2021 Western Minnesota Soybean Crop & Pest Survey

Cooperators: Minnesota Soybean Research & Promotion Council, NDSU IPM Survey

Purpose of Study:
The soybean crop and pest survey was designed to provide in-season data about regional pest pressure to assist farmers and consultants in making pest management decisions. The 2021 growing season was the sixth that UMN Extension undertook this MSR&PC-sponsored survey.

This project was coordinated with a similar survey undertaken by the NDSU IPM team. Bi-state survey maps were made by NDSU IPM and are available on the NDSU Pest Management website: https://www.ag.ndsu.edu/ndipm/ipm-survey-archives/

Results:
Field surveys of randomly selected Minnesota soybean fields were initiated on June 21. A total of 822 fields were surveyed from June 7 through August 13 in MN and ND (Fig 1).

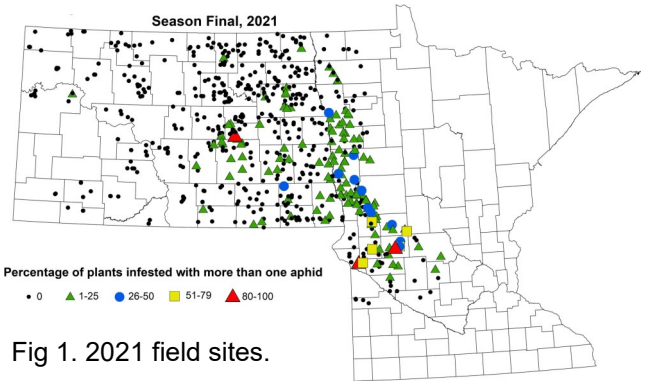

Fig 1. 2021 field sites.

The above-normal temperatures that prevailed throughout the 2021 growing season (Fig 2) accelerated soybeans to grow and develop faster than in 2019 (Fig 3), the last year of this IPM survey.

A total of 283 field visits occurred in Minnesota in 2021.

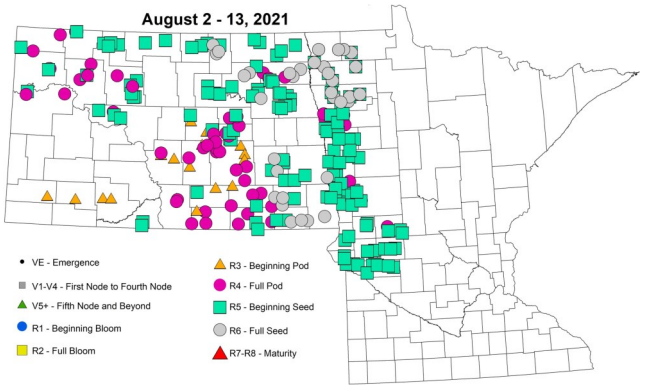

Fig 2. Growth stages, Aug 2-13, 2021.

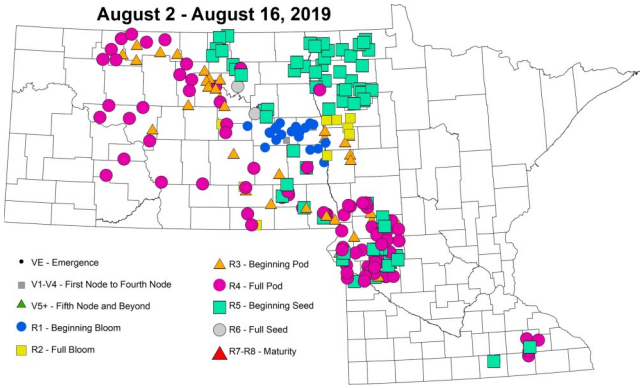

Fig 3. Growth stages, Aug 2-16, 2019.

A primary focus of the survey was documenting soybean aphid population dynamics. Surveys used a protocol based on the "Speed Scouting" procedure which bases treatment decisions for soybean aphid on the treatment threshold of 250 aphids per plant. Scouts inspected a minimum of 31 plants at random from randomly selected soybean fields; plants with aphids were noted and used to determine the percentage of plants with at least one aphid. Aphid population densities on individual plants were visually estimated and tallied on field cards (Fig 4) by the numerical range estimated.

