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INSECT PATHOGENIC (INSECT KILLING) NEMATODES FOR THE MANAGEMENT OF WIREWORMS

By Ramandeep Kaur Sandhi, Shabeg S. Briar and Gadi V. P. Reddy, MSU Western Triangle Agricultural Research Center, Conrad, Montana

Wireworms are the larval stages of click beetles. They are generalists and cause damage to many cereals, vegetable and other field crops. They are widely distributed throughout the Northern Great Plains (Montana, North and South Dakota and, Minnesota). In the recent past, wireworms and damage to crops have become a major problem for the growers in the Golden Triangle region of Montana. They dwell into the soil surface and injure plants by boring into stems, roots, and tubers. They damage the plants and go deep into soil for overwinter and come up onto the top layer in the early spring when the soil temperature reaches about 10°C. Wireworms are therefore, difficult to manage because of their hidden behavior.

Lindane was commonly used in early 1950’s for wireworm suppression. Recently, more and more cereal fields are found positive for moderate to heavy population of wireworms in Golden Triangle region of Montana. It appears that banning of Lindane in the year 2009 and eventually some other insecticides used for wireworm management may have resulted in wireworm resurgence. Currently, insecticides mainly neonicotinoids (Imidacloprid) are being used for wireworm management mainly as pre-plant treatments like seed treatment and pre-plant broadcasting. However, for post-emergence control, these insecticides are not very effective against wireworms. In addition, neonicotinoids can only repel the wireworms but do not kill them. Also, there are reports on the neonicotinoids affecting the beneficial insects and pollinators. The development of effective biological control strategies is therefore, required to manage this pest to avoid crop yield losses.

Currently, we are evaluating the efficacy of Entomopathogenic nematodes (EPN’s) against wireworms at Western Triangle Agricultural Research Center (WTARC) located in Conrad, Montana. This research project has been funded by the Montana Wheat and Barley Committee to Dr. Gadi V.P. Reddy for developing sustainable manage-
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Trader's Dispatch, January 2018 — Page C44

New N.D. 4-H Ambassadors selected

By NDSU Extension Service

• Mara Bornemann, Morton, New Salem
• Almont High School, Center
• Victoria Christensen, Stutsman, Chris
tensen Academy, Courtenay
• Mary Goroski, Richland, Wahpeton High
School, Wahpeton
• Alyssa Kemp, Pembina, Cavalier High
School, Cavalier
• Eva Lahlum, LaMoure, homeschooled, Marion
• Nora Larson, Adams, Larson Home-
school, Lemmon, South Dakota
• Seth Nelson, Walsh, Park River High
School, Park River

Eight youth have joined the North Dakota 4-H Ambassadors team. Pictured are: (from left, front row): Eva Lahlum, Mary Goroski and Mara Bornemann; (back row) Victoria Christensen, Brittany Barnhardt, Nora Larson, Alyssa Kemp and Seth Nelson. (NDSU photo)

Eight youth were selected to join the North Dakota 4-H Ambassadors team at a recent selections event.

The new team members, the county where they are enrolled in 4-H and the school they attend are:

• Brittany Barnhardt, Morton, Mandan High School, Mandan

Insect pathogenic (Insect killing) nematodes for the management of wireworms (CONTINUED FROM PAGE C42)

Eight youth have joined the North Dakota 4-H Ambassadors team. Pictured are: (from left, front row): Eva Lahlum, Mary Goroski and Mara Bornemann; (back row) Victoria Christensen, Brittany Barnhardt, Nora Larson, Alyssa Kemp and Seth Nelson. (NDSU photo)

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Aliment strategies for the wireworms on spring wheat. Briefly, EPNs are a group of nematodes that can infect and kill the insect and are therefore known as ento-
mopathogenic or insect pathogenic nema-
todes. They are novel biological control agents that have a broad host range, safer to humans, and have no known nega-
tive or toxic effects on the environment. Therefore, the members of two nematode families including and are commonly studied EPNs and are considered effective biological control agents for the manage-
ment strategies for insect and wireworm control.

The life cycle of EPNs starts with an infec-
tion of harmful insects. The life cycle of EPNs starts with an infec-
tion of harmful insects. For example, nematodes reproduce and go through several generations. When food become scarce, the adults produce new infective juveniles that can adapt to the outside environment. In a week, hundreds of thousands of infective juveniles burst out from the insect cadavers (dead larvae) and start looking for new hosts as shown in figure 1 and 2.

In summer of 2017, a graduate student, Ramandeep Sandhi has conducted laborato-
ratory bioassays for checking the ability of EPN’s to cause wireworm mortality. The medium sized larvae of 3 species of wireworms; Limonius californicus, Hypnoides bicolour, and Aeolus mellitus were selected in this experiment. These species are predominantly reported to occur and are damaging the spring wheat fields in the Golden triangle areas of Montana. Ten strains of EPN’s namely, S. carpocapsae (A11 and Cxrd strain), S. feltiae SN strain, H. bacteriophora (HP88 and VS strain), S. riobrave, 17 c+e and 7-12 strains, S. carpocapsae A11 and Cxrd strain. On the basis of these positive results, further research will be carried out whether EPN’s strains with higher wireworm mortality as compared to other strains. In case of second pre-dominate at wireworm species H. bicolor, higher wireworm mor-
tality was observed in S. carpocapsae A11 strain followed by S. feltiae SN strain, S. rariaver (K22 strain), H. georgiana (Kesha), and S. rarius (17 c+e). Different doses (2000, 1000, 500, 250, 100 and 50 Infective Juveniles/ml of water) were used in these tests. The mortality was observed for 30 days and 24 intervals. In case of wireworm, L. californicus, H. floridensis (K22 strain) followed by S. rariaver 355 strain and S. carpocapsae A11 strain showed high mortality as compared to other strains. In case of second pre-dominate at wireworm species S. carpocapsae A11 strain followed by S. feltiae SN strain, S. rarius 17 c+e, and S. carpocapsae Cxrd strain, In. A. mellitus, S. rarius 17 c+e, and S. carpocapsae A11 strain showed more mortality followed by S. carpocapsae Cxrd strain. On the basis of these positive results, further research will be carried out whether EPN’s strains with higher doses can cause mortality in less time at high doses. The strains showing promi-
nence in the laboratory tests, will be used to evaluate in the greenhouse and field experiments for their field efficacy. Opti-
mically, this new technology can be successfully implemented for wireworm management. This strategy is expected to have a significant and positive impact on the Northern Great Plains agriculture and will greatly help the farming community.