

FY 2007 Delaware Potato Cyst Nematode Survey Final Report

Cooperators: University of Delaware, Delaware Department of Agriculture, USDA-APHIS, PPQ

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Introduction:

The potato cyst nematode (PCN), *Globodera pallida*, is a major pest of potato crops in temperate areas, and is widely distributed in Europe and other potato growing regions in the world. Other affected crops include tomato, eggplant, and some weeds. Losses of up to 80% are possible, on potatoes that exhibit yellowing and wilting of foliage. In North America, the nematode is established in Newfoundland, Canada. In April of 2006, PCN was found in a soil sample collected from a potato processing facility in Idaho. The nematode has the potential to infect potato growing areas in the Eastern U.S. if introduced on soil or seed potatoes. Seed potatoes are the greatest risk source for introduction and contamination. The potato industry requested that USDA-APHIS PPQ supervise a national survey for PCN on certified seed potato and commercial acreage. For this reason, the University of Delaware, in cooperation with Delaware Department of Agriculture (DDA) and PPQ personnel, surveyed field soils with a history of planted potatoes throughout Delaware and will sample any trace forward seed piece sources. The University of Delaware Plant Diagnostic Clinic lab provided nematode assays and diagnostics services.

Methods:

A state-wide survey was conducted beginning July 1, 2007, for the presence of cysts of *Globodera pallida*. Early detection at very low incidence would be crucial to demonstrate areas as free from infestation by *Globodera*. Delaware had an estimated 3700 acres of potatoes planted in 2006. No seed certification potato acreage currently exists in Delaware. Commercial production potato fields were sampled representing the potato-growing counties of New Castle and Kent. A minimum of 10% of acreage based on 2006 planting sites (approximately 3700 acres) was sampled by staff of the Delaware Department of Agriculture (DDA) and PPQ. The CAPS technician and seasonal personnel collected representative soil samples of three 5 lb samples per acre, taken as dips every three feet across a grid. A total of 115 samples were taken. Samples were transported to the University of Delaware Plant Diagnostic Clinic in Newark for testing for the presence of cysts of *Globodera* spp. by centrifugation and sugar flotation. All field sampling and laboratory testing followed the methods approved in the USDA-APHIS, PPQ approved national survey protocols. Any sample with suspect cysts was to be sent to the appropriate confirmatory laboratory (USDA-APHIS, National Identification Services or ARS Nematology Lab, Beltsville) or the regional identifier Grace O'Keefe, at Penn State University. Reports were submitted to the USDA-APHIS State Plant Health Director and included progress

reports in the frequency and time frame specified. All survey data was entered into the NPAIS database, as well as the national database for NPDN.

Each field sample was mixed and split, and processed as four laboratory samples representative of 1000 cc of soil from the original. Soil was processed using sieving, centrifugation, and sugar flotation according to the following flow chart protocol:

Centrifugation and Sugar Flotation for *Globodera* Cysts Delaware 2007

- a. Prepare 680 g sucrose dissolved in 1 liter of water (340 g/500)
- b. 1000 cc soil mixed in bucket with water, soak 20 min. Each sample produces 4 sub-samples
- c. Mix, pour over No. 20 sieve over clean bucket, separate into 2 buckets, rinse
- d. Allow to settle 10 sec, pour half over No. 60 sieve
- e. Wash from No. 60 into a clean labeled 50 ml beaker, repeat with other half
- f. Pour from 50 ml beaker into clean 50 ml centrifuge tube, even levels
- g. Centrifuge at 400 g (1410 rpm) for 5 min
- h. Carefully decant supernatant from tubes and discard
- i. Add 25 ml sucrose solution and mix thoroughly
- j. Centrifuge at 400 g for 1 min
- k. Decant over a No. 70 sieve, rinse off sucrose thoroughly
- l. Rinse from sieve into lined filter paper and put in petri dishes
- m. Examine samples under dissecting scope, look for nematode cysts, and count. Maintain sample ID and record keeping. Rinse and clean thoroughly between samples.

Results and Discussion:

No suspect cysts of *Globodera pallida* were found in any Delaware potato soil debris recovered from processing of soil samples. It was not necessary to send any samples for verification by the regional identifier. Results data was entered into an Excel data file (Table 1). Results included numbers of cysts observed of *Heterodera* that were presumed to be soybean cyst nematode (SCN), *Heterodera glycines*. Specific identification would have required examination of larvae or DNA analysis. Information was sent to cooperating growers regarding *Heterodera* cysts found, as that may impact soybean variety planting decisions. No cysts resembling *Globodera* were observed in any of the soils. The data indicates that this representative sampling of potato acreage finds no infestation by the potato cyst nematode in Delaware.

Table 1.