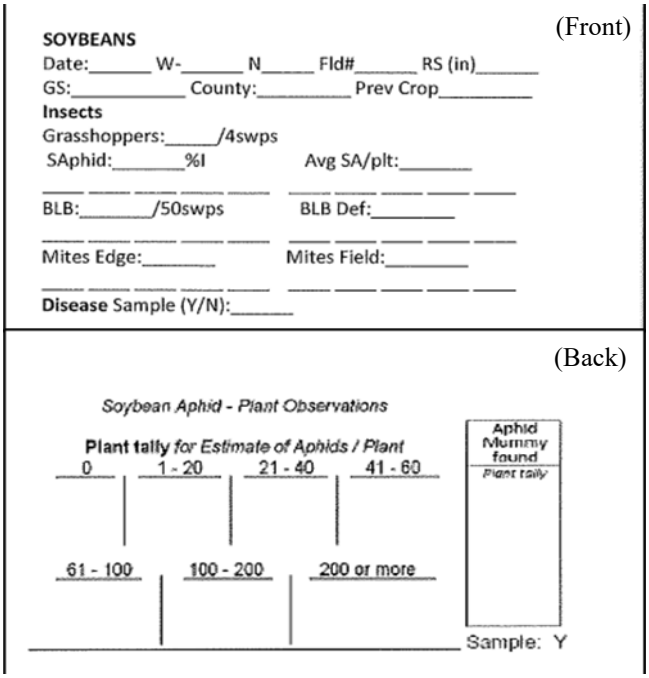

Fig 4. Pocket-sized card used for data collection. Soybean fields were scouted for crop growth stage and spider mites and 31 plants within each field were scouted for soybean aphid population estimates.

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Western Minnesota Soybean Crop Survey [continued]

Although incidence and severity remained low throughout 2021, detectable aphid infestations were found in WC Minnesota between June 7 through 18 (Fig 5). Although soybean aphid incidence (the percentage of plants within a field that were infested) continued to grow throughout the growing season in WC MN, the population density or average number of soybean aphids per plant of these infestations remained well below the soybean aphid treatment threshold of 250 aphids per plant, averaging less than 20 aphids per plant (Fig 6).

