

## Annual Report: Soybean Aphid Control by Natural Enemies in Manitoba

Alejandro C. Costamagna and Ishan Samaranayake

Department of Entomology - University of Manitoba

217 Animal Science/Entomology Bldg, 12 Dafoe Road, Winnipeg, Manitoba R3T 2N2, Canada |  
phone: 1-204-474-9007 | fax: 1-204-474-7628

### *Suppression of soybean aphid by natural enemies present in soybeans and alfalfa:*

We conducted final analyses on the experiments conducted during 2012 testing soybean aphid suppression by natural enemies from soybean and alfalfa. We found that soybean aphids were significantly suppressed in all four locations studies and in both crops at similar rates, despite significantly larger populations of natural enemies present in alfalfa, indicating that predator assemblages in alfalfa can control soybean aphid. Suppression by foliar predators was similar to suppression by ground and foliar predators combined, indicating a relative low contribution of ground predators to overall suppression. Finally, soybean aphid suppression was similar in alfalfa than suppression of pea aphid, indicating that predators in alfalfa are not specialized to alfalfa aphids and have the potential to move to soybean when high aphid infestations occur in that crop. The results of this experiments demonstrate for the first time that natural enemies present in Manitoba can effectively control soybean aphid and were presented at the Entomological Society of Canada (2012)<sup>1</sup> and America (2013)<sup>2</sup> Annual Meetings.

### *Suppression of soybean aphid in different agricultural landscapes in Manitoba:*

We conducted field manipulations to test the impact of natural enemies on soybean aphids on a gradient of agricultural landscapes in Manitoba, ranging for areas with high proportion of natural vegetation and alfalfa (presumed sources of aphid natural enemies), to areas dominated by field crop production. We compared predation of aphids on potted soybean plants infested with immobile stages of soybean aphids (14 aphids / pot), that were exposed (open treatment) versus protected from predation (covered with a mesh cage, exclusion treatment, Fig. 1). This design was replicated five times in each soybean field, on five separate locations that included farmer's fields in La Broquerie (3 fields), Gimli (3 fields), Carman (2 fields), Morris (3 fields) and Emerson (3 fields), and two university fields (Carman and Glenlea). Aphid populations were monitored weekly for the two weeks of the experiment and natural enemy populations were sampled with five 25 sweeps-samples in each field.



Fig. 1. Exclusion cages used to test soybean aphid suppression by natural enemies in soybean fields (paired open plants were located approximately 1 meter from each cage).

All habitats around each field within a 2 km radius were mapped to quantify landscape composition and structure and determine their influence on soybean aphid control by natural enemies. We found significant soybean aphid suppression in all fields studied (all  $P_s < 0.05$ , separate analyses of variance for each field), with levels of controls ranging from 3- to 22-fold reductions of aphid populations, depending on the field. None of the

aphid populations reaching threshold levels when exposed to natural enemies (open= 16.4 [range: 7 – 29], exclusion= 135.7 [range: 37 – 320] aphids / cage). These results were presented at the Entomological Society of Manitoba Annual Meeting (2013)<sup>3</sup>. We are currently processing sweep net samples to quantify natural enemies and incorporating surrounding habitat information into Arc Map in order to digitally quantify landscape structure.

#### *Assessment of the dispersal of effective natural enemies into soybean fields*

Mark-recapture study: Approximately 250 seven-spotted ladybeetles, *Coccinella septempunctata*, were released in two neighboring fields of soybean and alfalfa to study ladybeetle movement between crops. The ladybeetles were captured during the previous day from alfalfa and wheat fields and were marked with paint dots in unique combinations that identify the crop and point of release. Seven transects in each crop were sampled using sweep nets four times a day until 96 hours after release. A total of 504 samples were taken in each sampling and the identity of the ladybeetles recaptured was recorded. The data collected is currently being analyzed to determine patterns of ladybeetle movement between fields.

Bidirectional Malaise trap sampling: Movement of natural enemies between soybean and neighboring fields was monitored using bi-directional Malaise traps, which were located in the border between contiguous fields and had separate collecting jars for each side of the border (Fig. 2). Border fields included canola, alfalfa, natural vegetation, wheat, and other habitats, for a total of 18 neighboring fields monitored. Preliminary analysis of the results of the first week of data revealed significant movement of hoverflies and lacewings from canola and natural vegetation to soybean and very low overall movement of ladybeetles, damsel bugs and other groups of natural enemies. Final analyses will be conducted after we finish processing all samples and will include the total natural enemies sampled during the two weeks of the field cage experiment.



Fig. 2. Bi-directional Malaise trap used to monitor natural enemy movement between neighboring fields (here between soybean and canola).

#### Scientific communications:

<sup>1</sup> Costamagna A.C. 2012. Comparison of predation in annual versus perennial agroecosystems: aphid predation in soybean versus alfalfa in Manitoba. Entomological Society of Canada, November 3 – 7, 2012, Edmonton, Alberta.

<sup>2</sup> Costamagna A.C. 2013. Comparison of predation in annual versus perennial agroecosystems: Aphid predation in soybean versus alfalfa in Manitoba. ESA Annual Meeting, November 10- 13, 2013, Austin, Texas. (poster)

<sup>3</sup> Samaranayake, I., and A.C. Costamagna. 2013. Soybean aphid control and movement of natural enemies from adjacent habitats. Entomological Society of Manitoba, November 1- 2, 2013, Winnipeg, Manitoba.