Parasitoids of the Bean Leaf Beetle (Coleoptera: Chrysomelidae) Found in Nebraska Soybean Fields

Stephen D. Danielson  
*University of Nebraska-Lincoln*, sdanielson1@unl.edu

James R. Brandle  
*University of Nebraska-Lincoln*, jbrandle1@unl.edu

Laurie Hodges  
*University of Nebraska-Lincoln*, lhodges1@unl.edu

Follow this and additional works at: https://digitalcommons.unl.edu/agronomyfacpub

Part of the Plant Sciences Commons

https://digitalcommons.unl.edu/agronomyfacpub/370

This Article is brought to you for free and open access by the Agronomy and Horticulture Department at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Agronomy & Horticulture -- Faculty Publications by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.
Parasitoids of the Bean Leaf Beetle (Coleoptera: Chrysomelidae) Found in Nebraska Soybean Fields

S. D. Danielson,1 J. R. Brandle,2 and L. Hodges3

ABSTRACT: The bean leaf beetle, Cerotoma trifurcata (Forster) (Coleoptera: Chrysomelidae), is the major insect pest of soybean in Nebraska and throughout much of the midwestern United States. Natural enemies of the bean leaf beetle have been reported in other states, but none have been reported in Nebraska. In this study, bean leaf beetle adults were obtained by aspirating those found on soybean plants early in the season and by sweep net once plants were in the V4 stage (approximately 0.33 meter tall). Sampling was done in 1997 and 1998 in soybean fields at the University of Nebraska Agricultural Research and Development Center in Saunders County in east-central Nebraska. Beetles were taken to the laboratory and reared to monitor for parasitoid emergence or preserved in ethyl alcohol for later examination for external parasitic mites. Nine tachinid parasitoids emerged from nine of the beetles that were collected in 1997 and identified as Celatoria sp. (species undescribed) (Diptera: Tachinidae). Percentage of beetles infested with the parasitoid ranged from zero to 1.1. Ectoparasitic mites, identified as Trombidium hyperi Vercammen-Grandjean, Van Driesche, and Gyrisco (Acari: Trombidiidae), were found under the elytra on six of the preserved beetles from 1997 and 16 of the beetles from 1998. A total of 8 mites were found in 1997 and 55 were found in 1998. Percentage of beetles infested with the mites ranged from 0-4 in 1997 and from 0-40 in 1998. This is the first report of natural enemies of the bean leaf beetle from Nebraska. This information may be useful to those developing integrated pest management strategies for the bean leaf beetle in the future.

Introduction

Pedigo (1994) described the bean leaf beetle, Cerotoma trifurcata (Forster), as the most consistently important pest of soybean in the North Central states. The damage by adult bean leaf beetles to soybean is considered economic when beetle numbers are high (Hunt et al., 1994) and management consists of insecticide applications when appropriate (Pedigo, 1994).

Natural enemies of the bean leaf beetle have been found in states other than Nebraska. Eddy and Nettles (1930) found a tachinid fly parasitoid in 20% of the bean leaf beetles in South Carolina. Herzog (1977) reared the tachinid fly, Celatoria diabroticae (Shimer) (Diptera: Tachinidae), from up to 22% of the bean leaf beetles he collected in Louisiana. Marrone et al. (1983) also found tachinid fly parasitoids in up to 7% of the bean leaf beetles collected in North Carolina. Another tachinid fly parasitoid, Medina sp., was found in bean leaf beetles collected in Minnesota (Loughran and Ragsdale, 1986). Ectoparasitic larval mites, Trombidium hyperi Vercammen-Grandjean, Van Driesche, and Gyrisco (Acari: Trombidiidae) and Trombidium newelli Welbourn and Flessel, were found attached to bean leaf beetles collected in Iowa soybean fields at levels less than 5% (Peterson et al., 1992).

This study was conducted to determine what parasitoids might be associated with the bean leaf beetle in Nebraska because no natural enemies of this pest had previously been reported as occurring in our state.