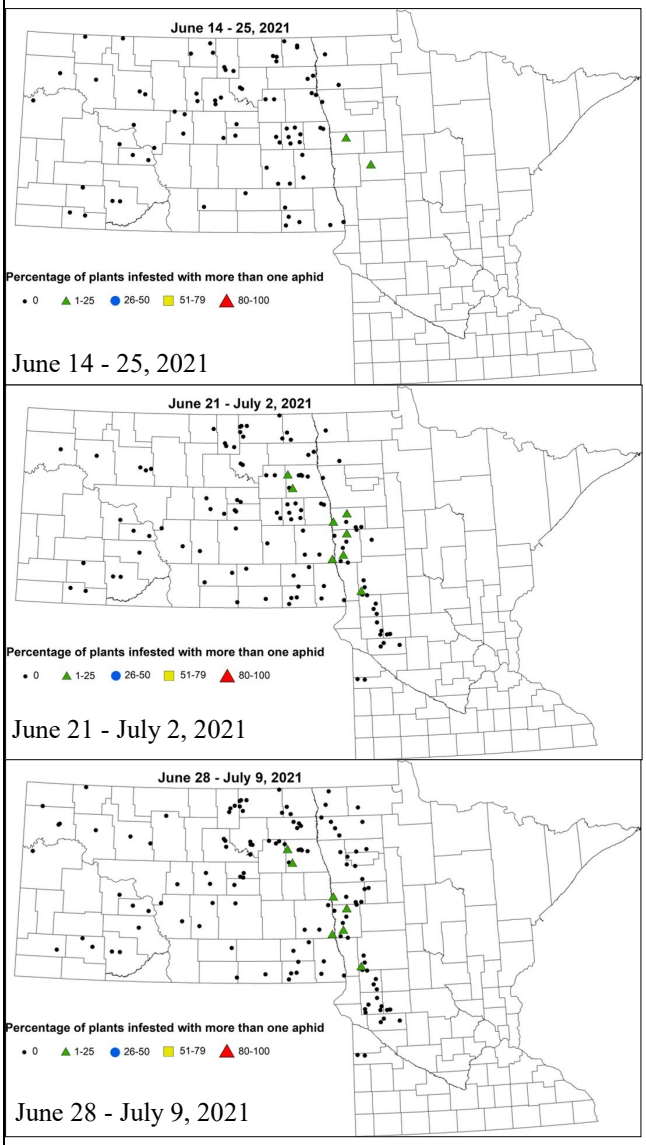
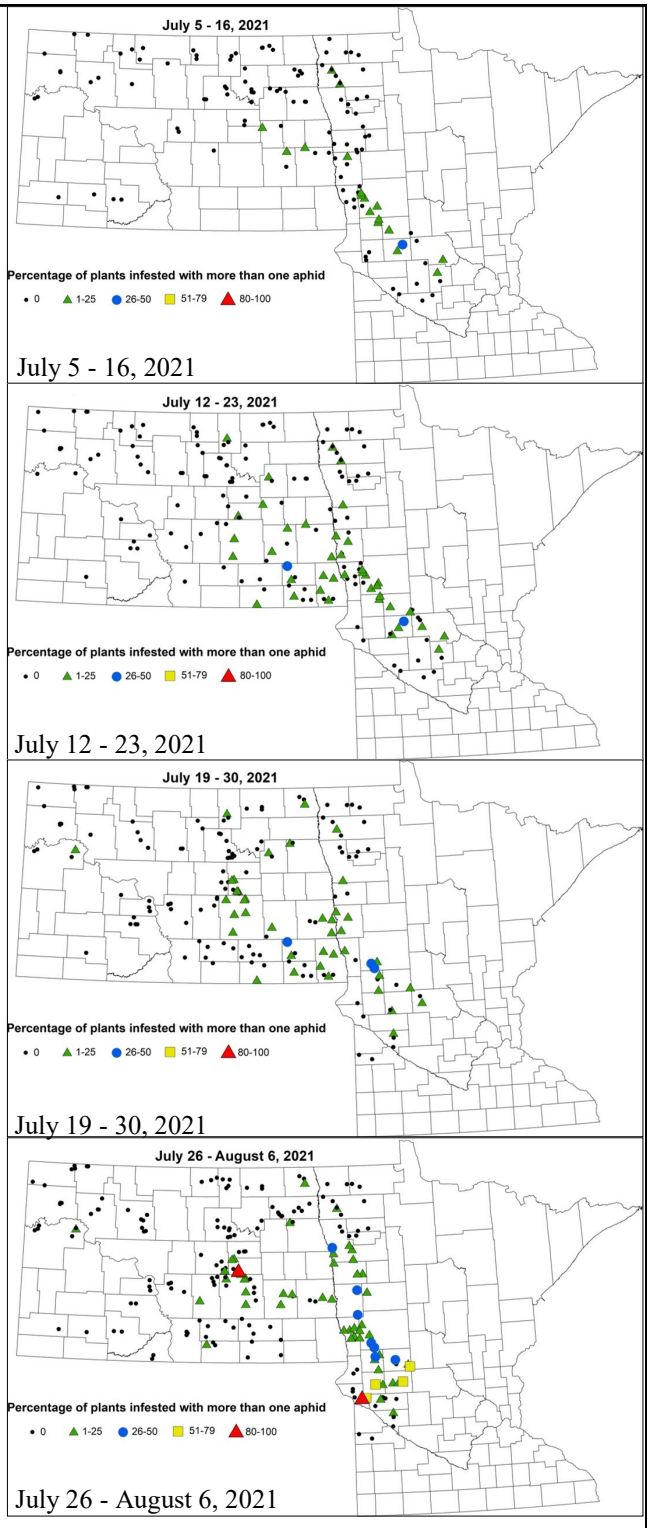


Figure 5. Percentage of surveyed soybean plants with at least one soybean aphid.



