Current and Developing Soybean Aphid Scouting Protocols

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Date:
Field:
Variety:
Collector:
GPS Coordinates:
Plant No.
Node
Time
Laterals
R-stage
V-stage

Soybean aphid economic threshold provides treatment decision support

Field scouting is the step required to reach that decision (treat or no-treat)

How do current scouting protocols compare?

- Whole plant count
- Speed-scouting

What's new in sampling research?

- Node-based sample unit

Journal of Economic Entomology **100:1258-1267.**

FIELD AND FORAGE CROPS

Economic Threshold for Soybean Aphid (Hemiptera: Aphididae)

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Common University research protocol in **6 North Central states**, pooled data from **19 yield-loss experiments** over **3 years**.

Results validated soybean aphid economic threshold to treat within 5 - 7 days when aphid density exceeds **250 aphids/plant**.

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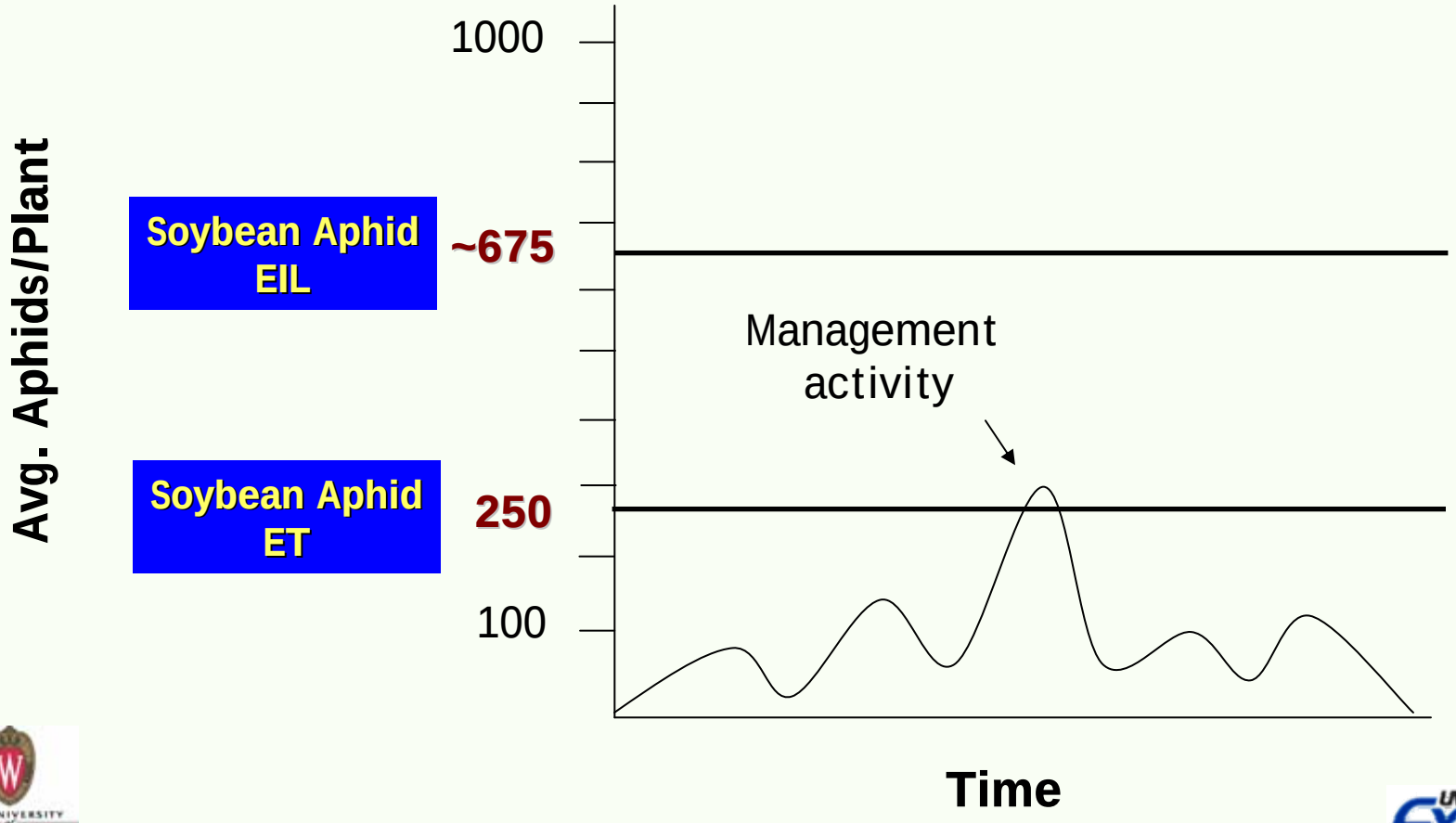
Economic Injury Level (EIL)

