PEST SURVEY REPORT

2015-2024

CYST NEMATODE SURVEY

PLANT INDUSTRY BUREAU LAB
WISCONSIN DEPARTMENT OF AGRICULTURE, TRADE AND CONSUMER PROTECTION

Background

Since 2015, DATCP has surveyed soil for non-native cyst nematodes which can limit the yield of small grains, potatoes, and corn. Heavy root predation on wheat for example results in stunted plants, reduced tillering, chlorotic leaves, and shallow, bushy roots. Other cyst nematode species, such as soybean cyst nematode, are economically significant and widespread in Wisconsin. Potato cyst nematodes and exotic cereal cyst nematodes have never been detected in Wisconsin.

Nematodes are microscopically small worm-like animals that can infest crops and negatively affect their health and productivity. Cyst nematodes are particularly difficult to control because females form durable pinhead-sized cysts on plant roots which can survive in the soil for decades (Figure 1). These cysts are filled with eggs containing juvenile nematodes ready to hatch and infest more roots once conditions are favorable (Figure 2). Avoiding introduction, and early detection, are the best options for protecting Wisconsin agriculture from these pests.

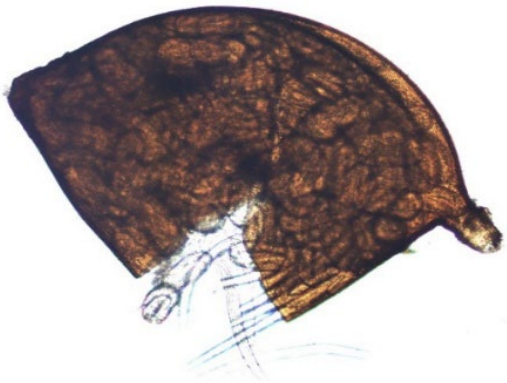

Figure 1. Ruptured cyst nematode releasing eggs and juveniles.
Photo: DATCP

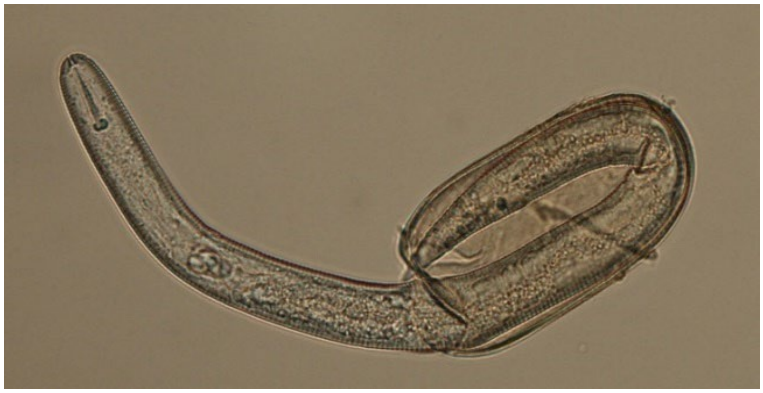

Figure 2. Juvenile cyst nematode hatching from egg.
Photo: DATCP

Survey Targets

Since 2015, the targeted non-native cyst nematodes of this survey have included, cereal cyst (*Heterodera avenae*), exotic cereal cyst (*Heterodera filipjevi),* the Mediterranean cyst *(Heterodera latipons),* the false root-knot nematode (*Nacobbus aberrans*), the Mexican corn cyst (*Punctodera chalcoensis*), the pale nematode (*Globodera pallida),* and the golden nematode *(Globodera rostochiensis*). If introduced, any of these species could impact Wisconsin agriculture production and trade.

Survey Sites and Sampling

This survey focused on winter wheat producing counties of the state from 2015 to 2020 and in 2024. In 2022 the survey focused on potato growing areas. Table 1 shows the number of fields surveyed for each crop.

Table 1. Number of fields survey by host crop
* The host crop was not recorded for one field in 2024.

Year	Wheat	Oat	Corn	Potato	Total
2015	91	9	98	0	198
2016	89	3	22	0	114
2017	15	0	80	0	95
2018	16	1	56	0	73
2019	0	0	58	0	58
2020	0	0	66	0	66
2022	0	0	0	208	208
2024	20	0	30	0	51*

Soil sampling was conducted during the growing season by collecting 15-20 soil cores from randomly chosen fields. Soil samples were taken to the Plant Industry Bureau (PIB) laboratory for separation of cysts from soil by wet sieving. Cysts were sorted out under 20X to 400X magnification and further processed with gene-based methods. Species-specific PCRs and sequence analysis allowed for identification of nematodes to species level.

