Improving Diagnostics and Our Understanding of Pulse and Soybean Nematode Pests

The quarantined nematode, *Ditylenchus dipsaci*, found in Canadian yellow pea shipments causing market access issues with India had been misdiagnosed. The accurately identified nematode, *Ditylenchus weischeri*, poses no threat to Canadian pulse production.

SOME NEMATODES CAN be crop pests, but pulse-nematode interactions on the prairies have not been widely studied. Nematodes are of economic importance, not only as they impact production, but also market access. India has insisted that yellow pea shipments from Canada be certified free of the parasitic nematode *Ditylenchus dipsaci*. The Canadian Food Inspection Agency (CFIA) has been conducting bulk ship monitoring and had, at a low frequency, reported the presence of the nematode, causing ships to be diverted and fumigated in southeast Asia before arrival in India. Exporters experienced delays and extra costs, resulting in lower yellow pea prices for farmers.

The team of researchers in Dr. Tenuta's soil ecology lab underwent several experiments to tackle this trade issue. They developed a molecular test to precisely identify nematodes at a species level and surveyed seed samples. From this, they found that the nematode present in yellow pea and other pulses on the prairies was, in fact, not *D. dispaci*, but a closely related species, *D. weischeri*. The CFIA adopted their methodology, reanalyzing their past positive samples of *D. dipsaci*. Continued monitoring for the nematode has since been suspended by the CFIA, as there was no evidence of the pest after almost 15 years of monitoring yellow pea shipments.

Through greenhouse host screening and field microplot studies, the researchers also found that under normal prairie growing conditions, yellow peas, lentils, chickpeas and dry beans were not good hosts for *D. weischeri*. So why was the nematode present in pea samples? Canada thistle was found to be a host for *D. weischeri* and infested weed seeds were present in export shipments. In further controlled environment studies, *D. weischeri* did survive and reproduce on some yellow pea cultivars at the highest temperature examined (27°C). Research supported by MPSG, APG, SPG and AAFC through the CAP Pulse Science Cluster, has been initiated to investigate how *D. weischeri* can reproduce at these higher temperatures on yellow pea. The new project also aims to mitigate trade threats by screening important crops grown in India as possible hosts for *D. weischeri*.

A survey of prairie pulse fields found *D. dipsaci* present in one yellow pea field in Manitoba in 2015. Garlic is susceptible to parasitism by *D. dipsaci*, and two garlic growers in Manitoba have submitted rotten bulbs to Dr. Tenuta's lab for diagnosis. Although cultivation of garlic crops is not widespread, it threatens to disperse *D. dipsaci* to yellow pea fields. Proper phytosanitation, purchase of *D. dipsaci*-free bulbs and limiting the presence of garlic fields near pea fields are required to reduce the threat to yellow pea exports.

Researchers also found about a third of surveyed prairie fields had the nematode *Pratylenchus neglectus*. *P. neglectus* has been reported to cause yield losses in peas, lentils and chickpeas in other areas of the world, but its host range and impact on the prairies is unknown. Unlike *D. dipsaci*, *P. neglectus* does not pose a market access risk. Instead, *P. neglectus* could be causing yield losses and/or is part of the disease complex causing root rot on pulse crops. Rearing methods have been developed and on-going research will screen crop hosts and relate soil population levels to disease and yield loss in susceptible hosts.

The final activity of this cluster project developed primer sets, real-time PCR primers and protocols to quantify soybean cyst nematode (SCN) DNA in soil. This method will be an alternative to the laborious, costly and error-prone method of cyst extraction and egg counting. This diagnostic procedure also supports ongoing MPSG-funded SCN surveys led by Dr. Tenuta.

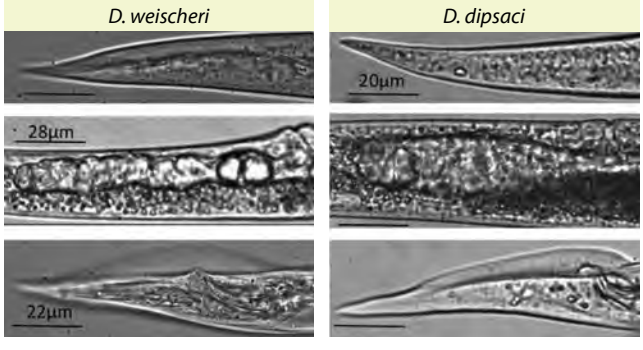

Figure 1. Micrographs of Ditylenchus *obtained from Canada thistle in Manitoba (*D. weischeri*), and garlic from Ontario (*D. dipsaci*).*

PRINCIPAL INVESTIGATOR Dr. Mario Tenuta, University of Manitoba

MPSG INVESTMENT $165,776

CO-FUNDER Agriculture and Agri-Food Canada, through *Growing Forward 2* Pulse Science Cluster

DURATION 5 years