Pest density which causes losses equal to the costs of control

Economic Threshold (ET) Pest density at which control action is taken to PREVENT pest population from reaching or exceeding the EIL






- Doubling time for field populations of SBA averaged 6.8(±0.8) days.
- Natural enemies, host plant quality and weather combined can constrain population growth.
- Treating below the ET (too early) or above the EIL (too late) each have negative consequences in an IPM system.

SBA Scouting Ground Rules

Current Methods:

1. Whole plant count
2. Speed-scouting

Developing Methods:

1. Node-based unit

Begin scouting late vegetative/ early flowering (R1), Continue through full pod (R5).

Repeated field visits (weekly ideal).

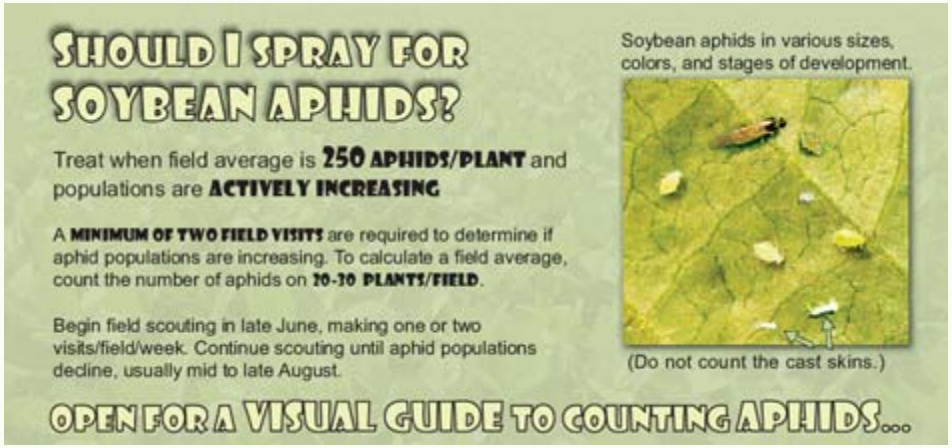
All sampling methods are based on the ET of 250 aphids/plant.

