



PPQ 2025 Annual Report
Optimizing Pest Management: Specialty Crop Pests

Table of Contents

Introduction.....2

Grape Pests.....3

 European Grapevine Moth (EGVM)3

 Glassy-Winged Sharpshooter (GWSS)3

 Spotted Lanternfly (SLF)4

Citrus Diseases and Asian Citrus Psyllid5

 HLB Multi-Agency Coordination (MAC) Group7

Tree Fruit and Nursery Stock Pests8

 Exotic Fruit Flies8

 Navel Orangeworm (NOW) 10

Phytophthora ramorum (*P. ramorum*)..... 11

Potatoes12

 Pale Cyst Nematode..... 12

 Golden Nematode..... 13

Introduction

The goal of the Specialty Crop Pests (SCP) Program is to protect U.S. fruits and vegetables, tree nuts, horticulture, and nursery crops from adverse impacts associated with invasive plant pests and diseases, such as crop damage or threats to international trade and interstate commerce. The U.S. Department of Agriculture's (USDA) Plant Protection and Quarantine (PPQ) program works with Federal, State, Tribal, university, and industry partners to develop and implement practices, policies, and regulations that prevent or mitigate impacts for invasive plant pests and diseases of Federal regulatory significance. These activities include verifying pest distribution, identifying and mitigating risk pathways to prevent long distance spread of the pests, developing and implementing diagnostic tools and pest mitigation strategies, and communicating with the public to gain support for program strategies.

These efforts help U.S. farmers export their products, prevent damage to specialty crop production (helping to ensure the availability of fresh fruits and vegetables), and protect natural resources, including forests and residential landscapes. The program currently addresses numerous plant pests and diseases, including exotic fruit flies, a variety of citrus pests and diseases, the glassy-winged sharpshooter (GWSS), spotted lanternfly (SLF), pale cyst nematode, navel orangeworm (NOW), and *Phytophthora ramorum*, among others.

Overall, the program directly protects specialty crop production worth more than \$12.7 billion in 2023 (USDA Animal and Plant Health Inspection Service [APHIS] internal analysis based on National Agricultural Statistics Survey data). The program indirectly protects additional specialty crop production valued at \$7.7 billion in 2023, by preventing the spread of these damaging pests and diseases to new areas (based on APHIS internal analysis and National Agricultural Statistics Service data).

Without the SCP program, trading partners might not accept a variety of U.S. fruits and vegetables. The value of trade in specialty crops that could potentially be disrupted without the SCP program was \$3.8 billion in 2023, according to an internal APHIS report using data from the USDA Foreign Agricultural Service's Global Agricultural Trade System.

Grape Pests

The SCP program targets several devastating plant pests and diseases, including European grapevine moth (EGVM), GWSS, and SLF, that could affect grape production and impact export markets.

European Grapevine Moth (EGVM)

In August 2016, PPQ declared the successful eradication of EGVM from California. However, PPQ, in collaboration with the California Department of Food and Agriculture (CDFA), county departments of agriculture, and industry partners continue to monitor for EGVM. In fiscal year (FY) 2025, the program placed more than 20,000 traps in 39 participating counties, using a multi-lure trap that targets four grape pests in addition to EGVM, and surveyors monitored California grape-growing areas for SLF. No infestations were found.

Glassy-Winged Sharpshooter (GWSS)

PPQ also continued the successful, cooperative GWSS program designed to suppress populations of this pest where it is established. GWSS is a vector for Pierce's disease, which is lethal to grapevines. The program's suppression and regulatory activities work to prevent the spread of the vector and disease across California. In FY 2025, the program continued to conduct surveys and other regulatory activities, including inspections of nursery stock and bulk citrus for the pest in 49 California counties, and continued area-wide suppression activities in affected agricultural production areas of four California counties. Urban rapid response activities in Solano County (next to Napa County) continue to make progress in a decrease in both detections and impacted area. Solano County Department of Agriculture continued delimiting survey, visual inspection, and chemical treatments to the affected area. The number of GWSS adults found in 2025 is down by 98.7% compared to 2022 (peak year) (78 vs 1). In FY 2025, GWSS biocontrol operations released a total of 80,575 GWSS biological control agents (*Cosmocomoidea ashmeadi* and *C. morrelli*) in 12 counties (El Dorado, Fresno, Kern, Kings, Madera, Santa Barbara, Santa Clara, Solano, Stanislaus, San Diego, Tulare, and Ventura). With citrus growers' voluntary suppression treatments, the program covered almost 11,000 acres. Of the more than 33,007 shipments of nursery stock from infested areas, California county inspectors rejected 3 shipments due to

GWSS life stages being present. Together, the EGVM and GWSS programs directly protected 820,000 acres of grape production worth \$6.8 billion in California in 2023 (National Agricultural Statistics Survey Noncitrus Fruit and Nuts 2023 Summary).

