Aphids infesting winter wheat in Michigan

Chris DiFonzo, Field Crops Entomologist, Michigan State University, East Lansing

Aphids are an important pest of wheat in the United States, but they are not a major problem in small grains in Michigan. However, over time there seems to be a trend (or at least talk) about spraying for aphid in wheat in the spring, or even in the fall – as late as November! Has something changed? This bulletins addresses such concerns and provides scouting recommendations.

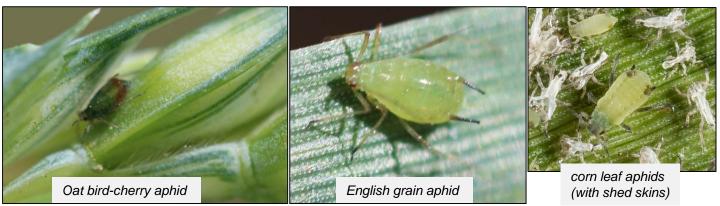### Are there aphids in wheat?

Yes, this year and every year. Aphids are typically first detected in wheat fields in late April or early May. By June, up to four different species can be found in any wheat field. The same species infest corn, sorghum, and grasses along field margins. Most do not overwinter in Michigan.

•Oat bird-cherry is usually the first aphid to colonize fields in April or early May. It is olive green with a rusty-orange patch on its butt-end, visible with the naked eye. It perhaps overwinters in Michigan in the egg stage, which could explain why it is typically found early.

•English grain aphid colonizes Michigan from the south in mid-May, in the same timeframe as armyworm. It is a large green aphid with long black cornicles ('tail-pipes') and long legs with black 'knees'. It is very common in Michigan wheat fields.

•Corn leaf aphid is blue-green, with short black cornicles and short antennae. It is less common in wheat, but it is the primary species infesting Michigan corn fields.

•Greenbug is light green with a dark stripe on its back. It is the least common of the four species.

Oat bird-cherry aphid

English grain aphid

corn leaf aphids
(with shed skins)

How do aphids damage wheat?

Direct feeding by tons of aphids. Aphids feed by sucking juices from the phloem cells of plants. A few aphids per tiller do not cause a problem, but a heavy infestation can stress plants by removing water and nutrients. This is of most concern in early spring, prior to heading.

Salivary Toxins. The saliva injected by some aphid species causes a enzymatic reaction in susceptible varieties. Symptoms include yellowing or reddening of leaves, and even plant death. One such species, the Russian wheat aphid, infests wheat in the western US but it is NOT found in Michigan. The other, greenbug, is uncommon in Michigan fields, so we do not have the problems seen in western and southern wheat-producing areas.

<u>Virus transmission</u>. The four species of aphids mentioned on page one can transmit barley yellow dwarf virus (BYDV) in wheat, barley, and oats. Transmission in the fall is more important than transmission in late spring, because the virus infects the plant for a longer period of time. For fall transmission, the source of the virus is likely grasses outside the field. Once wheat is heading, the impact of BYDV is negligible.

Is aphid damage common in Michigan wheat? Is spraying justified?

Typically, no. Economic damage is rare because the most damaging aphid (Russian wheat) isn't present and fields rarely reach threshold (discussed below) for oat bird-cherry and English grain aphids. In fact, I have never seen a commercial field over threshold in the state. Rates of BYDV infection are also low in Michigan compared to states to the south, because Michigan has winter. Wheat is typically planted after the Hessian fly-free date when grain aphid populations are already declining. Cold weather wipes out aphids so that no transmission takes place during the winter months, and new aphids must recolonize in the spring.

So why is wheat being sprayed more? Growers are managing wheat more intensively, paying greater attention to fertility, weeds, diseases, and insects. Many of the ideas in intensive wheat management originated in the southern states, where the field season is longer, aphids survive through the winter, and BYDV infection is a chronic problem. However, spraying for aphids is rarely justified in the north, and if fields are planted after the fly-free date, there should be no need to treat in the fall. Also, as part of intensive management the wheat industry is doing a better job managing head scab in Michigan. When a sprayer is already going over a field to apply fungicide, it is tempting to throw an insecticide in the tank to 'clean up' whatever insects are out there; in fact, brochures on intensive wheat management routinely recommend this practice. But there are repercussions to insurance insecticide applications that may not be obvious:

Biological control keeps most insect pests in check in wheat. Parasitoids are especially important for armyworm aphids, & cereal leaf beetle. Spraying wipes out beneficials and disrupts biocontrol; this may be why cereal leaf beetle is trending upward in the last few years.

Grain aphid killed
by a parasitoid

Natural enemies build up in wheat, then move to other crops later in the season. The low numbers of aphids, thrips, and other insects in wheat aren't something to clean up – it's the fuel which generates populations of beneficials for July and August.

Ladybug larva
hunting in wheat

Scouting for aphids in wheat

Use thresholds to make spray decisions for aphids! There are many thresholds for insect pests of field crops. Some thresholds are simply guesses, while others are based on years of research. The thresholds for aphids in wheat are research-based (ie they are pretty good). Scouting involves sampling individual tillers, examining the upper and lower leaf surface and stem for aphids. Don't just walk the edge of the field - aphid colonizers often land on field edges, thus populations on the edge may not be representative of the rest of the field. Walk 10-20 paces into the field, sample a tiller, walk another 10 paces, and so forth. Being able to find aphids on tillers is more important than being able to distinguish species.

Aphid thresholds for seedling to boot stage wheat in Michigan

Picture: Dennis Pennington, MSUE
June 2016

A **direct method** involves recording the # of aphids per tiller, on 100 tillers, then calculating the average. The aphid species does not matter, only the # per stem. Use this threshold in the fall or in spring as aphids colonize fields, but before heading.

Threshold: 12 or more aphids per tiller

For visual comparison, this leaf has ~20 English grain aphids. Threshold = every tiller with this level of infestation, in the fall or in spring prior to heading.

The **presence/ absence sampling method** involves determining the number of tillers with at least one aphid (presence). Aphid species does not matter. The total number of aphids per tiller does not matter. You simply determine if a tiller has aphids or not. With this method, you examine infestation numbers as you go, rather than sampling hundreds of plants before making a decision. This means that you make a quick decision in fields with very low or high aphid populations.

Pick 25 tillers, count the number with aphids, and consult the decision table below:
•If 25 (100%) tillers are infested, stop sampling; the field is over threshold. Consider spraying.
•If 18 or fewer tillers are infested, stop sampling; the field is below threshold. Scout in 5-7 days.
•If 19 to 24 tillers are infested, it isn't clear if the field is over threshold. More information is needed. Pick 5 more tillers, examine them for aphids, and add the result to the total. Now your decision is based on the second line in the table, 30 total tillers.
•Keep picking groups of 5 tillers until you reach a decision or examine a maximum of 100 tillers.

Decision table for presence/absence sampling of cereal aphids

Use in the fall or in the spring prior to heading

Total number of tillers examined	Cumulative number of infested tillers		
	Stop sampling: Do Not Spray	*Keep sampling: Pick 5 more tillers*	*Stop Sampling: Spray*
25	0-18	19-24	25
30	<22	23-29	30
35	<27	28-34	35
40	<31	32-39	40
45	<35	36-43	44-45
50	<40	41-48	49-50
55	<44	45-53	54-55
60	<48	49-58	59-60
65	<53	54-62	63-65
70	<57	58-67	68-70
75	<61	62-72	73-75
80	<66	67-77	78-80
85	<70	71-81	82-85
90	<75	76-86	87-90
95	<79	80-91	92-95
100	<84	84-100 tillers infested = treat	