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Insect Control in Small Grain Crops

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INTRODUCTION

Except for occasional outbreaks of armyworm and scattered damage from other insects, small grains in Michigan have escaped serious insect damage until recent years. The appearance of the cereal leaf beetle in Berrien and Cass Counties in 1962 and the subsequent spread and increase of this pest over the state has changed this situation. Growers must now check their small grains for the beetle and take measures for its control when it appears in damaging numbers. The other pests are also still with us, and you must continue to check your fields for them.

Some suggestions on how to check for these insects are summarized in Table 1. The checks can be made by walking or driving through the field and looking for possible problems. Many pests of small grains build up in weedy areas of the field itself or in adjacent fields, and later damage the grain crop. Check such weedy areas with special care. Notes on identification of the pests and recommendations for their control are also presented below. Recommended insecticides are summarized in Table 2.

HESSIAN FLY

The small, white maggots of the Hessian fly feed on the stems of wheat from beneath the leaf sheath. These maggots lack both legs and a definite head. The feeding of the fall generation stunts growth and when infestations are severe intensifies winterkill of the plants. The pest overwinters as a hard flax-seed like pupa and emerges as the adult fly early in the spring. The adult lays its eggs on the wheat leaves, and maggots hatching from these eggs feed on the plants. Their feeding in the spring stunts the plants and causes the stems to lodge. The fully developed maggot transforms to the flaxseed stage, and the adults emerge from these flaxseeds to lay eggs again in the early fall.

Damage from Hessian fly can be avoided by planting winter wheat after the adult fly has finished laying its eggs in the early fall. The "fly-free" dates for Michigan counties are shown in Table 3. Wheat

planted after the date given in the table will usually remain free of the Hessian fly. Some wheat varieties are resistant to the Hessian fly. Check with your seed dealer for seed of a good resistant variety.

WHITE GRUBS AND WIREWORMS

Adults of the white grubs (called May beetles or June bugs) and adults of the wireworms (called click beetles) usually lay their eggs in grassy fields, sod, old pasture and weeds. The larvae that hatch from these eggs feed on the roots of grasses, small grains and other crops that may be planted later in these fields. The larvae can persist and cause damage for two years after the sod has been plowed. White grubs have white, thick, soft, cylindrical bodies and curl into a C-shape when disturbed. They have a definite head, six small legs just behind the head, and reach up to 1½ inches in length. The wireworms have tan, hard, thin, cylindrical bodies. They also have a definite head and six small legs just behind the head. Look for white grubs and wireworms in the plow furrows while fitting the land and apply an insecticide if they are easily found. Check the roots of wilting seedling plants for feeding and the soil around such plants for the grubs or worms. If there is time, these affected areas and a margin around them may be disked, an insecticide applied, and the area replanted.

Apply the insecticide as a spray or granule to cover the soil surface. Work it into the upper layer of soil immediately. Applying the insecticide just before the final disking of the soil is a good practice.

BILLBUG AND STALK BORER

These two pests are usually most abundant in weedy areas of the field, or in margins along the side of weedy fields. The billbugs feed on new growth of fall planted grains and, occasionally, spring grains. Their feeding appears as holes in the new leaves and a tattering of the old leaves in the spring.

The billbugs are hard shelled snout beetles. There are two types; one is large, black, and often found hiding in the soil near the plant; the other is smaller, gray and usually found deep in the upper rolled leaves of the plant. The larvae are small, white worms with

a definite head but without legs. Their tunneling can cause grain to lodge when infestation is heavy.

The stalk borer is a cylindrical worm with three pairs of jointed legs near its head and five pairs of fleshy legs near its tail end. It can be readily identified by the broad, dark, "saddle" marking across its middle. The larvae tunnel into the bases of the stems and cause stunting or death of the plants. Their holes in the stems are marked by sawdust-like castings called frass. The borers are most damaging to small plants early in the season, but also damage headed plants. Their damage to headed plants is seen as conspicuous dried stems and heads. The wheat stem maggot also causes dried heads. The maggot is a headless, legless larva that tunnels in the upper section of the stem. The wheat stem maggot has not been numerous enough to cause appreciable yield loss in Michigan small grains.