Spotted Lanternfly (SLF)

In FY 2025, PPQ and cooperators continued to address SLF through Specialty Crop Pest funding, with an additional \$4.64 million in funding made available under the Plant Protection Act Section 7721. This invasive pest is now found in 19 States, including Connecticut, Delaware, Georgia, Illinois, Indiana, Kentucky, Maryland, Michigan, Massachusetts, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Virginia, and West Virginia and the District of Columbia. The insect sucks sap from stems, branches, and trunks, causing damage to plants as they feed. SLF also excretes a sticky, sugary fluid called “honeydew” that promotes the growth of sooty mold on hosts and understory plants, which can further damage plants and reduce marketability. SLF prefers to feed on the “tree of heaven” (*Ailanthus altissima*), a rapidly growing deciduous tree native to China that has become a widespread invasive species across North America. However, SLF also feeds on a wide range of crops and plants, including grapevines, apples, hops, walnut, stone fruit, and hardwood trees. Thus far, vineyards have been the most adversely affected agricultural commodity.

There is a strong correlation between new SLF populations and major transportation pathways, such as railroads and interstate corridors. PPQ conducts targeted treatments and, in some areas, removes SLF’s preferred host plant, tree of heaven, from transportation hubs with the aim of reducing the risk of SLF spread to new areas. PPQ and cooperators also continue to conduct treatments in high-risk sites of the infestation and to eradicate isolated infestations. In FY 2025, the program continued using golden spray oil, an environmentally friendly control option that allows year-round control, to treat SLF egg masses to combat the pest, and expanded its use to include early instar nymphs, providing more options to reduce populations around high-risk areas. The program mechanically removed over 350,000 egg masses and treated over 50,000 egg masses with golden pest spray oil (GPSO) – an environmentally friendly control option that allows year-round. PPQ and cooperators treated over 4,500 acres in affected areas, including treatments with contact insecticide, systemic insecticide, and herbicide. PPQ and cooperators performed visual surveys in more than 35,000 sites and deployed an estimated 1,000 traps nationwide.

Also in FY 2025, PPQ continued developing and evaluating new methods to control SLF, including potential biological control organisms, such as a fungal pathogen that targets the tree of heaven (*Verticilium nonalfalfae*), mycoinsecticides (*Beauveria bassiana*), and a parasitoid that targets SLF nymphs (*Dryinus sinicus*), and additional treatments for egg masses. PPQ will continue to evaluate the biological control agents and develop methods to rear them on a larger scale in the laboratory should they prove to be effective and specific to their targets. PPQ also developed a process to prioritize methods development needs for SLF program needs as outlined in the SLF strategic plan.

Citrus Diseases and Asian Citrus Psyllid

PPQ supports the citrus industry's continued ability to produce, harvest, process, and ship citrus fruits and nursery stock despite the presence of diseases such as citrus canker, citrus greening or Huanglongbing (HLB), citrus yellow vein clearing virus, sweet orange scab, and citrus black spot, which decrease fruit quality, increase production costs for producers, and threaten export markets for fruit from affected areas.

HLB is the most serious disease of citrus currently impacting Florida and Texas, and threatening the citrus crop in Alabama, Arizona, California, Georgia, Louisiana, and Mississippi. The insect vector, the Asian citrus psyllid (ACP), spreads the disease. Through the Citrus Health Response Program, PPQ and State cooperators also conduct surveys for other diseases not known to occur in the United States, including citrus leprosis virus and citrus variegated chlorosis.

PPQ and cooperators in citrus-producing States perform multi-pest surveys providing timely information about the presence of pests and diseases to growers and State coopeartors. This information allows growers to take necessary actions to manage their groves and allows PPQ and States to update quarantine boundaries and regulations to prevent the spread of serious citrus pests and diseases through the movement of regulated materials.