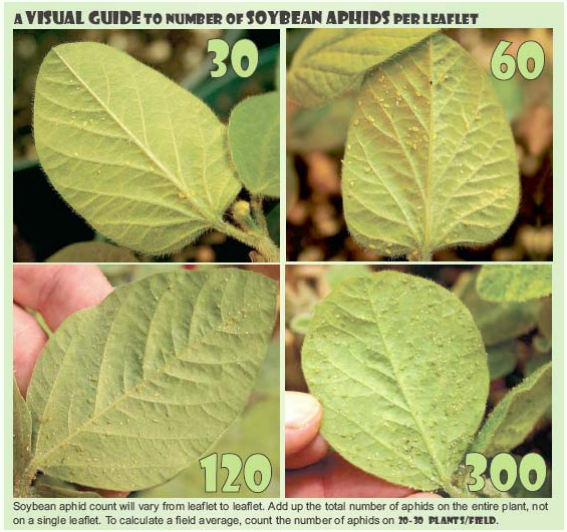
Whole Plant Count – "gold" standard

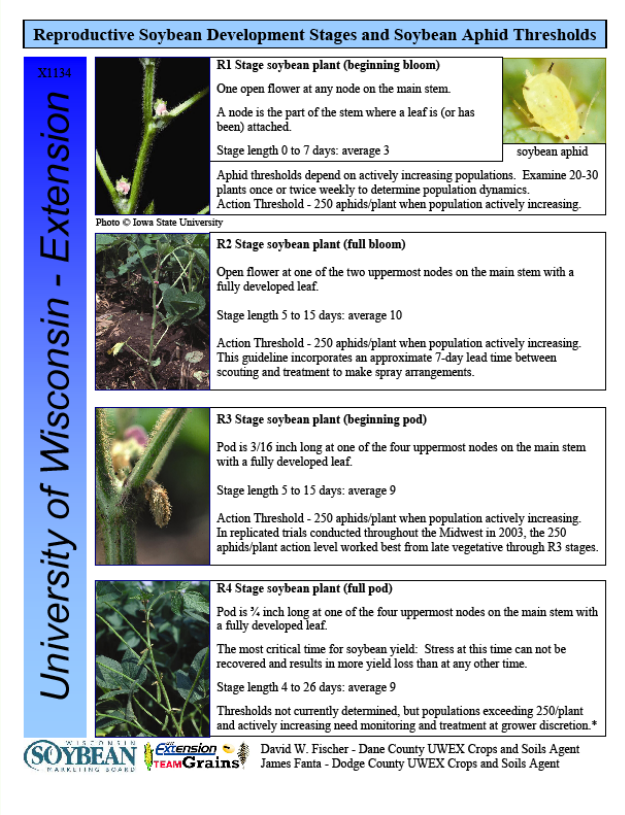
- Count the number of aphids on 20 to 30 plants randomly sampled from throughout the field for a representative sample.
- Examine entire plant for aphids, especially upper leaves and stems.
- Whole plant counts up to 250 are critical. For heavily infested plants you may find it easier to estimate (500-1000; 1000+) *rather than trying to count "3,262" aphids on one plant!*
- Calculate average aphids/plant based on total number of plants sampled.

Soybean Aphid Scouting Guides

Available from UW Madison NPM at:
http://ipcm.wisc.edu/







Available at UW Soybean Plant Health:
http://www.plantpath.wisc.edu/soyhealth/pdf/sbrthresholds05.pdf

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IDENTIFICATION OF

soybean aphid AND look-alike species

Ho Jung Yoo, Purdue University

Identification of Soybean Aphid & Look-alike Species

Martin Spellman

The soybean aphid, *Aphis glycines* Matsumura, is a small, pear-shaped bright green to yellow aphid with dark tips on the cornicles (two tube-like structures or "tailpipes" on the tip of the abdomen); the cauda or tail end of the abdomen is pale and narrow with four or five pairs of setae, or hair-like structures. This aphid can be found on growing points and young leaves of early vegetative soybean plants. As soybean plants mature from late vegetative through reproductive stages, aphids are found on all plant parts. Although most common on undersides of leaves, they also occur on stems, petioles and upper leaf surfaces. Soybean aphid damages plants by sucking phloem (plant sap) resulting in plant stunting, reduced pod set, and smaller seed size. If populations are large, feeding may cause shiny, sticky leaves coated with aphid exudate ("honey dew") and black "sooty" mold fungal growth on soybean leaves.

Robert Venette, USDA Forest Service

Refer to the picture for distinctive features of a soybean aphid. (A) black tipped cornicles, (B) six legs, and (C) six segmented antennae. Make certain that your pest identification is correct before making any insecticide application.

Martin Spellman

This image shows several forms of soybean aphid - the normal green form (A), a darker form (B), shed exoskeletons (C), and "mummies" of parasitized aphids (D) (aphids can be parasitized by small wasps that develop inside the aphid body and exit leaving a hollow outer shell called a mummy).