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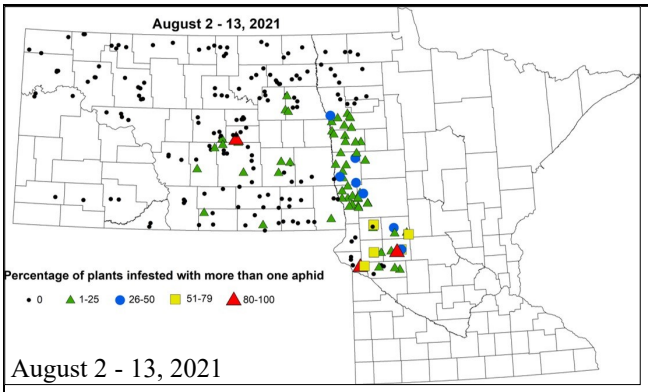

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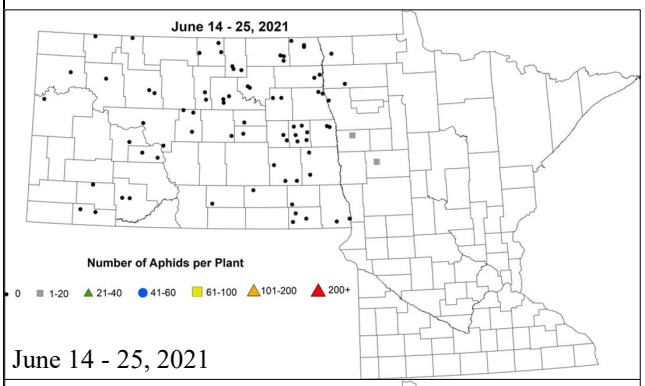
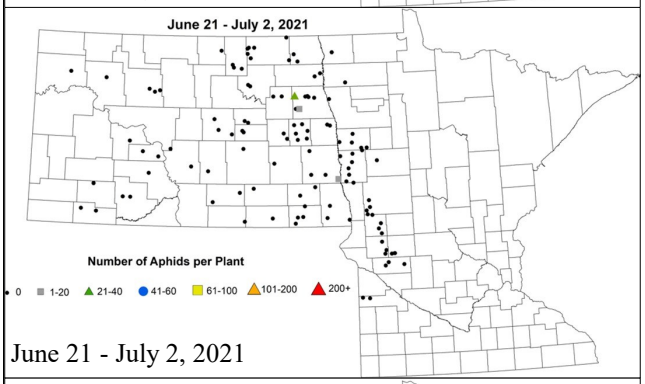




