level, certified plants for sale, previously only visual inspections
Testing at G4 based on hypergeometric sampling, 95% chance of detecting a 5% infection level
Strawberry Virus Problems from Nurseries

Problem in CA 2002-2003, ~50 million in crop loss, first serious losses where criniviruses were major factor in strawberry

Virus problem in nurseries in eastern Canada, led to serious crop losses in eastern 2/3 of US, 2013-2015, est. $25 million crop loss in 2013
Moving strawberry viruses in plants
Florida – Plants from two nurseries in Nova Scotia
Cost grower >$100,000 per acre, to remove, replant, reestablish
Virus in nursery, even without disease could erupt into a disaster at any time

Strawberries in eastern Canada – 2012/13
Strawberries in CA in 2002-2003
Strawberries in CA in 2013
Blackberries in the southeastern US
Questions