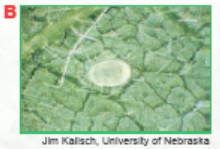
Whitefly Species

Various whitefly species are known to feed on soybean but have never been known to cause economic damage. Whiteflies are most commonly seen on velvetleaf or button weed, and soybean fields with heavy weed populations may have higher whitefly numbers. First instars (crawlers) (A) are legged and oval shaped, about 0.3 by 0.15 mm. The second, third and fourth instars are also oval, do not have legs, and are slightly larger than the first instar. The late fourth instar (pupa) (B) is about 0.7 by 0.4 mm and appears waxy and is tightly attached to the leaf with marginal filaments (tiny hair-like structures around the entire outer edge). Coloration may vary.

A

Marlin E. Rice, Iowa State University

B



Jim Kalisch, University of Nebraska

Mealybug

Mealybugs are closely related and look similar to whiteflies. They are oval shaped and are covered with waxy, white, mealy secretions. Like whiteflies, they also have an active crawler stage and an inactive stage. Although not common, they can occur on soybean leaves and stems, but are not known to cause significant damage.

Lyle Buss, University of Florida

Potato Leafhopper, *Empoasca fabae*

Nymphs are 2-3 mm long, wedge-shaped, pale in color, and wingless. Older nymphs are bright green, with prominent eyes and have wing pads. Unlike aphids, nymphs move sideways rapidly when disturbed.

Marlin E. Rice, Iowa State University

Color tri-fold scouting guide to soybean aphid and 8 other "look-alike" species. Portion of six-panel publication shown here.
Available from UW Entomology: http://entomology.wisc.edu/~cullen/

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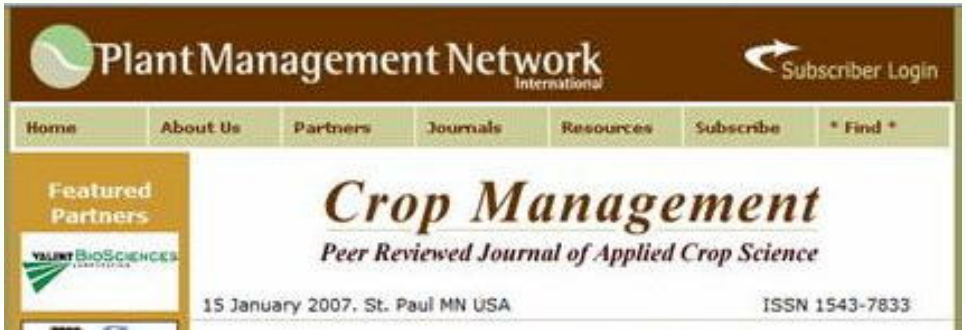
Speed Scouting Method

www.plantmanagementnetwork.org/



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Field Validation of Speed Scouting for Soybean Aphid

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Rationale

Binomial sequential sampling plan.

Mathematical relationship between proportion of infested plants, density of aphids per plant, and an ET of 250 aphids/plant.

The goal is to provide a rapid decision aid for estimating pest populations with an acceptable level of error over a wide range of pest densities.

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Speed Scouting Basics

- Randomly select 11 plants.
- Score as "infested" (= 40+ aphids/plant) or "not infested" (= 0 -39 aphids/plant).
- Three possible outcomes

Do not treat (re-sample in 7-10 days)

Treat (confirm in 3-4 days)

Continue sampling (score 5 more plants)

- Visit UNIVERSITY OF MINNESOTA www.soybeans.umn.edu/crop/insects/aphid/aphid_sampling.htm for instructions, worksheets, examples.

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Speed Scouting for Soybean Aphid

[developed by E. Hodgson, B. McComack, & D. Ragsdale
University of Minnesota Entomology Dept.]

Go to www.soybeans.umn.edu
for FAQs and copies of the form.