In FY 2025, PPQ updated quarantine boundaries for citrus blackspot, citrus canker, HLB, and sweet orange scab due to detections outside existing quarantine areas or to align with State quarantine boundaries. In areas affected by citrus pests and diseases, PPQ's flexible regulatory protocols have

minimized the impact of the quarantines on growers, who can move citrus out of quarantined areas to packinghouses if they follow mitigation procedures to prevent the disease or its insect vector from spreading. PPQ works with citrus nurseries across the United States to ensure that nursery stock produced in areas quarantined for citrus diseases is free from the pests, ensuring that clean plants are moving between States and available for citrus producers and residential use.

PPQ performed a pathway analysis to determine the risk of interstate movement of citrus fruit with attached stems and leaves from quarantined areas. PPQ also provided options to stakeholders that they could implement to protect their citrus nursery stock from losing certification in APHIS-approved structures following a severe weather event. Release of plant material will be dependent on quarantine area, size of breach, and duration of breach; and stakeholders may implement mitigations for the 2026 and future growing seasons.

In FY 2025, PPQ maintained compliance agreements with 555 businesses that moved regulated host materials such as citrus fruit and nursery stock, issued nearly 590,000 certificates and limited permits (includes items such as boxes of fruit and individual plants that growers under compliance agreement can certify on site) for the movement of regulated citrus articles, and conducted 3,778 inspections of regulated entities to verify compliance with citrus regulations.

PPQ and cooperators continue extensive surveys that establish citrus black spot-free production units and low-prevalence areas for citrus canker in Florida for export packing to the European Union. PPQ also supports area-wide management efforts in Texas and California for citrus pests and diseases. In FY 2025, PPQ and cooperators continued to conduct risk-based surveys for HLB in residential and commercial citrus areas in California to ensure they detect the disease quickly if it is present. PPQ assists CDFA in aggressively responding to positive detections of HLB (thus far in residential areas only) and implementing an area-wide management approach for ACP population control.

PPQ and CDFA continued surveys for citrus yellow vein clearing virus in California and confirmed three detections in Tulare County, the county where it was first confirmed. CDFA established an interior quarantine in October 2025 for the Hacienda Heights area of Los Angeles County and the Tulare and Visalia areas of Tulare County to prevent the spread of CYVCV to non-infested areas of California and

the United States. APHIS-International Services (IS) also conducts survey and treatment activities for citrus pests and diseases in Mexico, working to coordinate the timing of treatments for pests such as ACP along both sides of the U.S. border to maximize the effectiveness of pest suppression activities. APHIS funds these activities in Mexico using the citrus greening emergency funds.

For the 2024-2025 season, there were 471,300 bearing acres with production worth approximately \$2.8 billion (National Agricultural Statistics Survey Citrus Fruits 2024 Summary). Without PPQ's activities, citrus exports could be at risk each year. The 2024 value of U.S. citrus exports totaled approximately \$890 million (Foreign Agricultural Service Global Agricultural Trade System).

HLB Multi-Agency Coordination (MAC) Group

In December 2013, USDA implemented a unified emergency response framework, the HLB MAC group, to better position the Department to help address the citrus industry's immediate and long-term needs in dealing with this disease. In addition to APHIS, the MAC is comprised of representatives from USDA's Agricultural Research Service (ARS) and National Institute of Food and Agriculture (NIFA); U.S. Environmental Protection Agency; State departments of agriculture in Arizona, California, Florida, and Texas; and citrus industry organizations in California, Florida, and Texas. The HLB MAC Group helps to coordinate and prioritize federally funded research with industry's efforts to bridge the gap between research and implementation, reduce unnecessary duplication, and more quickly provide practical tools for citrus growers to use.

Between FY 2014 and 2019, the HLB MAC funded a total of 105 projects focused on strategies for vector control, therapies for infected trees, sustainability of new plantings, early detection technologies, best management practices for citrus groves, and support for the development of HLB-resistant citrus varieties. Since FY 2019, the HLB MAC shifted focus towards determining the best management practices for producing citrus under the threat and pressure of HLB. PPQ first supported the Florida Citrus Research and Field Trials (CRaFT) project to conduct field evaluations of strategies that showed previous scientific evidence of success and then initiated similar projects in California and Texas. These long-term projects evaluate interactions between methods, treatments, environments, rootstock/scion combinations, and growing practices in the different conditions in each State.