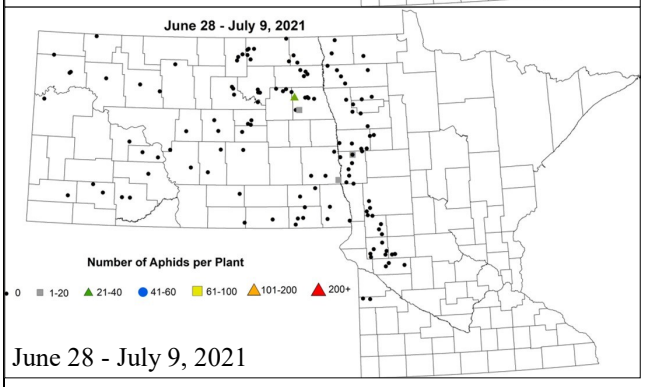
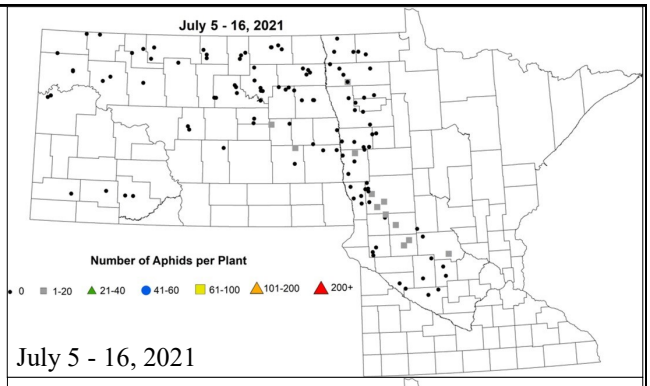
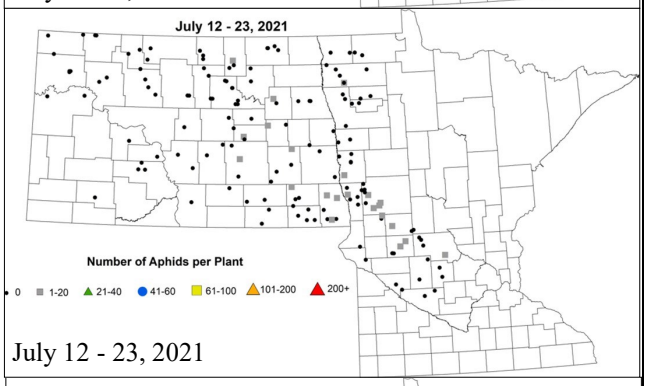
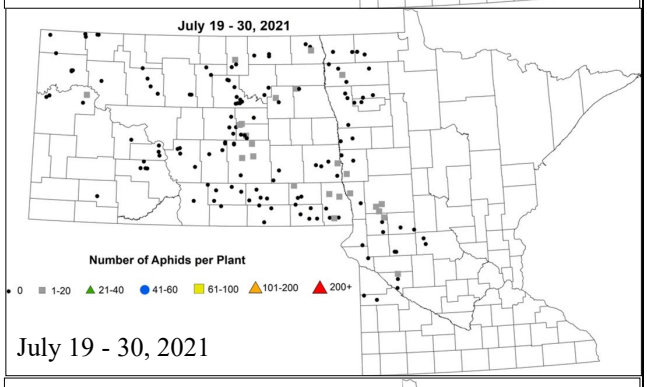
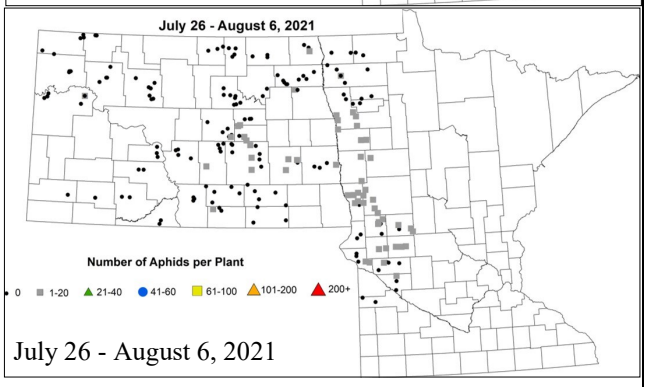


Figure 6. Average number of soybean aphids estimated per surveyed plant.









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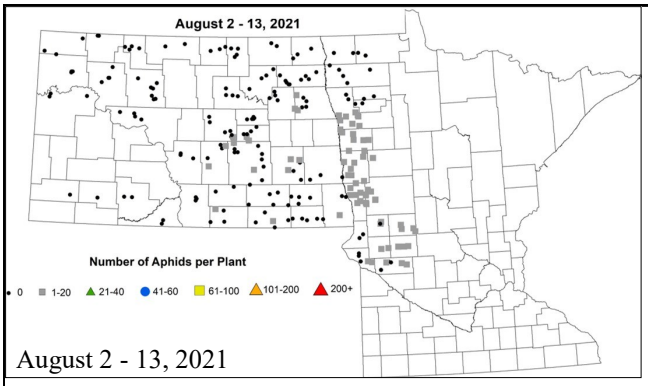


Figure 6. Average number of soybean aphids surveyed plant.

Of concern in any drought year are two-spotted spider mite infestations (Fig 7), which tend to begin at the outer edge of fields. Edge-of-field spider mite infestations began to appear in multiple WC MN fields in the middle of July, peaking towards the end of the survey (Fig 8).

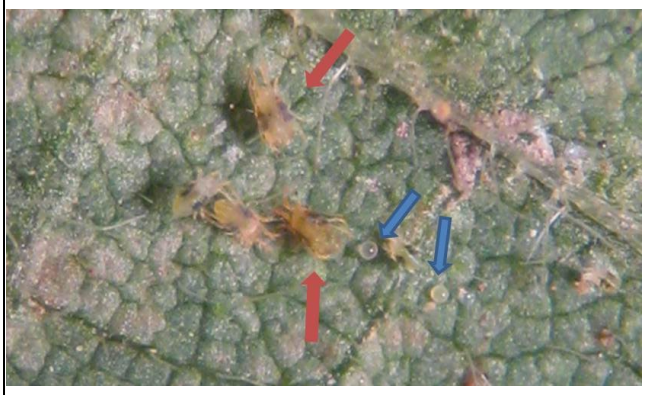


Fig. 7. Two spotted spider mites (red arrows) and eggs (blue arrows) on a soybean leaf.

