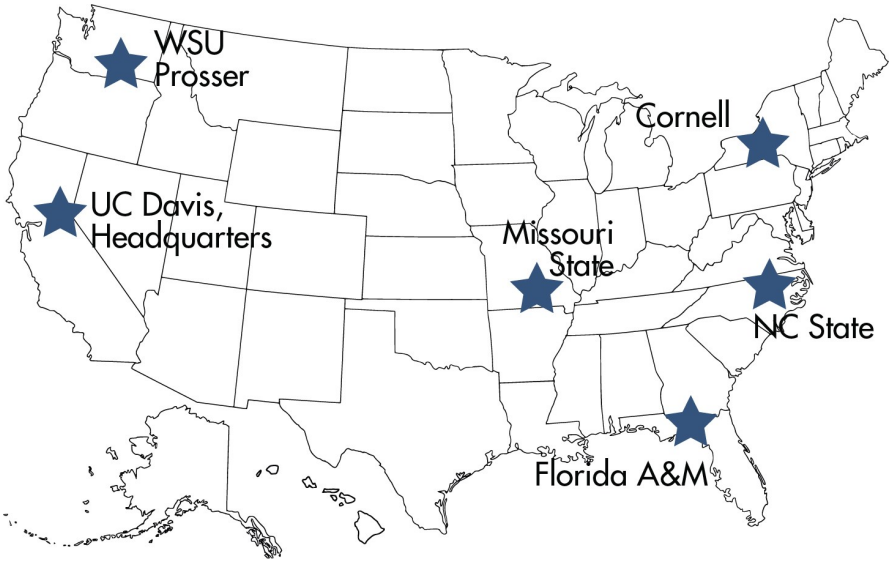
August 2023

Taking a Closer Look at NCPN-Grapes Clean Plant Centers

In this issue of the *NCPN Network News,* we continue our series examining the locations and activities of Clean Plant Centers serving specific crops within the Network. NCPN currently funds clean plant efforts for Fruit Trees, Grapes, Hops, Roses, Sweetpotatoes, Citrus, and Berries. For more information, visit the NCPN-Grapes website.



NCPN VALUE #1: QUALITY *We believe in setting and following quality standards for the production of clean plant material. Our clients should be confident that they are receiving material from known, verified sources with traceable history. This attention to detail supports the start clean, stay clean approach and provides value to American agriculture.*

Are Clean Plants Worth the Cost?

Grape growing is a risky business, and insidious invaders—viruses and other pathogens—are nearly impossible to detect until they show up in the vineyard. The economic costs incurred from vine and fruit damage by viruses and graft-transmissible pathogens routinely reach billions of dollars annually (Mannini and Digiaro, 2017). In the days before robust grapevine disease testing, growers took a gamble every time they planted new stock, relying on luck and trusted nursery operations to provide pathogen-free plants.

Today, the National Clean Plant Network (NCPN) program with funding from USDA, helps support clean plant Centers that produce and maintain virus-tested, foundation grape vine stocks. After stocks are "cleaned" of selected viruses and pathogens, Centers propagate the material to sell and distribute to nurseries and growers.

The promise of lower disease pressure is certainly desirable to fruit growers, but is it worth the cost to taxpayers? Recently, Cornell researcher Jie Li calculated the return on public investment for the Foundation Plant Services (FPS) in California, the foremost NCPN Center for grape stock in the U.S. The benefit-to-cost ratios calculated under two different scenarios was significant, with each dollar returning $22 to $96 in economic benefits, depending on estimated disease severity (Li et al. 2022).

Read article here

Grape Growing is Alive and Well in the Midwest

The Midwest Center of NCPN-Grapes is strategically located in the heartland of the USA. The Center resides in Mountain Grove, Missouri at the Missouri State Fruit Experiment Station, where the climate is not necessarily conducive to growing some grape cultivars. Even so, the grape and wine industry in this region continues to expand, necessitating partnership with NCPN to provide clean grape cultivars that can withstand unpredictable freezing, heat and humidity, and high disease pressures. The Midwest Center has generated ten American and American-French hybrid grape cultivars using microshoot tip tissue culture. High-throughput sequencing technology is used to monitor mother vines for all known viruses. Commercial vineyards, nurseries, and home growers alike count on the supply of clean cuttings of virus-tested grape cultivars produced at this facility.