Florida's CRaFT program is treating more than 86,000 acres (12,000 of them supported with HLB MAC funds) of mature citrus trees with novel therapies as part of the field trials; in California, the program is supporting growers in adopting strategies to mitigate ACP presence in groves covering 6,577 acres to prevent HLB introductions; and in Texas, the program is evaluating strategies including different approaches to grove floor management and ACP management on 1,280 acres. In FY 2025, PPQ provided HLB MAC funds to California, Florida, and Texas for ongoing CRaFT projects and provided funding to maintain the CRaFT dashboard. PPQ also funded a field trial for potential treatments using symbiont technology (novel delivery system for antimicrobial treatments) and injection technologies, a project balancing growth and defense phytohormones for optimal yield and productivity of citrus, a project testing field grafting to deliver citrus tristeza virus vectors into citrus trees to manage HLB without replanting, and development of fruit residue and worker safety data for future registration of proposed treatments.

Tree Fruit and Nursery Stock Pests

PPQ works with State and Tribal partners, universities, and industry to develop and carry out programs to protect tree fruit and nursery crops from damage and trade disruptions due to invasive pests. Through these activities, PPQ directly protects nursery stock production worth approximately \$1.3 billion in 2019, (the most recent year that data is available), and tree fruit production worth approximately \$2 billion in 2023 (APHIS internal analysis based on National Agricultural Statistics Survey data). By preventing pests and diseases like exotic fruit flies and *Phytophthora ramorum* from spreading to new areas, PPQ indirectly protects approximately \$6.4 billion in fruit and nursery stock production (APHIS internal analysis based on National Agricultural Statistics Survey data).

Exotic Fruit Flies

PPQ takes the threat of exotic fruit fly outbreaks very seriously. Working with State cooperators, PPQ aims to detect an outbreak early and respond rapidly. Swift and effective actions protect crops and the industries that depend on them, as well as valuable foreign export markets.

PPQ protects a wide variety of specialty crops (particularly tree fruit and citrus) through exotic fruit fly

exclusion and detection activities targeting Mediterranean fruit fly (Medfly), Mexican fruit fly (Mexfly), Oriental fruit fly, and other species. Exotic fruit flies are among the most destructive pests of fruits and vegetables in the world. Invasive fruit flies feed on over 400 crops, including citrus and other fruits, nuts, vegetables, and berries. Fruit flies can damage fruits and vegetables when they lay their eggs under the skin of the produce. The program has reduced the number and mitigated the impact of Medfly and Mexfly incursions for decades by conducting preventive releases of sterile insects to reduce the likelihood that a wild fly incursion leads to an outbreak, detecting and responding to outbreaks when they occur, and developing advanced methods for survey and control.

Since 2015, when the first Medfly outbreak occurred in the Caribbean, PPQ has worked with partner countries in the region to improve surveillance for Medfly and other exotic fruit flies. PPQ and MOSCAMED assisted the Dominican Republic response to a Medfly outbreak during FY 2025, providing 72 million sterile flies (funded through the Organismo Internacional Regional de Sanidad Agropecuaria).

Domestically, PPQ and State cooperators maintain cooperative Preventative Release Programs (PRPs), regularly releasing sterile fruit flies in high-risk areas to reduce the likelihood that introduced Medflies or Mexflies initiate an outbreak in the United States. In the Los Angeles area in California, PPQ and cooperators release 110 million sterile Medflies per week, and in four port areas in Florida, 50 million per week. To protect Texas from Mexfly incursions, PPQ maintains a PRP in Texas, releasing approximately 142 million sterile Mexflies per week over the three significant commercial citrus producing counties in the Texas Lower Rio Grande Valley. PPQ and cooperators also maintain a detection network of approximately 160,000 traps in California, Florida, New York, Puerto Rico, Texas, and other States vulnerable to exotic fruit fly incursions.