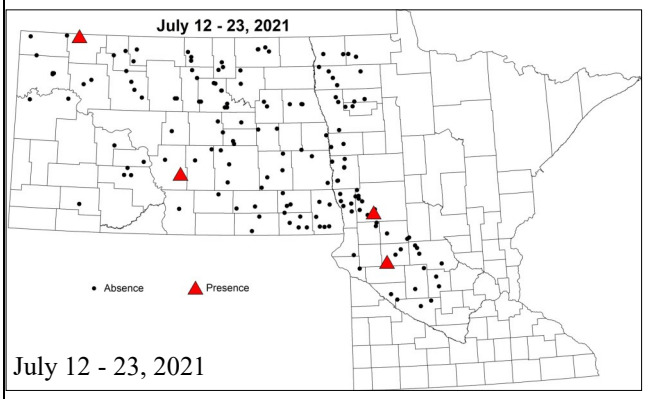
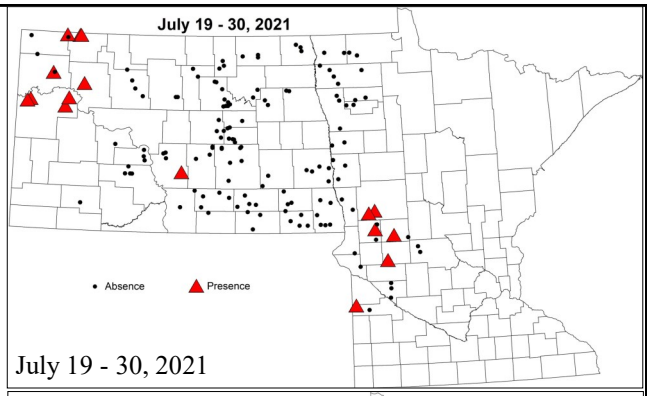
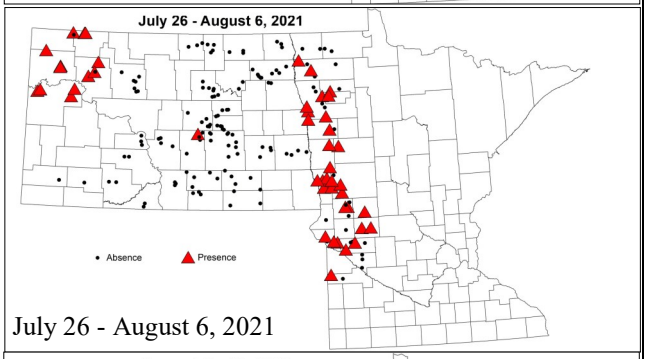


Fig. 8. Edge of field two-spotted spider mite infestations (red triangles).





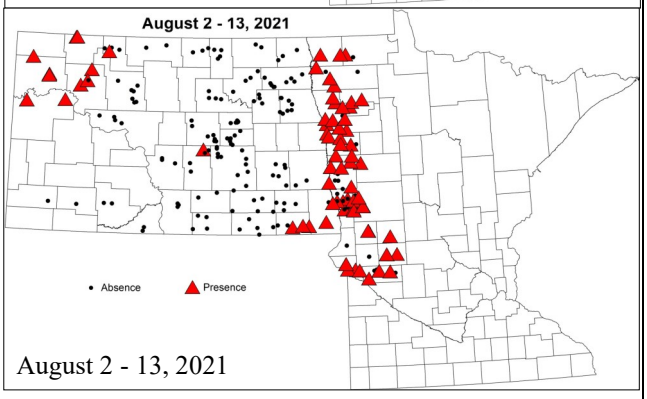


Fig. 8. Edge of field two-spotted spider mite infestations (red triangles).