Cyst Nematode Species Identified from 2015 to 2024

There were no detections of the cereal cyst (*Heterodera avenae*), exotic cereal cyst (*Heterodera filipjevi),* Mediterranean cyst *(Heterodera latipons),* false root-knot nematode (*Nacobbus aberrans*), Mexican corn cyst (*Punctodera chalcoensis*), or potato cyst nematodes (*Globodera spp.*) during these surveys. Not all cyst nematode species were analyzed each year. On the following page, Table 2 describes the cyst nematode species analyzed and detected by year.

Cyst nematodes in the genus *Heterodera* were the most frequently found cyst nematodes during our survey. They were recovered from 13% to 29% of the sample collected each year of our survey. This genus includes the soybean cyst nematode (*H. glycines*), an economically significant and widespread pest of soybeans, and clover cyst nematode (*H. trifolii*), an important and common pest of clovers and other legumes.

A variety of *Cactodera* species, most of which do not have common names, were found during the 2015-2019 surveys. *Cactodera* species were not tested for during the 2020, 2022, or 2024 surveys. *Cactodera* species such as *C. estonica*, *C. cacti*, *C. weissii* and *C. milleri* have previously been documented in this state. The 2015 survey found *Cactodera rosae* for the first time in Wisconsin and the 2019 survey detected *Cactodera milleri*. *Cactodera* cysts are not likely to be impacting crops as they are usually found on non-crop hosts and were likely feeding on weeds present in the surveyed fields.

Conclusion

Early detection plant pest surveys are a line of defense against the establishment and spread of harmful plant pests in the United States and Wisconsin. Introduced cyst nematodes have the potential to negatively impact the production of corn, soybean, potatoes, and other crops in Wisconsin such as through crop yield losses and phytosanitary restrictions. Early detection during surveys and rapid response by state officials to control and, when possible, eliminate these from the state and country could mitigate impacts to Wisconsin growers.

Table 2. Cyst nematode species detected during field surveys from 2015 to 2024

	2015 Fields infested	2016 Fields infested	2017 Fields infested	2018 Fields Infested	2019 Fields Infested	2020 Fields Infested	2022 Fields Infested	2024 Fields Infested
Cereal cyst *(Heterodera avenae)*	0	0	0	0	0	0	0	0
Exotic cereal cyst *(Heterodera filipjevi)*	0	0	0	0	0	0	0	0
Mediterranean cyst *(Heterodera latipons)*	0	0	0	0	0	0	0	0
Mexican corn cyst *(Punctodera chalcoensis)*	0	0	0	0	0	0	0	0
False root-knot nematode (*Nacobbus aberrans*)	Not analyzed	Not analyzed	Not analyzed	Not analyzed	Not analyzed	0	0	0
Potato Cyst Nematodes *(Globodera pallida and Globodera rostochiensis)*	Not analyzed	Not analyzed	Not analyzed	Not analyzed	Not analyzed	Not analyzed	0	0
Cactus cyst-like *(Cactodera spp.)*	6% (12/198)	4% (4/114)	2% (2/95)	1.4% (1/73)	10% (6/58)	Not analyzed	Not analyzed	Not analyzed
Soybean cyst *(Heterodera glycines)*	15% (29/198)	19% (22/114)	21% (20/95)	21% (15/73)	10% (6/58)	20% (13/66)	0	14% (7/51)
Soybean cyst-like *(Heterodera spp.)* including clover cyst (*H. trifolii)*	7% (14/198)	6% (7/114)	8% (8/95)	6% (4/73)	7% (12/58)	9% (6/66)	13% (26/208)	0
Total number of samples containing cyst nematodes**	28% (55/198)	25% (29/114)	32% (30/95)	26% (19/73)	33% (19/58)	29% (19/66)	13% (26/208)	14% (7/51)

**Samples may contain more than one species of cyst nematode and as a result the sum of all cyst nematode species detected may be higher than the total number of soil samples testing positive for cyst nematodes.

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PEST SURVEY PROGRAM

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