When outbreaks occur, PPQ and cooperators immediately implement emergency response activities to eradicate the exotic fruit fly population. In FY 2025, PPQ was involved with fifteen domestic fruit fly quarantine programs, including four outbreaks in California, ten in Texas, and one in New York. Using emergency funds transferred from the Commodity Credit Corporation, PPQ and cooperators completed the eradication of two outbreaks in California and eight outbreaks in Texas. In early FY 2026, PPQ and cooperators resolved the remaining two Mexfly outbreaks in Texas that began in FY 2025 and continue

to address the two outbreaks in California that began in late FY 2025.

PPQ also continued to address the European cherry fruit fly (ECFF) in northwestern New York in FY 2025. PPQ and cooperators in New York enforce quarantine regulations over the 7,353 square-mile affected area to reduce the risk of human-assisted spread of ECFF to other cherry-producing areas. PPQ conducted surveillance along the border of the quarantine and detected ECFF in one area outside the current quarantined zone. PPQ will expand the quarantine in FY 2026 to include the newly affected area.

Cherry producers can mitigate the damage the pest may cause to crops through current management practices. PPQ regulatory measures allow the movement of cherries out of the quarantine areas using float tests in the orchard and at the processing plants—when the cherries are submerged in water, fruit fly life stages float to the surface—to determine whether any ECFF are present in shipments. These float tests reduce trapping requirements for growers in their fields while meeting the goal of preventing ECFF from spreading through cherry shipments. In FY 2025, PPQ and cooperators facilitated the safe movement of 161,526 pounds of fresh cherries out of the quarantined area.

[Navel Orangeworm \(NOW\)](#)

PPQ and cooperators also work to address navel orangeworm (NOW), which is a serious pest of tree nut crops including almonds, pistachios, and walnuts. Adult moths lay eggs through gaps in the nut hulls or shells, where newly hatched larvae feed and contaminate the nuts with insect waste and secondary fungal spores that may produce poisonous aflatoxins. In FY 2025, PPQ and cooperators in California continued release of sterile NOW moths in the NOW areawide program targeting the moth.

PPQ uses its rearing facility in Phoenix, Arizona, to produce sterile NOW moths and ships them to California, where PPQ's Aircraft and Equipment Operations (AEO) released them by airplane, or ground over participating pistachio and almond orchards. In FY 2025, PPQ and CDFA continued work with participating orchards that maintain 2,573 acres for NOW release and 2,388 for non-release for comparison. PPQ produced and released approximately 750,000 sterile NOW moths per day (roughly 142 million moths throughout the season) over participating almond and pistachio orchards. The

program staggered SIT releases around almond and pistachio harvest dates when the nuts are most susceptible to NOW infestation.

PPQ worked with ARS to develop a protocol that assesses NOW damage for pistachios; and CDFA implemented the protocol for the 2025 season. By tailoring protocols that assess NOW damage in almonds and pistachios, the program receives more reliable and relevant damage data to assess the efficacy of sterile NOW releases. PPQ and cooperators continue to evaluate the impact of NOW sterile moth releases and the other integrated pest management measures in tree nut crops.

[Phytophthora ramorum \(P. ramorum\)](#)

PPQ protects natural resources and nursery stock production and trade by limiting the spread of *P. ramorum* from quarantine areas and affected nurseries through regulatory strategies and adoption of mitigations and changes to cultural practices. *P. ramorum*, which causes sudden oak death, can be moved through host nursery stock and can affect a variety of forest trees. The disease is present in coastal northern California (affecting 16 counties in the State) and a small area in Curry County, Oregon.

In FY 2025, Oregon State officials continued surveys related to a positive detection outside the quarantined area. PPQ will update quarantine regulations to include the new area when the delimiting surveys are completed. Because of the presence of *P. ramorum* in the surrounding environment, nurseries within the quarantine area that ship interstate must meet annual certification survey and sampling requirements to prevent the movement of potentially infested material. The program also regulates nurseries outside the quarantine area when *P. ramorum* is detected in plants, water, or other regulated articles. The nurseries must remain free of *P. ramorum* for 3 consecutive years to be deregulated. All positive interstate shipping nurseries must participate in a compliance program using protocols to eliminate the pathogen and implement required mitigations focused on critical control points to reduce the risk of reintroduction. During FY 2025, 25 nurseries participated in the program, with 12 nurseries added to the program during the year.

