

Golden Nematode Program Update

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The Golden Nematode, *Globodera rostochiensis* has been successfully controlled in the United States and is only known to occur in isolated portions of New York State. Thanks to the combined efforts of growers, academia, NY Dept. of Agriculture and Markets and the USDA, areas of land are now being removed from quarantine for this nematode.

However, this is no time to let our guard down! Potato cyst nematodes are considered major pests of potato in cool temperate areas. The amount of damage (especially tuber weight) is closely related to the amount of nematode eggs per soil unit. Yield losses are also dependent on potato cultivar, environmental conditions, and agronomic practices. Yields may be reduced even when no apparent symptoms are seen above ground. Depending on potato cultivar, yield losses can range from 19 to 90% (Friedman, 1985). Repeated potato cultivation on infested land can lead to crop loss of up to 80% due to buildup of the nematode population (CABI/EPPO, n.d.). In the UK, loss estimates due to PCN are about \$81 million per year or about 9% yield loss of annual national production. Annual costs within the European Union are estimated at \$400 million (Moxnes and Hausken, 2007).

According to the United States Potato Board, total U.S. potato and potato product exports reached record levels in fiscal year 2013. The value of these exports is estimated at \$1.6 billion and consists of 17% of U.S. potato production (USPB, 2013). *Globodera rostochiensis* serves as a serious threat to both domestic and international trade in potatoes and nursery stock (USDA, 2006). This species is listed as a harmful organism in 60 countries worldwide (USDA-PCIT, 2013). Trade between the United States and Canada was previously halted with the find of *G. pallida* in Idaho and *G. rostochiensis* in Quebec. In order to resume trade between the United States and Canada, a joint protocol was produced which will be implemented if any future detections of potato cyst nematodes occurs (APHIS, 2006a; CFIA and USDA, 2009).



Figure 8. Yellow females of *Globodera rostochiensis* on root. Photo courtesy of Bonsak Hammeraas, Bioforsk - Norwegian Institute for Agricultural and Environmental Research, <http://www.bugwood.org/>.

It can take 20 years from the time potato cyst nematodes are introduced to an area before detection occurs. Once introduced into a potato field, it can take six to seven years before nematode numbers are at a detectable level (Berg, 2006). When potatoes are harvested, cysts can become detached from the roots, falling into the soil where they serve as a source of infection for future crops (CSL, 2003).

Due to the importance of potato cyst nematodes to potato production and trade, focus on developing resistant varieties (Brodie, 1996; Castelli et al., 2005; EPPO, 2006a; Gerbhardt et al., 2006) and control options have been explored, including crop rotation, nematicides, trap cropping, and soil sterilization (Kerry et al., n.d.; Minnis et al., 2004; Turner et al., 2006; Moxnes and Hausken, 2007). Commercial cultivars have been developed that can lead to 80 to 95% population reductions each year (reviewed in Friedman, 1985).

The successful containment of GN in NY for over 60 years provides an opportunity for releasing land from regulatory control. Growers interested in this opportunity are encouraged to contact USDA APHIS or NY Department of Agriculture and Markets.

When land is removed from quarantine, restrictions on the interstate movement of potato shipments and other regulated articles from these areas are no longer required. This action will also enable potato shipments and other commodities to be eligible for export to countries which require agricultural goods originate in areas free from GN.

Soil surveys are conducted annually in potato production areas throughout New York to ensure agricultural land remains free from this nematode and to ensure early detection of possible new infestations.

Deregulation

In 2013 the cooperative Golden Nematode program continued progress on a project to remove from quarantine all eligible land. As of January 1, 2014, the area under quarantine for Golden Nematode has been reduced by 347,609 acres. Infestation remains limited to 6,185 acres in parts of eight counties of New York State. Significant additional reductions in the GN quarantine area are expected in 2014 once technical procedures regarding the Guidelines on Surveillance and Phytosanitary Actions for the Potato Cyst Nematodes are finalized. To this point in time, only land that has never had a GN detection has been released from quarantined. The requirements for deregulation of formerly infested fields are much more stringent than the uninfested fields.

Milestone Development:

For the first time, the GN Program has successfully in-field bioassay - a method of proving land formerly infested with GN is now free from GN. This procedure uses a system where land is planted to GN susceptible potato varieties for three consecutive years. Intensive soil sampling is conducted following each crop of potatoes and must yield zero viable GN cysts. As of 2013, nine fields in NY have successfully passed this “acid test” proving they are indeed free from GN.