Outreach from the Midwest Center is neighborly! The grape and wine community of the Midwest is a harmonious group that shares research, techniques, and anecdotes. From vineyard managers, state agriculture officials, wine makers, researchers, legislators, and extension specialists come clear communication and collaboration, which brings healthy grapevines. Regular visits to regional vineyards and attention to the concerns of those working with grapevines every day helps the NCPN-Midwest hub meet emerging challenges in viticulture. Grapevine vein clearing virus is one of those challenges unique to this region that the Midwest Center specializes in diagnosing and monitoring. The Midwest Center passionately promotes the NCPN mission of *Healthy Agriculture through Clean Plants.*

From left to right: Jacquelyn Wray[1], Sam Sergent[2], Krishna Puri[2], Matthew Manu[1], Bryce Goodlett[1], Wenping Qiu[3], Sylvia Petersen[3], Susanne Howard[3]
([1]Missouri State University Graduate Student [2]Missouri Department of Agriculture [3]Missouri State University)

NCPN VALUE #2: *We exist to help the specialty crop industry thrive and grow by providing superior clean-plant products to interested growers, nurseries, and sellers.*

FPS at UC Davis Propagates Grapevines for Greenhouse Collection

Foundation Plant Services (FPS) is the headquarters for NCPN-Grape activities and is home to the largest grape collection in the Network. NCPN-Grapes recently adopted a strategic plan that prioritizes locating each grape selection in two locations, either at two different centers or both indoors and outdoors at the same Center. This priority aligns with efforts at FPS to construct a greenhouse to increase capacity to protect grapevines indoors.

On May 31, 2023, staff from FPS and the UC Davis College of Agricultural and Environmental Sciences were joined by grape industry representatives to celebrate breaking ground for a new greenhouse. California's grape industry has generously provided funding for construction and propagation efforts. The greenhouse will hold grapevines representing up to 700 priority selections from the FPS grape collection. Efforts to propagate clean plant material that will be maintained indoors, protected from vector-borne pathogens, have been a focus for FPS this year. With industry input to determine priority grape selections, the FPS team has been collecting propagative material from the FPS Classic Foundation Vineyard to create backups in the greenhouse collection.

Funding for the new greenhouse was provided by the California Fruit Tree, Nut Tree and Grapevine Improvement Advisory Board, managed by the California Department of Food and Agriculture, the California Grape Rootstock Research Foundation, and the California Grape Rootstock Commission. Propagation and testing of materials destined for the new greenhouse is partially funded by NCPN and CDFA PD/GWSS Board.

Foundation Plant Services Team

Left to right: FPS Director Maher Al Rwahnih, UC Davis CAES Dean Helene Dillard, CDFA IAB Chair Dustin Hooper, Chris Lindelof Chair of California Grape Rootstock Commission.

NCPN VALUE #3: CONNECTIVITY *We believe that a dedicated group of individuals who have common goals can be even more productive and successful when they share their experiences and knowledge in a mutually beneficial way. With this approach in mind, we aspire to a higher standard by creating a sharing, caring work environment based on mutual respect and trust.*

News from New York

The Eastern NCPN-Grapes Center is located at Cornell University in Geneva, NY. Its mission is to increase the diversity of clean grapevine selections suitable to regional conditions in support of the growth and prosperity of local grape and wine industries.

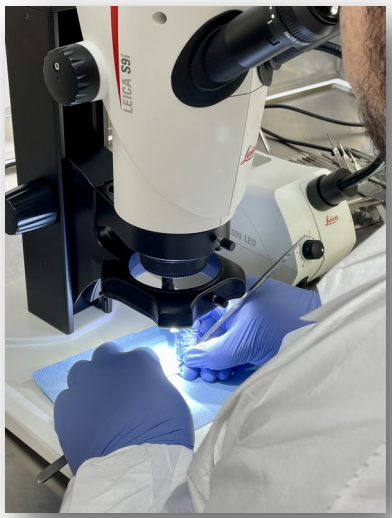
The Cornell Grapes Center continues to safely introduce high-quality grapevine selections from foreign and domestic sources, and to release clean, virus-tested, and *Agrobacterium vitis*-tested vines, following therapeutic treatments, as appropriate, and extensive diagnostics. Among the new selections introduced in 2022 are five interspecific hybrids from western Europe. These are not currently available in the United States and are of interest because of their cold hardiness and resistance to powdery and downy mildew. The NCPN-Grapes activities at Cornell support efforts to increase the diversity of clean grapevines available to the grape, juice, and wine industries in the eastern United States, in conjunction with other NCPN-Grapes Centers.

