

Research in Plain English (RIPE)

Economic Studies Reinforce Efforts to Safeguard Specialty Crops in the United States

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Summary by Michelle Podolec.

The Takeaway

- Many specialty crops, including grapevines, are propagated via cuttings or other vegetative parts instead of seeds. Clonal propagation can lead to transmission of pathogens from infected tissues to new plantings.
- Infected planting material causes significant economic losses in production, quality and lifespan of perennial crops.
- Techniques such as tissue culture combined with extensive testing can eliminate viruses to produce clean, virus-tested foundation plant stocks.
- Planting clean material derived from pathogen-tested foundation plant stock helps growers of specialty crop avoid expensive and difficult to manage diseases.
- Since its founding in 2010, a modest amount (\$5 M/year to date) of Federal funding to National Clean Plant Centers has supported pathogen testing and elimination in seven specialty crops, including grapevines, as well as the production, maintenance and distribution of clean stocks.
- Across several crops, studies estimated return on public investment in National Clean Plant Centers ranging from 10:1 to 150:1.
- In grapevines, economic studies have estimated that each dollar of public investment in the production, maintenance and distribution of clean (pathogen-tested) plants will increase grower returns by \$38 to \$140 over the next 10 years– a phenomenal return on public investment.
- Economic studies on disease management options (e.g. the value of planting with clean vines, when to rogue or replant) that maximize grower returns justify grower adoption of clean plants.

Background

Many specialty crops including grapevines are clonally propagated, and are genetically identical to their parent vines. Cuttings used to propagate both rootstock and scion can disseminate infected plant tissue to new plantings. Infections by so-called 'graft transmissible' viruses, viroids, bacteria and phytoplasmas are not curable – once infected plants remain infected. Once in the field, infections can spread to uninfected plants by airborne infections, pollen, insect vectors, and contaminated tools and machines. For grapevines, pathogens are primarily transmitted by insect vectors. Management of the pathogens and maintaining sufficient crop quality is difficult and expensive for growers.

Methods

This publication reviews recent research outlining economic impacts of diseases of vegetatively-propagated specialty crops. These studies estimated not only losses to the industry as a whole, but also profit-maximizing disease management solutions (when to rogue infected plants, when to replant) for viral pathogens of grapes. The publication also discusses the return on public investment in National Clean Plant Network (NCPN) centers, and outlines additional opportunities for studies that could help growers use more clean planting material.

National Clean Plant Centers

The National Clean Plant Network, funded by the USDA since 2010, was created to protect specialty crops from economically harmful pests and diseases. The mission of its 33 Clean Plant Centers (5 for grapes) is to maintain pathogen-tested foundation plant stocks and distribute clean propagative material to nurseries, growers, and consumers. NCPN currently supports seven crops (grapes, fruit trees, citrus, berries, hops, roses, and sweet potatoes). Material from the thousands of accessions maintained by NCPN is distributed annually from pathogen-tested foundation plant stocks.

Clean plant centers maintain a limited amount of foundation plants (less than 5 individuals) of each accession, with continual testing and surveillance. They annually produce a limited amount of cuttings to nurseries for establishing increase blocks, which are used to provide further cuttings for commercial propagation.

Economic Impact to Grapes

The publication covered economic impact studies of five disease examples: citrus greening, grapevine leafroll, grapevine red blotch, grapevine Pierce's disease and plum pox.

For grapevine viral diseases, the economic studies concluded:

- Grapevine leafroll disease is associated with \$25,000 to \$226,000 per acre losses over the 25 year lifespan of a vineyard.
- The annual impact of grapevine leafroll virus 3 in California was estimated at \$90 million.
- Other studies detailed additional losses due to Pierce's disease (\$92 million annually) or grapevine red blotch virus (\$2,200/ha in Eastern Washington, \$69,500/ha in Napa).
- Grapevine testing and foundation plantings at UC-Davis' Foundation Plant Services provided a 10-fold benefit (\$20 million annually) for North Coast vineyards, and an additional \$70,000 annual benefit to other grape growing regions in California.

In addition to estimating disease-related losses, economic studies have also outlined the following management options:

- Using "net-present value" analysis to evaluate economic benefits of management (rogueing and insecticide or replanting).
- Generally, studies recommended rogueing along with with mealybug insecticide treatment in vineyards with low (5-10% incidence) levels of leafroll, and replanting when >25% of vines were infected.
- Recommendations varied by region, crop value, and management practices.

If growers select material derived from disease-tested plant stock for planting specialty crops, they can introduction of graft-transmissible diseases to their operations.

Establishing and maintaining clean plant materials is expensive, and care must be taken to keep the materials free from diseases. Supply of clean stock may be limited, and availability of newer cultivars can fall short of grower demand, especially when new cultivars/introductions are common. Breeding programs can screen and verify their elite selections are free of pathogens before launching new cultivars or new clones to ensure sufficient supply to cover grower demand.