<u>Potato Cyst Nematode 2007</u>			
<u>Sample Number</u>	<u>County</u>	<u>Results</u>	<u>Date Completed</u>
PCN07DE001-B-001	New Castle	Negative	Aug-07
PCN07DE001-B-002	New Castle	Negative	Aug-07
PCN07DE001-B-003	New Castle	Negative	Aug-07
PCN07DE001-B-004	New Castle	Negative	Aug-07
PCN07DE001-B-005	New Castle	Negative	Aug-07
PCN07DE001-B-006	New Castle	Negative, 1 <i>Heterodera</i> (empty)	Aug-07
PCN07DE001-B-007	New Castle	Negative	Aug-07
PCN07DE001-B-008	New Castle	Negative	Aug-07
PCN07DE001-B-009	New Castle	Negative, 1 <i>Heterodera</i> (empty)	Aug-07
PCN07DE001-B-010	New Castle	Negative, 2 <i>Heterodera</i> (empty)	Aug-07
PCN07DE001-B-011	New Castle	Negative	Aug-07
PCN07DE001-B-012	New Castle	Negative, 2 <i>Heterodera</i> (empty)	Aug-07
PCN07DE001-B-013	New Castle	Negative	Aug-07
PCN07DE001-B-014	New Castle	Negative	Aug-07
PCN07DE001-B-015	New Castle	Negative	Aug-07
PCN07DE002-E-001	Kent	Negative, 9 <i>Heterodera</i>	9/10/2007
PCN07DE002-E-002	Kent	Negative	9/10/2007
PCN07DE002-E-003	Kent	Negative, 12 <i>Heterodera</i>	9/10/2007
PCN07DE002-E-004	Kent	Negative, 11 <i>Heterodera</i>	9/10/2007
PCN07DE002-E-005	Kent	Negative, 6 <i>Heterodera</i>	9/10/2007
PCN07DE002-E-006	Kent	Negative, 9 <i>Heterodera</i>	9/10/2007
PCN07DE002-E-007	Kent	Negative, 15 <i>Heterodera</i>	9/12/2007
PCN07DE002-E-008	Kent	Negative, 19 <i>Heterodera</i>	9/12/2007
PCN07DE002-E-009	Kent	Negative, 36 <i>Heterodera</i>	9/12/2007
PCN07DE002-E-010	Kent	Negative, 16 <i>Heterodera</i>	9/24/2007
PCN07DE002-E-011	Kent	Negative, 9 <i>Heterodera</i>	9/24/2007
PCN07DE002-D-001	Kent	Negative, 14 <i>Heterodera</i>	10/10/2007
PCN07DE002-D-002	Kent	Negative, 4 <i>Heterodera</i>	10/10/2007
PCN07DE002-D-003	Kent	Negative, 5 <i>Heterodera</i>	10/10/2007
PCN07DE002-D-004	Kent	Negative, 5 <i>Heterodera</i>	10/10/2007
PCN07DE002-D-005	Kent	Negative, 7 <i>Heterodera</i>	10/22/2007
PCN07DE002-D-006	Kent	Negative, 5 <i>Heterodera</i>	10/22/2007
PCN07DE002-D-007	Kent	Negative, 2 <i>Heterodera</i>	10/22/2007
PCN07DE002-D-008	Kent	Negative	10/22/2007
PCN07DE002-D-009	Kent	Negative, 11 <i>Heterodera</i>	10/24/2007
PCN07DE002-D-010	Kent	Negative, 2 <i>Heterodera</i>	10/24/2007
PCN07DE002-D-011	Kent	Negative, 4 <i>Heterodera</i>	10/24/2007
PCN07DE002-D-012	Kent	Negative	10/24/2007
PCN07DE002-D-013	Kent	Negative, 2 <i>Heterodera</i>	10/29/2007