Lagging just behind edge-of-field infestations, spider mite (SM) infestations also spread to colonize plants within soybean fields in WC MN in the middle of July (Fig 9). Both edge-of-field and in-field spider mite infestations in NW MN lagged behind those in WC MN, becoming more evident toward the end of July (Figs. 8 & 9).

Plant injury and treatment thresholds and economic losses (lower leaf yellowing is apparent and loss is common; SM injury, webbing and mites are common; mites and minor feeding injury present in upper canopy) were met in many fields. Whether or not one chose to treat depended upon one's sense of whether or not there was yield potential to protect, whether to spend more to….

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produce an already poor crop, and whether rainfall was likely to fall in a timely enough manner to "save" the crop if one acted to save it.

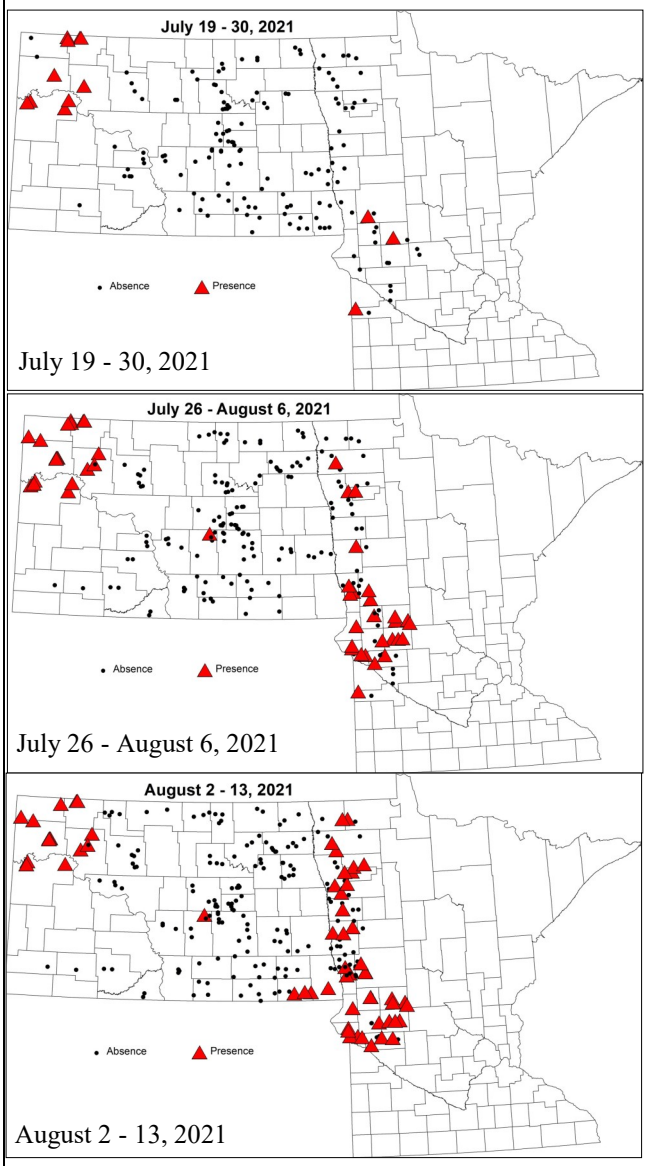

Fig 9. Within-field two-spotted spider mite infestations (red triangles).

Soybean aphid. Scouting can lead one to understand whether aphid population densities in a field have reached all three aspects of the treatment threshold:

- More than 80% of plants are infested with aphids
- There is an average of 250 aphids per plant
- The aphid population is growing.

In 2021, the understanding that aphids had not reached treatment thresholds could help producers.. to both avoid unnecessary insecticide applications and save a farmer between $9.12 and $35.49 per acre in insecticide and application costs.