NCPN centers are expensive to maintain, but provide many economic benefits to growers. They are funded with a mix of public funds, user fees, commodity marketing orders or checkoff programs, and institutional support. Public funds help moderate NCPN centers susceptibility to market fluctuation and ensure continuous operation. Economic studies demonstrate that NCPN centers provide important economic benefits to growers and the public, and investing in them saves money, ensures crops are healthy, and supports a sustainable viticulture and fruit tree production industry.

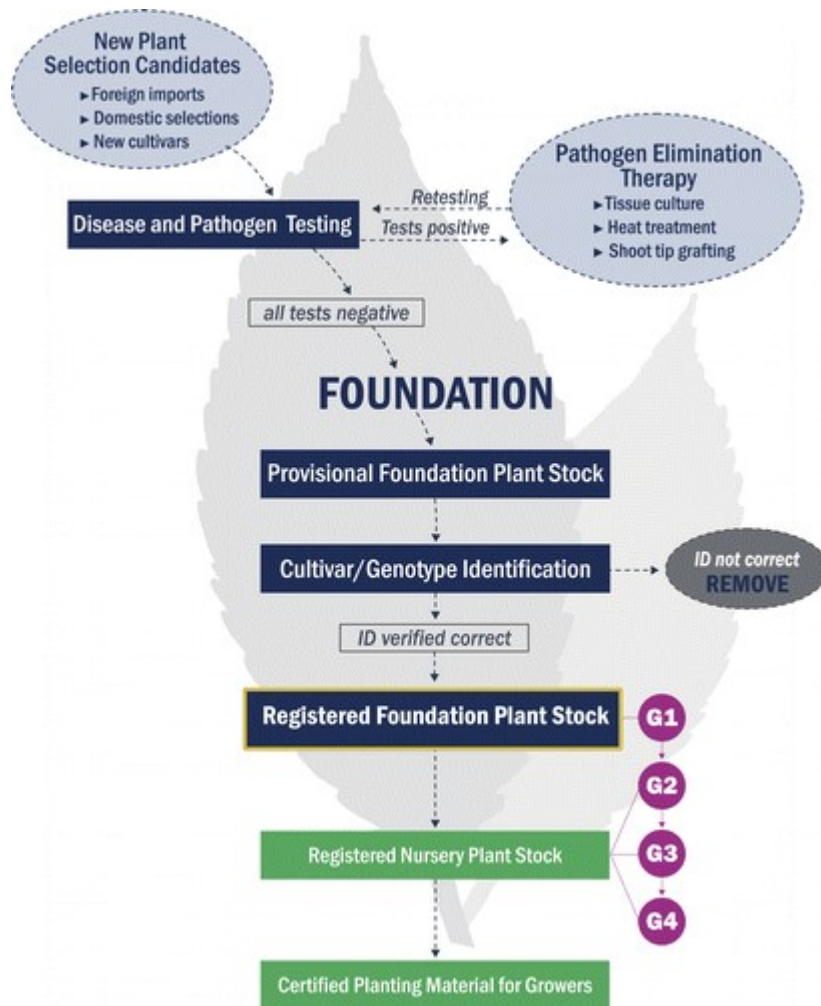


Figure 1 Flowchart depicting the journey of a specialty crop selection through a center of the National Clean Plant Network (NCPN).

Economic studies like those reviewed in this paper contribute to grower recommendations for pathogen control. For growers to adopt the use of certified virus-tested vines, they need to be convinced of the financial benefits of the proposed integrated disease management solutions. By using disease thresholds and decision matrices that have been customized to grower regions, researchers and educators can provide recommendations that are easier to understand and use. A decision-making framework that uses profit-maximizing solutions helps growers better understand the financial impacts of disease ecology and make better decisions on disease control methods for their crops. Utilizing certified disease-free planting materials is a recommendation with clear financial benefits for growers.

Conclusions and Practical Considerations

While not all clean planting materials available at NCPN have been analyzed for their economic benefits, the selected studies clearly show the benefits of providing clean planting material to growers. The examples reviewed in this paper show the benefits of public investment in the NCPN centers. They:

- Incentivize adoption of clean planting material from clean disease-tested stocks.
- Contribute to the development of disease management solutions rooted in profit maximization.
- Contribute to development of ecologically driven solutions to disease.
- Facilitate solutions that speak to grower needs for profitability.
- Support collaboration with growers.

Additional economic studies of specialty crops, pathogens and diseases, and commercial producer adoption of clean planting materials would help to document the value of NCPN.

Pathogen-tested materials help increase sustainability of specialty crop cultivation and economic stability of grower communities. NCPN clean plant centers are important sources of disease-free products for nurseries and growers. Funding the NCPN is an impactful way for the public to support specialty crop growers.

Additional research into specialty crops, community uptake, and clear communication strategies for research and results would help support NCPN's success, and advance efforts to ensure United States specialty crop industries remain successful and sustainable in a competitive global market.

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