INTRODUCTION

MN has an estimated 26,000+ acres of organic soybean. Organic soybean growers are faced with risk of aphid infestation and significant yield loss annually. Having an effective “responsive control” is desirable to prevent economic loss, especially in outbreak years when 40 to 50% yield losses were documented.

A summary of field trials from 2006 to 2012 are provided to illustrate the frustrations and provide a road map for where recommendations currently stand to manage Soybean aphid (SBA) in organic soybean.

2006 - Effect of Foliar Applied Compost Tea and Fish Emulsion on Organically Grown Soybeans

This study was established to evaluate the effect of applying liquid nutrients, compost tea and fish emulsion, on soybean for yield and quality. It quickly highlighted a major production problem. How do you manage an aphid outbreak in organic system?

Neem (azadirachtin) was applied 7/14 and 7/20, but the Organic Materials Review Institute (OMRI) approved insecticide failed to control the populations, reaching numbers of 1000+ aphids/plant from mid July to early August. Yield losses exceeded 40% compared to historical averages for the local organic farms (Table 1).

2007 - Organic Aphid Insecticides and Thresholds

Neem performed poorly at recognized Action Threshold (AT) level. Would it perform at lower populations? What other OMRI options might we have? Should organic thresholds be lower? Products were evaluated at plant infestation levels of 50, 100, and 150 aphids per plant and compared to an untreated check and no aphids.

None of the organic insecticides succeeded in controlling or stopping the population growth of the soybean aphid. Pyrethrum appeared to have had some success in suppressing population growth. Action Thresholds definitely need to be lower.

2008 - Organic Insecticide Efficacy for Soybean Aphid

Outbreaks by mid-July prompted small plot, replicated trials to expand 2007 efforts, with emphasis on pyrethrum. Aphid counts at 3-DAT had increased; poor aphid control low in the canopy was responsible. Treatments reapplied with a reconfined sprayer with drop nozzles. Population growth slowed and bought some time.

Yields by treatment did not produce significantly different results. Pyrethrum alone had better impact on aphids than the mixtures. Improvement related to plant coverage and canopy penetration.

2009 - Air Assist Sprayer with Organic Insecticide

Insecticide applications were applied with an air assist sprayer to assess if improved coverage enhanced performance of organic insecticides, particularly pyrethrum.

Outcomes were similar. Pyrethrum applications suppressed aphid populations up to 60% based on repeated-measures of whole plant counts on randomly selected plants. Populations did not decrease after neem application.

Counts on 90% of the pyrethrum treated plants declined by an average of 130 aphids (N=30); counts on 27% of untreated plants also declined, but by only 22 aphids (N=15).

Counts declined on treated plants, but when numbers were greater than 250 aphids/plant, it was less likely to get counts below the AT.

2010 - Pyrethrum / Air Assisted Sprayer put to the Test

An organic field with a significant aphid infestation was reported from Crookston, MN. The field was assessed using “Speed Scouting” plus additional infestation classification (see below). The field exceeded the conventional ET of 250 aphids/plant. Pyrethrum (Pyganic @ 0.35 lb A.I./a) was applied with the air assist sprayer. Assessments were made separately for the field and a smaller, RCB-design, plot layout.

In general, treatments were applied later than desired, exceeding a target AT of 100 aphids/plant. Aphid populations declined by just under 60% for the pyrethrum treatment; they increased by 55% on untreated plants. Yield differences from replicated blocks were not significant, though they favored the pyrethrum treatment. The 50-60% suppression became the common theme for pyrethrum.

2011 - Decisions, Pyrethrum and Aerial Application

Fourteen fields were scouted using the 2010 approach. SBA populations increased to the 100 aphids/plant level and pyrethrum treatments were initiated. Applications were made by air by a spray plane equipped with an electrostatic sprayer.

For example, Brakke #2 (figure 1) approached 100 on 7/19, was treated 7/21 and 7/26, bringing SBA numbers down to tolerable levels. This field yielded 51 bu/a (L. Brakke, personal communication).

Another field (figure 2) received an aerial application of pyrethrum on 8/13. After 48 hours, populations were reduced by 32% compared to three, tarped areas used as untreated checks. The “white dwarf” form of the SBA were present in both pre and post counts. The post counts were shifted predominately to the white dwarf form. Colonies in the upper parts of the plant were severely depilated, leaving mostly white dwarves surviving on the lower, older, and “leathery” leaves of plants.

2012 - Repeatability?

SBA infestations in all 17 organic fields that were monitored failed to reach treatable levels by any standard in 2012 – We enjoyed the rest and didn’t miss the stress!!!

Discussion

Soybean aphid infestations pose a vexing problem in organic systems. In general:

- Natural pyrethrum was the best product evaluated, but only provided suppression of soybean aphid by 50 – 60%.
- Multiple applications in outbreaks are likely, but still dependent on timing of infestation (e.g., July vs. August; R2 vs. R4);
- Delaying until 250 aphids/plant was too late for “responsive control” with organic insecticides. An AT of 100 aphids/plant proved better, but there is no guarantee infestations would reach numbers reliably associated with economic losses;
- Coverage is critical, particularly when aphid colonies are on lower leaves and stems.

Soybean Aphid in Organic Systems - Pyrethrum

Soybean Aphid in Organic Insecticide System - Pyganic Treatment

Lowering the SBA Action Threshold (AT)

The weak performance by OMRI insecticides for SBA has led to the need for making earlier treatment decisions directed at smaller populations. The decision to use an AT closer to 100 aphids/plant seemed the most practical. What procedure can we use to make an earlier decision?

"Speed Scouting" was used for 15 fields, along with tallying plant infestation by a visual estimate of population size. Bar charts graphically broke down plants by infestation level. Over time, it showed infestation change and bars clustered around the average (see graphic to the right for example from 2011)

\[ \text{Sooty mold was} \]


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