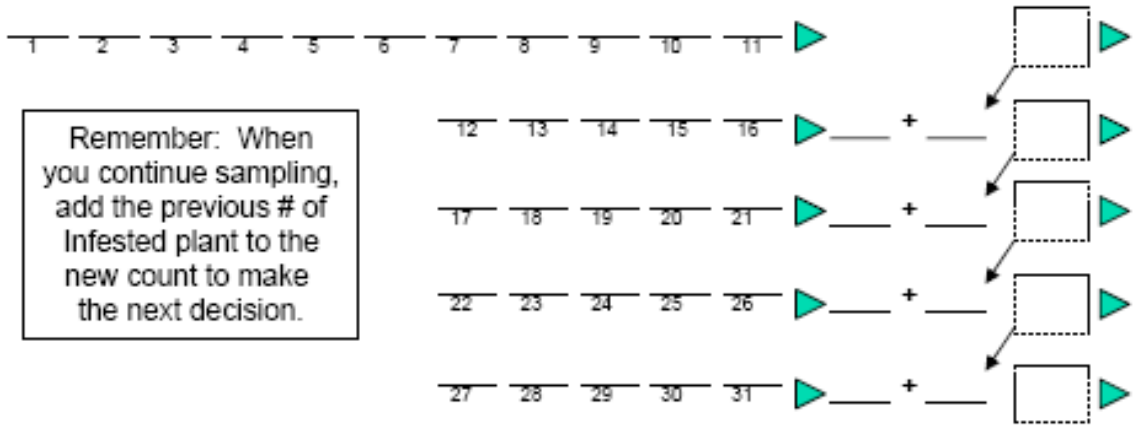
For questions in Minnesota contact:
David Ragsdale, U of M Entomology Dept.
612-624-6771, ragsd001@umn.edu

Directions

1. Go to the first plant at random. If less than 40 aphids are on the entire plant, mark a minus [-] for that non-infested plant. If at least 40 aphids are on the plant (STOP COUNTING when you reach 40 – this is the speedy part), mark a plus [+] for that infested plant.
2. Choose a direction at random and walk 30 rows or paces to the next plant.
3. Repeat Step #1 until 11 plants are sampled in different areas of the field.
4. Make a decision using the total number of infested plants (the total number of pluses).
5. If you must 'continue sampling' (7-10 plants with a +), sample 5 more plants and use the new total number of plants (16) to make a decision.
6. If no decision is reached, sample additional sets of 5 plants until 31 plants are sampled. Remember, always use the total number of plants to make a decision.
7. If no decision can be made after sampling 31 plants, resample the same field in 3-4 days.
8. A 'TREAT' decision must be confirmed a 2nd time 3-4 days later. If confirmed, apply insecticide in 3-4 days.

Field: _____ Date: _____ Decision: _____

Use these Notations: - = Less than 40 aphids/ plant ('non-infested')
+ = 40 or more aphids/ plant ('infested')



DO NOT treat. Resample in 7-10 days	CONTINUE sampling 5 more plants	TREAT decision, confirm in 3-4 days
6 or less	7 to 10	11 or more
10 or less	11 to 14	15 or more
14 or less	15 to 18	19 or more
18 or less	19 to 22	23 or more
22 or less	23 to 26	27 or more

Remember: When you continue sampling, add the previous # of Infested plant to the new count to make the next decision.

Plant Stage: _____

Notes: _____

_____

_____

STOP SAMPLING!
Resample the same field in 3-4 days.

CONFIRM 'TREAT' DECISION
Resample the same field in 3-4 days
Apply insecticide in 3-4 days if confirmed

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Speed Scouting Summary

- Cost effective sampling method at low aphid densities and very high densities.
- However, it is conservative. When incorrect (21% of the time) it yields "treat" decision too early, below the ET of 250 aphids/plant.
- To avoid over-application, experience suggests basing treatment decision on two consecutive "treat" sampling outcomes.

What's New in SBA Sampling Research?

- McCornack et al. (2007). UMN research and North Central state validation trials.

http://esa.confex.com/esa/2007/techprogram/paper_32113.htm

- Aphids found on upper plant portion until mid-July. Mid-season aphids move to lower and inner canopy locations.
- This within-plant distribution shift has prevented sampling single leaf or node to accurately estimate whole plant density.

Node-Based Sample Units ?

- Testing ability of selected sample units to reliably estimate whole-plant aphid densities.
- Ideally, a subset of nodes could be sampled rather than whole plant.
- Under development, not yet ready for commercial use. Stay tuned.