- For additional information about biology, scouting and management of soybean aphid search "soybean aphid" on the University of Minnesota Extension website or visit: https://extension.umn.edu/soybean-pest-management/soybean-aphid

Two-spotted spider mite. Scouting can also lead one to understand whether spider mites and the injury that they cause have reached treatment thresholds. Years ago, UMN IPM Specialist Bruce Potter developed spider mite infestation-based treatment thresholds that are designed to balance minimizing yield losses, not waiting to treat until infestations have already affected yield potential and not treating too early and avoid having to re-treat a field:

- **0**: No spider mites or injury observed.
- **1**: Minor stippling on lower leaves. No premature yellowing observed.
- **2**: Stippling common on lower leaves. Small areas with yellowing on scattered plants.
- **3:** Spray threshold: Heavy stippling on lower leaves with some stippling progressing into the middle canopy. Mites present in the middle canopy, with scattered colonies in the upper canopy. Lower leaf yellowing is common, and there's some lower leaf loss.
- **4**: Economic loss: Lower leaf yellowing is readily apparent. Leaf drop is common. In the middle canopy, stippling, webbing, and mites are common. Mites and minor stippling present in the upper canopy.
- **5**: Lower leaf loss is common, with yellowing or browning moving up the plant into the middle canopy. Stippling and distortion of the upper leaves are common. Mites are present in high levels in the middle and lower canopy.

It is recommended that in addition to noting spider mite injury, one determine whether mites are still present before spraying. When scouting, carry a white piece of paper to place underneath plants. To make mites easier to see than when they are camouflaged on leaves, place the paper underneath leaves and then tap the plants and look for moving mites on the paper.

Good canopy coverage through using adequate carrier volume is key. Because there is always the risk of pesticide resistance and different pesticides have more or less effect on specific spider mite developmental stages (Table 1; ex. only effective against adults), it is important to evaluate how effective a treatment was 5 to 7 days afterward.

Preserving a.i.'s efficacy. Insecticides have been widely used in soybean production, often without consideration of treatment thresholds, as 'cheap and easy insurance' when added to the...

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...spray tank when making post-emergence herbicide or fungicide applications. Avoiding unnecessary applications can also help to preserve a.i. efficacy. Each time that an insecticide or miticide is used, it selects those insects or mites that are resistant to that active ingredient(s) (a.i.) to survive and reproduce, killing those that are sensitive to the a.i. Over time this results in a population shift from one that is largely a.i.-sensitive to one that is largely a.i.-resistant.

Do your best to avoid unnecessary pesticide applications. Insecticide and fungicide applications can adversely affect biological control conferred by natural predators or entomopathogenic fungi and may actually cause spider mite populations to flare up.

Table 1. Pesticides labeled for control of two-spotted spider mite (TSSM) and soybean aphid (SBA) on soybean (Adapted from Potter, Koch and Ostlie, 2021).

Insecticide group	Common name	Trade name	Label for TSSM	TSSM stage controlled	Label for SBA	Resistance concerns
1B-organophosphate	dimethoate	Several* (e.g. Dimethoate 4E, 4EC, 400, Dimate 4E, 4EC)	X	adults/ immature	X	TSSM resistance concerns
3A-pyrethroid	bifenthrin	Several* (e.g. Bifenture 2E, Brigade 2E, Discipline 2E, Fanfare 2E, Sniper 2E, Tundra 2E)	X	adults/ immature	X	SBA resistance concerns
6-chlorine channel activators	abamectin	Agri-Mek SC*	X	adults/ immature		
10A-Hexythizox	hexythiazox	Onanger		egg/ immature		
10b-etoxazole	etoxazole	Zeal SC, Zeal Zeal WDG (corn only)	X	egg/ immature		
12C-propargite	propargite	Comite*, Comite II*		egg/ immature		
23-tetranic and tetramic acid derivatives	spiromesifen	Oberon 2SC		egg/ immature		
Mixtures						
3A + 3A	zeta-cypermethrin + bifenthrin	Hero*	X	adult/ immature	X	SBA resistance concerns
3A + 44 (fungicide)	bifenthrin + *Bacillus sp.*	EthosXB*	X	adult/ immature	X	SBA resistance concerns

* Restricted use pesticide

Always read and follow label directions. Products are mentioned for illustrative purposes only. Their inclusion does not mean endorsement and their absence does not imply disapproval.

- For more information about two-spotted spider mites, visit the University of Minnesota Extension Managing spider mite on soybean webpage (https://extension.umn.edu/soybean-pest-management/managing-spider-mite-soybean)

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