Through all the activities of the many programs described above, PPQ directly protects nursery stock production worth approximately \$1.3 billion in 2019 (the most recent year that data is available), and tree fruit production worth more than \$2 billion in 2023 (APHIS internal analysis based on National Agricultural Statistics Service data). By preventing plant pests and diseases like exotic fruit flies and *P. ramorum* from spreading to new areas, PPQ indirectly protects approximately \$6.4 billion in fruit and nursery stock production (APHIS internal analysis based on National Agricultural Statistics Survey data).

Potatoes

PPQ addresses two major potato pests, pale cyst nematode (PCN) in Idaho and the golden nematode (GN) in New York that feed on the roots of high-value crops such as potatoes, and tomatoes. If pest populations are left unchecked, they can reduce crop yields by 20 to 70 percent. PPQ and cooperators have confined each to a relatively small area and continue survey and regulatory efforts to protect potatoes that are grown in all 50 States and exported from 18 States. Together, the PCN and GN programs protected 925,400 acres of U.S. potatoes, valued at approximately \$5.1 billion at 2024 (National Agricultural Statistics Service). In 2024, the United States exported \$3.4 billion of fresh and seed potatoes to 50 countries (USDA Foreign Agricultural Service's Global Agricultural Trade System).

Pale Cyst Nematode

PCN has not been detected outside of Idaho, and fumigations of infested fields in Idaho have reduced PCN populations by 99 percent since the pest was first detected in 2006. In FY 2025, PPQ processed 3,421 samples for the PCN eradication effort in Idaho and 7,846 samples for detection surveys in 7 other States. In FY 2025, the program conducted 1,439 regulatory treatments of farm equipment to prevent the spread of PCN out of regulated areas. There are currently 31 PCN-infested fields, and the current regulated area is 6,265.64 acres (down from 6,495 acres at the beginning of FY 2024), of which 3,420.10 acres are infested fields, and 2,845.53 acres are associated fields (those connected through use of shared farm equipment or other means of pest spread). The infested fields are in an 8.5-mile radius that spans a portion of northern Bingham County and southern Bonneville County.

In FY 2025, the PCN program deregulated the first infested field in program history. The program continued eradication treatments on five infested fields, totaling 537.8 acres. Fields that no longer show PCN viability, after a series of three negative greenhouse bioassay tests remain regulated but benefit from reduced sanitation requirements. They are eligible to immediately return to potato production at the landowners' discretion for the purpose of full field bioassays to check for viable PCN populations as part of the final step in the deregulation process. The program is working with ARS, the University of Idaho, and other cooperators to develop PCN-resistant potato varieties. PPQ has funded several projects to produce PCN-resistant potato varieties through Plant Protection Act Section 7721 for this long-term effort.

Golden Nematode

In FY 2025, PPQ and New York cooperators continued an effective survey and regulatory program targeting GN, with a focus on deregulation of all eligible land in accordance with 7 CFR 301.85 and the *United States and Canada Guidelines on Surveillance and Phytosanitary Actions for the Potato Cyst Nematodes *Globodera rostochiensis* and *Globodera pallida**. The GN program is working to deregulate fields that are neither infested nor associated with infested fields rather than being regulated based on political boundaries such as counties or townships. PPQ, working closely with the New York State Department of Agriculture and Markets (NYS AGM), has removed more than 1.2 million acres from the GN regulated area in New York since 2010, allowing several farmers to grow their crops without restrictions.

In FY 2025, PPQ worked with NYS AGM on additional proposed reductions to the area regulated by the State following the completion of soil surveys consistent with PPQ regulations. PPQ deregulated 1,003.56 acres based on negative soil surveys for GN or regulated fields permanently removed from agriculture production. PPQ continues to manage an active control and mitigation program to prevent GN from spreading from the remaining regulated acres in portions of eight New York counties, including 5,945 acres that are infested with GN.

The program enforces regulations designed to prevent the spread of GN and requires sanitation or steam treatments of farm equipment and other regulated items moving out of the quarantined area. In FY 2025,

the program conducted 463 regulatory treatments of farm equipment and other regulated articles, processed 5,181 soil samples for the GN deregulation effort in New York, and certified 10 shipments of potatoes to Canada, totaling 500,000 pounds. PPQ has cooperated with ARS, NYS AGM, and Cornell University to develop GN-resistant potato varieties for several decades. The program has developed a total of 45 GN-resistant varieties. Because the pest can overcome resistance, it is necessary to continue development of new GN-resistant varieties.