PCN07DE002-D-014	Kent	Negative, 1 <i>Heterodera</i>	10/29/2007
PCN07DE002-D-015	Kent	Negative, 3 <i>Heterodera</i>	9/17/2007
PCN07DE002-D-016	Kent	Negative	9/17/2007
PCN07DE002-D-017	Kent	Negative, 5 <i>Heterodera</i> , weed seeds	9/19/2007
PCN07DE002-D-018	Kent	Negative	9/17/2007
PCN07DE002-D-019	Kent	Negative	9/24/2007
PCN07DE002-D-020	Kent	Negative, 4 <i>Heterodera</i>	9/19/2007
PCN07DE002-D-021	Kent	Negative, 2 <i>Heterodera</i>	10/3/2007
PCN07DE002-D-022	Kent	Negative, 2 <i>Heterodera</i>	10/3/2007
PCN07DE002-D-023	Kent	Negative, 6 <i>Heterodera</i>	10/3/2007
PCN07DE002-D-024	Kent	Negative	10/8/2007
PCN07DE002-D-025	Kent	Negative	10/8/2007
PCN07DE002-D-026	Kent	Negative	10/8/2007
PCN07DE002-D-027	Kent	Negative	10/8/2007
PCN07DE002-D-028	Kent	Negative	10/29/2007
PCN07DE002-D-029	Kent	Negative, 5 <i>Heterodera</i>	10/29/2007
PCN07DE002-D-030	Kent	Negative, 4 <i>Heterodera</i>	10/29/2007
PCN07DE002-D-031	Kent	Negative, 8 <i>Heterodera</i>	10/29/2007
PCN07DE002-D-032	Kent	Negative, 2 <i>Heterodera</i>	10/30/2007
PCN07DE002-D-033	Kent	Negative, 6 <i>Heterodera</i>	11/19/2007
PCN07DE002-D-034	Kent	Negative, 3 <i>Heterodera</i>	11/19/2007
PCN07DE002-D-035	Kent	Negative	11/19/2007
PCN07DE002-D-036	Kent	Negative	11/20/2007
PCN07DE002-D-037	Kent	Negative, 2 <i>Heterodera</i>	11/20/2007
PCN07DE002-D-038	Kent	Negative, 3 <i>Heterodera</i>	11/20/2007
PCN07DE002-D-039	Kent	Negative, 9 <i>Heterodera</i>	11/20/2007
PCN07DE002-D-040	Kent	Negative	11/20/2007
PCN07DE002-D-041	Kent	Negative, 4 <i>Heterodera</i>	11/6/2007
PCN07DE002-D-042	Kent	Negative, 4 <i>Heterodera</i>	11/20/2007
PCN07DE002-D-043	Kent	Negative	11/20/2007
PCN07DE002-D-044	Kent	Negative, 5 <i>Heterodera</i>	11/14/2007
PCN07DE002-D-045	Kent	Negative, 8 <i>Heterodera</i>	11/14/2007
PCN07DE002-D-046	Kent	Negative	11/14/2007
PCN07DE002-D-047	Kent	Negative	11/16/2007
PCN07DE002-D-048	Kent	Negative, 1 <i>Heterodera</i>	11/16/2007
PCN07DE002-D-049	Kent	Negative	11/16/2007
PCN07DE002-D-050	Kent	Negative	11/19/2007
PCN07DE002-D-051	Kent	Negative, 4 <i>Heterodera</i>	11/20/2007
PCN07DE002-D-052	Kent	Negative, 1 <i>Heterodera</i>	11/20/2007
PCN07DE002-D-053	Kent	Negative, 5 <i>Heterodera</i>	11/26/2007
PCN07DE002-D-054	Kent	Negative	11/26/2007
PCN07DE002-D-055	Kent	Negative, 2 <i>Heterodera</i>	11/26/2007
PCN07DE002-D-056	Kent	Negative	11/19/2007
PCN07DE002-D-057	Kent	Negative	11/26/2007
PCN07DE002-C-001	Kent	Negative	10/31/2007
PCN07DE002-C0-02	Kent	Negative, 2 <i>Heterodera</i>	11/2/2007
PCN07DE002-C-003	Kent	Negative	10/31/2007
PCN07DE002-C-004	Kent	Negative	11/2/2007

PCN07DE002-C-005	Kent	Negative	11/2/2007
PCN07DE002-C-006	Kent	Negative	10/31/2007
PCN07DE002-C-007	Kent	Negative	10/31/2007
PCN07DE002-C-008	Kent	Negative	10/31/2007
PCN07DE002-C-009	Kent	Negative	11/6/2007
PCN07DE002-C-010	Kent	Negative	11/6/2007
PCN07DE002-C-011	Kent	Negative	11/12/2007
PCN07DE002-C-012	Kent	Negative	11/6/2007
PCN07DE002-C-013	Kent	Negative	11/12/2007
PCN07DE002-C-014	Kent	Negative, 1 <i>Heterodera</i>	11/12/2007
PCN07DE002-C-015	Kent	Negative	11/12/2007
PCN07DE002-C-016	Kent	Negative	11/6/2007
PCN07DE002-C-017	Kent	Negative	11/12/2007
PCN07DE002-C-018	Kent	Negative	11/5/2007
PCN07DE002-C-019	Kent	Negative, 2 <i>Heterodera</i>	11/5/2007
PCN07DE002-C-020	Kent	Negative	11/5/2007
PCN07DE002-C-021	Kent	Negative	11/5/2007
PCN07DE002-C-022	Kent	Negative	11/7/2007
PCN07DE002-C-023	Kent	Negative	11/7/2207
PCN07DE002-C-024	Kent	Negative, 1 <i>Heterodera</i>	11/7/2007
PCN07DE002-C-025	Kent	Negative	11/7/2007
PCN07DE002-C-026	Kent	Negative	11/14/2007
PCN07DE002-C-027	Kent	Negative	11/14/2007
PCN07DE002-A-001	Kent	Negative	11/28/2007
PCN07DE002-A-002	Kent	Negative	11/28/2007
PCN07DE002-A-003	Kent	Negative	11/28/2007
PCN07DE002-A-004	Kent	Negative	11/28/2007
PCN07DE002-A-005	Kent	Negative	11/28/2007