Materials and Methods

Sampling was conducted in 1997 and 1998 at the University of Nebraska Agricultural Research and Development Center Agroforestry Farm in Saunders County, Nebraska. Six soybean fields were sampled approximately at weekly intervals in each of the two seasons. Bean leaf beetle adults were sampled by visually observing and aspirating beetles found on soybean plants early in the season and then by sweep
sampling once plants were in the V4 stage (approximately 0.33 m tall). In 1997, 100 sweeps with a standard 38 cm sweep net were taken in each field on the 9 sampling dates from 24 July to 19 September. In 1998, 100 sweeps were taken from each field on the 8 sampling dates from 8 July to 11 September.

Beetles that we collected were returned to the laboratory to determine if they were parasitized. One hundred beetles (or half of those collected if that number was less than 100) from each field on each sampling date, were preserved in 70% ethyl alcohol for subsequent examination under the dissecting microscope for external parasitic mites. Beetles were examined as described by Peterson et al. (1992) for the presence of the mites under the elytra. Another 100 beetles (or half of those collected) from each field were placed in 0.5 liter cardboard containers and provided with fresh soybean leaflets every two to three days. These beetles were examined every two to three days for the emergence of parasitoids as described by Herzog (1977) and Marrone et al. (1983).

Results and Discussion

In 1997, nine parasitoids were obtained from the total of 1006 bean leaf beetle adults that were collected in the field and subsequently reared in the laboratory. These were identified as Celatoria sp. (species undescribed) (Diptera: Tachinidae) by the USDA Systematic Entomology Laboratory. The percentage of these beetles that were parasitized by the tachinid ranged from zero to 1.1. The bean leaf beetle hosts of these parasitoids were collected on 23 June (0.9), 24 (0.7) and 31 July (0.8), and 6 August (1.1) in 1997 (numbers in parentheses are the percentage of bean leaf beetles that were parasitized). In 1998, no parasitoids were obtained from the total of 660 bean leaf beetles that were collected.

In 1997, six bean leaf beetles out of 1168 were found to have external parasitic mites attached under the elytra. One had three mites attached and the others had a single mite attached. These mites were identified as Trombidium hyperi Vercammen-Grandjean, Van Driesche, and Gyrisco by the USDA Systematic Entomology Laboratory. The beetles that were parasitized by these mites were collected on 2 June (0.6), 24 (4.2) and 31 (4.0) July, and 6 August (0.3) in 1997 (numbers in parentheses are the percentage of beetles collected on that date that were parasitized). The percent of bean leaf beetles parasitized by T. hyperi in 1997 ranged from 0 to 4. In 1998, 16 beetles out of the total of 660 were found to have ectoparasitoid mites. In 1998, all the mites were found on beetles collected on 13 (15), 19, and 30 (33) June (numbers in parentheses are the percentage of beans parasitized on each date). The percentage of beetles infested with the mites ranged from 0 to 40 in 1998, which was much higher than in 1997. It is interesting that another mite, Trombidium newelli Welbourn and Flessel, was found in Iowa along with T. hyperi by Peterson et al. (1992), but was not found in our Nebraska study.

This is the first report of parasitoids of the bean leaf beetle being found in Nebraska. To date, pest management of the bean leaf beetle on soybean in Nebraska has involved the cultural practice of delayed planting and the use of insecticides to control adults when damage is severe. The finding of natural enemies of this pest in our state may lead pest managers and researchers to develop strategies that utilize the biological controls to assist with management of the bean leaf beetle or at least may minimize negative impacts on these natural enemies when possible.

ACKNOWLEDGMENTS: We thank Robert J. Wright and Thomas E. Hunt for reviewing this manuscript. We also thank Norman E. Woodley of the Systematic Entomology Laboratory, ARS-USDA for identification of Celatoria sp. and W.C. Welbourn associated with the Systematic Entomology Laboratory ARS-USDA and located at Gainesville, FL, for identification of Trombidium hyperi. The authors are also grateful to Srinivas Parimi, Stephanie Wreed, Kelli Knop, and Jeffrey Brandle for their technical assistance. Support for this research was provided by the University of Nebraska ARDC Interdisciplinary Farm Project. This is contribution 12721 of the journal series of the Agricultural Research Division, University of Nebraska-Lincoln.

Literature Cited


