

SUSCEPTIBILITY OF THE ASIATIC GARDEN BEETLE TO LOCALLY ISOLATED ENTOMOPATHOGENIC NEMATODES



Adrian J. Pekarcik and Kelley J. Tilmon

Department of Entomology

THE OHIO STATE UNIVERSITY

ASIATIC GARDEN BEETLE (AGB) Maladera castanea Arrow

Annual white grub Univoltine Generalist (Coleoptera: Scarabaeidae) JAN MAR APR JUN AUG SEP OCT NO\ DEC **FEB** MAY JU Hatching and larval Overwintering grubs Upward migration Pupation and adult Downward migration for Eggs hibernation laid growth emergence

Hallock 1936; Tashiro 1987



GEOGRAPHIC DISTRIBUTION





EMERGING PEST

"... there doesn't seem to be any *'silver bullets'* for controlling this pest."

Richer and Michel 2014





ENTOMOPATHOGENIC NEMATODES

- Obligate insect endoparasite
- Third and final juvenile stage is free living
- Biological control



Healthy grub

Nematode infested grub



BIOCONTROL BY NEMATODES

 Easy to mass produce in vivo (Testa & Shields 2017)

 Persistent for over 7 years after application (Shields & Testa 2018)

IPM compatible

(Koppenhofer et al. 2002)

• Evaluated extensively for AGB in turf grass

(Koppenhöfer & Fuzy 2003a, 2003b, 2004, 2008, 2009; Koppenhöfer et al. 2002, 2004, 2005; Morales-Rodriguez et al. 2010; Lacey & Georgis 2012)



OBJECTIVE

1. Evaluate AGB susceptibility to local nematodes in corn in the greenhouse

Hypothesis: AGB will show varying levels of susceptibility to isolated nematode species

Hypothesis: Nematodes will reduce root and shoot weight losses caused by AGB in corn seedlings





METHODS – FIELD SAMPLING



10 locations in 5 Ohio counties (Erie, Fulton, Henry, Lucas, Williams)



METHODS – EPN ISOLATION

1. BAITING 2. EXTRACTION





METHODS – AGB SUSCEPTIBILITY

2 AGB

V2 organic corn



Nematode treatments 16 replicates

- Control (H₂O)
- Hb (~1000 IJs)
- Hm (~1000 IJs)
- Sg (~1000 IJs)

Hb + Hm (~500 + ~500 IJs)

Evaluated after 7 days

- Grub mortality
- Dry root and shoot weights

Statistics

 Grub mortality and root, shoot and total plant weights were compared for nematode treatments in separate one-way ANOVAs with LSmeans ≤ 0.05 and Tukey-Kramer post-hoc tests THE OHIO STATE UNIVERSITY

RESULTS – AGB SUSCEPTIBILITY

Hypothesis: AGB will show varying levels of susceptibility to isolated nematode species



RESULTS – PLANT WEIGHTS

Hypothesis: Nematodes will reduce root and shoot weight losses caused by AGB in corn

Total weight (mg) F_(4 136)=0.80, P=0.5268) Hb + Hm Root, shoot and total weights for plants treated with 4p nematodes did not vary from Control the control 400 300 200 100 100 200 300 400 0 Root weight (mg) Shoot weight (mg) F_(4,136)=0.29, P=0.8848) F_(4,136)=1.22, P=0.3041)

The Ohio State University

RESULTS – PLANT WEIGHTS

Hypothesis: EPN treatments will reduce root and shoot weight losses caused by AGB in corn







- All 3 nematode species infested AGB grubs, albeit at different rates
- These results were consistent with previous studies (Koppenhofer and Fuzy 2003; Morales-Rodriguez et al. 2010)
- AGB infection by nematodes did not reduce plant damage in greenhouse
- Next step: Field trial under more realistic conditions



ACKNOWLEDGMENTS

<u>Tilmon Lab (OSU)</u> Amy Raudenbush Megan Zerrer



NCR-SARE student grant # GNC17-248



Elson Shields Tony Testa



Eric Richer John Shoenhals Mike Gastier Garth Rupp







THE OHIO STATE UNIVERSITY

REFERENCES

- **DiFonzo, C. 2007.** Asiatic garden beetle in southern Michigan. Michigan State University Extension. Accessed March 20, 2017. http://msue.anr.msu.edu/news/asiatic_garden_beetle_in_southern_michigan
- Hallock, H.C. 1936a. Life history and control of the Asiatic garden beetle. USDA Circ. 246: 1-20.
- Hammond, R. 2013. Asiatic garden beetle could be cause for concern for northern Ohio corn. About Us: News. OSU, Department of Entomology. Accessed on March 20, 2017. https://cfaes.osu.edu/news/articles/asiatic-garden-beetle-could-be-cause-for-concern-for-northern-ohio-corn
- Kaya, H.K., and R. Gaugler. 1993. Entomopathogenic nematodes. Annu. Rev. Entomol. 38: 181-206.
- Koppenhofer, A.M., R.S. Cowles, E.A. Cowles, E.M. Fuzy, and L. Baumgartner. 2002. Comparison of neonicotinoid insecticides as synergists for entomopathogenic nematodes. Biol. Control. 24(1): 90-97.
- Krupke, C., J. Obermeyer, and L. Bledsoe. 2007. A new field crops pest for Indiana: Asiatic garden beetle. Purdue Cooperative Extension Service. Accessed March 20, 2017.

https://extension.entm.purdue.edu/pestcrop/2007/issue11/

• **Richer, E.A., and A. Michel. 2014.** Product efficacy on Asiatic garden beetles in field corn. OSU Extension. Accessed March 20, 2017.

https://agcrops.osu.edu/sites/agcrops/files/ofr_reports/2014%2520Fulton%2520AGBproducts.pdf

• Richer, E., and A. Michel. 2014. Asiatic garden beetles continue to be an issue in NW Ohio. C.O.R.N. Newsletter, Agronomic Crops Network: Ohio State University Extension. 2014-17. https://agronos.osu.edu/newsletter/com-

newsletter/2014-17/asiatic-garden-beetles-continue-be-issue-nw-ohio

• **Tashiro, H. 1987.** Turfgrass insects of the United States and Canada. Cornell University Press, Ithaca, NY. 156-192.