

Nebraska
NCERA-125 2006 annual report

Project title: Susceptibility of biological stages of the horn fly, *Haematobia irritans*, to entomopathogenic fungi (Hyphomycetes).

Investigators: C. A. Angel-Sahagún, R. Lezama-Gutiérrez, J. Molina-Ochoa, E. Galindo-Velasco, M. López-Edwards, O. Rebolledo-Domínguez, C. Cruz-Vázquez, W. P. Reyes-Velázquez, S. R. Skoda, and J. E. Foster.

Contact: John E. Foster (jfoster1@unl.edu)

Abstract: The susceptibility of egg, pupa, and adult of *Haematobia irritans* (L.) (Diptera: Muscidae) to isolates of the fungi *Metarhizium anisopliae* (Metsch.) Sor., *Beauveria bassiana* (Bals.) Vuill., and *Paecilomyces fumosoroseus* (Wize) Brown and Smith, was evaluated under laboratory conditions. Groups of 20 eggs less than 4 h old, pupae less than 48 h old and adults were sprayed with a conidial suspension for each isolate. Eggs, pupae, and adults of horn fly were susceptible to these entomopathogenic fungi. For treated eggs, the isolates Ma3, Ma 15, Ma25, Pfr1, and Pfr8 reduced adult emergence to 3.8% to 6.3% in comparison with the control (72%). The mortality of pupae infected by the isolates Ma2, Ma25, and Pfr10 ranged between 50% and 71.3%. Mortality of adults after treatment with the isolates Ma6, Ma10, Ma14, Ma15, Pfr1, Pfr9, Pfr10, Pfr11, and Pfr12 were higher than 90%. The isolate Ma6 produced the lowest LC₅₀ against adult horn flies (8.08 x10¹² conidia/ml). These findings supported the hypotheses that isolates of *M. anisopliae*, and *P. fumosoroseus* are pathogenic against the different biological stages of horn flies by reducing adult emergence when applied on groups of eggs and pupae, and producing mortality when applied to adults.

Project title: Predacious Coccinellidae in Alfalfa

Investigators: A. P. Cunningham, S. D. Danielson and J. R. Brandle. University of Nebraska-Lincoln.

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Abstract: Alfalfa harvest timing is determined by the grower to maximize yield and forage quality. Previously, research has shown that harvest timing may be manipulated to help manage alfalfa pest populations. Little research has been done involving the effects of the harvest event and its timing on predacious Coccinellidae, which are primary predators of alfalfa insect pests.

This study involved three aspects of the relationship between predacious coccinellid populations and alfalfa harvest: 1) understanding the statistical and temporal relationships between lady beetle and alfalfa development for the purpose of timing harvest in such a way to conserve lady beetles, 2) mortality effects of harvesting equipment on lady beetles which do not escape the harvesting event, and 3) conservation of lady beetle adults in alfalfa fields using unharvested, baited borders (refugia). Lady beetle species involved in this study were *Hippodamia convergens*, *Coccinella septempunctata*, *Coleomegilla maculata*, *Hippodamia parenthesis*, *Harmonia axyridis*, *Cycloneda munda*, and *Hippodamia tredecimpunctata*. This study involved viewing these lady beetles collectively as a community to be preserved for biological control of soft-bodied alfalfa insect pests.

Alfalfa is optimally harvested during the early flower stage. Harvest timing usually did not interfere with periods when lady beetles were pupating. These periods of time were evident as three discrete periods in 2004, and one period in 2005 prior to the first harvest. In relation to the first harvest, lady beetles pupated before alfalfa was ready to be harvested or after the harvest was completed. Statistical models predicted that adult lady beetles would reach peak numbers during the early bud alfalfa stage. Models also predicted larval development to occur during alfalfa stages well ahead of harvest.

The majority of lady beetles collected in windrows immediately after harvest were not injured. Adults were collected more than other stages, and exhibited mortality of less than 6%. Significantly higher numbers of lady beetles were found in borders after harvest than before the event. This research adds to general knowledge of conservation biological control in alfalfa using lady beetles.

Project title: Effects of aphid abundance and surrounding vegetation on the encounter rate of Coccinellidae, Chrysopidae, and Nabidae in alfalfa.

Investigators: Kriz, J. C., S. D. Danielson, J. R. Brandle, and E. E. Blankenship.
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Abstract: Predaceous insect encounter rate was measured in 21 southeast Nebraska alfalfa fields through weekly sweep net sampling during 2002-03. The most frequently encountered predaceous insect families were Coccinellidae (Coleoptera), Nabidae (Hemiptera), and Chrysopidae (Neuroptera). The study used multiple regression analysis to examine the effect of aphid abundance and the surrounding vegetative patch composition on predaceous insect abundance. In 2002, *Hippodamia parenthesis* Say was encountered more frequently in fields with lower aphid abundances, and *H. convergens* Guerin-Meneville, *Coccinella septempunctata* L. and *Nabis americoferus* Carayon were encountered more frequently in fields with higher aphid abundances. In 2003, *Coleomegilla maculata* DeGeer was encountered more frequently in fields with higher aphid abundance. The remaining two species of Coccinellids and *Chrysoperla* spp. did not exhibit significant correlations with aphid abundance in either year. It was determined that in 2002, *H. parenthesis* was encountered more frequently in alfalfa surrounded by a higher percentage of unfarmed land, and *C. maculata*, *C. septempunctata*, *N. americoferus*, and *Chrysoperla* spp. were encountered more frequently in alfalfa surrounded by a higher percentage of farmed land. In 2003, *N. americoferus* was again encountered more frequently in alfalfa fields surrounded by a higher percentage of farmed land. The remaining three coccinellid species collected did not exhibit significant relationships between vegetative patch composition and encounter rate in either year.

2005-2006 Publications

Cabanillas, E., R. Wright, & R. V. Vyas. 2005. Cereal, fiber, oilseed, and medicinal crop applications. Pp. 265-280. In **Nematodes as Biocontrol Agents**, P. Grewal, R. Ehlers, and D. Shapiro-Ilan (eds.) CABI Publishing.

Angel-Sahagún CA, Lezama-Gutiérrez R, Molina-Ochoa J, Galindo-Velasco E, López-Edwards M, Rebolledo-Domínguez O, Cruz-Vázquez C, Reyes-Velázquez WP, Skoda SR, Foster JE. 2006. Susceptibility of biological stages of the horn fly, *Haematobia irritans*, to entomopathogenic fungi (Hyphomycetes). 8pp. *Journal of Insect Science* 5:50, available online: insectscience.org/5.50

Alexander P. Cunningham. 2006. Predacious Coccinellidae in Alfalfa, M.S. Thesis, Advisors: S. D. Danielson and J. R. Brandle. University of Nebraska-Lincoln.

Kriz, James C., Stephen D. Danielson, James R. Brandle, and Erin E. Blankenship. 2006. Relative Abundance of Exotic and Native Coccinellidae (Coleoptera) in Southeast Nebraska Alfalfa. *J. Entomol. Sci.* 41(1): 84-86.

Kriz, J. C., S. D. Danielson, J. R. Brandle, and E. E. Blankenship. 2006. Effects of aphid abundance and surrounding vegetation on the encounter rate of Coccinellidae, Chrysopidae, and Nabidae in alfalfa. *J. Entomol. Sci.* 41: 211-220.