Dormant grapevine cuttings from Germany in a quarantine greenhouse at Cornell's NCPN-Grape Center.

NCPN VALUE #4: EMPOWERMENT *We believe that leadership, innovation, and decision making for the production and distribution of clean plant material should happen at the grass roots level where end users are directly linked to producers to better guide the overall process. This approach creates an inclusive environment where diverse input leads to better decisions, clear priorities, and the ability to address the need for change.*

CPCNW Works to Integrate Therapies for Virus Elimination Improvements

Grapevines are one of the three crops serviced by the Clean Plant Center Northwest (CPCNW). Residing on the campus of the WSU Experimental Station in Prosser, Washington, CPCNW houses the second-largest foundation collection in the NCPN Grape network, and focuses on cultivars for colder, northern climates. The Center continually looks for opportunities to improve processes and produce cleaner grapevines. They recently sent their lab technicians for advanced training in virus elimination techniques at the USDA's Agricultural Genetic Resources Preservation Research Unit (AGPRU) in Ft. Collins, Colorado.



The lab technicians received hands-on instruction in tissue culture techniques and cryotherapy. The latter is an exciting technology with the potential to increase success in removing recalcitrant pathogens. In the coming year, CPCNW will be implementing cryotherapy protocols toward the goal of more effective elimination with fewer rounds of meristem tissue culture than are currently required.

Training participants were also shown how to preserve tissue-cultured grapevine plantlets for long-term storage. This approach is widely used at the AGPRU and in some of the NCPN Berry Centers. Longer storage ensures a backup-of-last-resort for important germplasm which, when needed, is faster and more cost-effective than restarting the entire clean plant process from a potentially infected vine.

Muscadine Clean Plant Network and the Future of The Muscadine Grape Industry

The Muscadine Clean Plant Network is a collaboration of Florida A&M and North Carolina State University to meet grape growing demands in the Mid-Atlantic and Gulf Coastal regions. The purpose of this industry-driven initiative is to provide planting material for muscadines and bunch *Vitis sp.* hybrids that are resistant to the impact of Pierce's disease (PD), the key limitation for the majority of grape growers in the Southeastern U.S. Breeding and research have resulted in many new cultivars with improved fruit and wine quality.

Field G1 foundation at Florida A&M Center for Viticulture.

The future of the muscadine grape and this region's wine industry is dependent on two key factors: the sustainability of domestic export markets and the availability of healthy propagation material of preferred cultivars in sufficient quantities to satisfy demand.

The acres devoted to muscadine and the economic impact of the southern grape industry have seen substantial growth in the last two decades due to an increased market demand for wine and healthy foods. The recent rapid expansion of the industry pose the major challenge due to the lack of adequate quantities of disease-free certified planting material and nursery certification system.

Propagation block in NC nursery at Cottle Farms in Faison, NC.

Muscadines are grown as own-rooted cuttings and there is no need for grafting vines. Grafting with other *Vitis* sps is limited by genetic incompatibility. Commercial propagation of muscadines is done by rooting of the softwood cuttings. The phytosanitary status of the planting stock is of crucial importance.

The Network maintains G1 nuclear planting stock of 35 accessions from southern PD-tolerant grapevines (muscadines and bunch *Vitis sp.* hybrids): 10 at the NC State/MPRU under the greenhouse (old muscadine varieties from NC and cleaning material from the AR breeding programs); 25 at FAMU/CVSFR under the screen and field foundation vineyard (commercially important muscadines and Florida hybrid cultivars, proprietary selections and FAMU's breeding program newly released cultivars).

NCPN VALUE #5: SUSTAINABILITY *We believe in creating a networked organization that can produce and distribute clean plant products in a sustainable manner.*