Details of the successful field application of the In-Field Bioassay will be published in a paper in the coming year.

Guidelines on Surveillance and Phytosanitary Actions for the Potato Cyst Nematodes provides a management plan, measures for continued trade of seed potatoes and provisions for releasing land from regulatory control and is available at http://www.aphis.usda.gov/plant_health/plant_pest_info/potato/pcn.shtml

Program Highlights for 2013:

Soil survey was conducted in all seed potato and commercial potato production areas in New York State. **In 2013, there were no new detections of potato cyst nematode in the state of New York.**

Control of GN is accomplished through strict sanitation to prevent soil movement from infested fields and through the systematic use of a four year crop rotation using resistant potato varieties and non-host crops. Although the primary host crop of this nematode is potato, tomato and eggplant are hosts as well. Host crops should not be planted consecutively for multiple years especially in areas exposed to nematode infestation.

A variant of GN known as Ro2 has been detected in a few fields where multiple crops of GN resistant potato varieties were grown consecutively. Scientists at Cornell University are working diligently to develop potato varieties that have resistance to Ro2. The genetic composition of Ro2 is such that development of resistance is extremely difficult.

Weeds in the Solanaceae family, such as the nightshades, are GN hosts and should be eliminated from potato production areas.

The USDA and New York State Department of Agriculture and Markets continue to enforce a vigorous sanitation program to prevent spread of GN. 928 regulatory treatments using steam heat under tarpaulin and high pressure washing were performed on used farm equipment in 2013 to prevent possible spread of GN.

Two Potato Cysts Nematode species: *Globodera rostochiensis* (Golden Nematode) and *Globodera pallida* (Pale Cyst Nematode) are referred to collectively as Potato Cyst Nematodes or PCN. In the United States, New York is the only state where Golden Nematode has been detected. Idaho is the only state where Pale Cyst Nematode has been detected. Both species are known to occur in Canada.

Idaho Update: In 2013 there were additional detections the Pale Cyst Nematode (*Globodera pallida*) all within the quarantined area of Idaho. Details are available on the APHIS web site at http://www.aphis.usda.gov/plant_health/plant_pest_info/index.shtml

The Best Management Practices for dealing with GN are provided below as a reminder to producers and anyone dealing with this quarantine significant nematode.

Best Management Practices to Prevent Spread of Soil-Borne Organisms Including Potato Cyst Nematodes

- Clean all machinery, trucks and other equipment when going from field to field. Do not allow any vehicles in fields unless the vehicles have been thoroughly cleaned.
- Do not spread tare soil or debris from potato processing operations or from storage filling/emptying operations on farm land or place it in an area where it can be spread to farm lands.
- Leave hedgerows, sod barriers or sod strips between fields and along highways.
- Grow non-host crops in rotations with potatoes and never plant golden nematode susceptible potatoes back to back. Crops that are not host of GN include corn, small grains and alfalfa.
- Plant golden nematode resistant potato varieties in non-infested fields at least once every 4 years.
- Do not plant potatoes, not even resistant varieties, back-to-back in fields in which GN has been detected.
- Plant cover crops as soon as possible when land is not in use to prevent GN spread by erosion.
- Inform people in your operation of the seriousness of PCN and potato diseases and be sure they follow all precautions. Provide equipment needed to conduct proper cleaning and disinfection procedures.
- Segregate potatoes in storage—each field should have a definite separation.
- Do not use used bags, containers, etc. for potato transport, and be sure all commercial transport vehicles are free of soil.
- Do not permit temporary help, custom applicators, or utility companies to bring their vehicles onto your farm land without proper sanitation and do not allow them to bring any equipment, bags, etc. with them to the field.
- Do not use common headlands, farm roads and public roads as turning areas.
- Prohibit non-authorized entry onto farmlands using “No Trespassing” signs.
- Do not assume that non-regulated fields are free of the pathogen.
- Work with state/federal officials to facilitate soil surveys to ensure fields remain free from GN and provide early detection.

Additional information on GN and PCN is available at the following website <http://www.aphis.usda.gov/ppq/ispm/nematode/index.html> or by calling USDA APHIS at 607.566.2212 or NY Dept. of Agriculture and Markets, Division of Plant Industry at 518.457.2087.