Check your fields for the appearance of billbugs and stalk borer and apply an insecticide if one-third or more of the plants show feeding by these pests.

GREENBUG, CORN LEAF APHID AND ENGLISH GRAIN APHID

The greenbug, corn leaf aphid, and the English grain aphid are small, soft-bodied, inactive insects that occur in groups (or colonies) on the small grains. The greenbug attacks small grains early in the spring. It sucks the plant juices and also injects a toxic saliva into the plant. Plants attacked by greenbug are weakened and turn yellow and areas of the plants may die out. The English grain aphid attacks the larger plants and is especially numerous in the heads. These aphids suck plant juices, and, when numerous, can cause poor seed set and light grain. The English grain aphid also carries the virus for barley yellow dwarf (called "red leaf" in oats). The corn leaf aphid occurs in low numbers in small grains throughout the season. It occasionally appears in large numbers on seedling winter grains during warm spells in early fall. Damaging numbers of this aphid occur especially frequently on early-planted (before the "fly-free" date) winter grains. The corn leaf aphid is also a vector of barley yellow dwarf.

These aphids and smaller numbers of other species of aphids are only occasional pests of small grains in Michigan. Our spring weather is usually unfavorable for the development of the greenbug, natural enemies usually keep the English grain aphid down to less than damaging numbers, and cool weather normally maintains the corn leaf aphid at low numbers. Chemical control of these aphids is not needed, unless most of the plants have colonies of aphids on them. The insecticide should be applied as a spray to cover the entire plant.

GRAIN THIRPS

Grain thrips are very small, ovoid, yellow to reddish insects that scrape the upper surfaces of the leaves and suck up the juices. The thrips feed hidden in the leaf sheathes of the small plants. Their damage first appears as a silvering of the upper surface of the leaves. Heavily damaged leaves dry up and the whole plant is stunted and retarded in growth when the thrips are abundant. Thrips are usually found in grassy areas of the field (low spots and headlands, for example), but can spread out and damage entire fields during dry weather. A spray should be applied to small grain crops when most of the plants in an area show some silvering of the leaves caused by the thrips.

CEREAL LEAF BEETLE

The adult cereal leaf beetle is a hard-shelled beetle with a red pronotum (neck) and metallic blue wings. Adults overwinter in a variety of sheltered places. They become active with the first warm days (about 50°F or more) of late winter or early spring and move first to grasses, then to winter grains. The adults later flock into spring-planted grains when the spring grains come up. They feed on the upper leaves of the crops by chewing a rectangular hole completely through the leaf. Eggs are laid on the upper surfaces of the leaves. The eggs are pinhead size, yellow, and laid on their sides, either singly or in small chains. The larvae that hatch from these eggs are thick-bodied and have a definite head and six jointed legs just behind the head. The larvae are actually whitish in color, but cover their bodies with a slimy black coating so they look like little slugs on the leaves. The larvae usually feed only on the upper surface of the leaves, and the lower surface of the leaves remains intact. The skeletonized leaves give a severely injured field a frosted appearance.

Check your fields for adult feeding and the eggs of the pest every few days, starting with the first warm spell of the season. An insecticide should be applied if there are about three eggs and larvae per stem in small plants that have not started to head, or about one larva per flag leaf on plants that have headed. Apply the spray when the eggs are common and the small larvae are first easily seen without searching for them. If you spray at this time, you will be sure that a spray is needed, that you won't be too early, and that the pest will be controlled before much damage is done to the crop.

An attempt is now being made to establish parasites (small wasp-like insects that attack the cereal leaf beetle) to help control the cereal leaf beetle. Establishment of these parasites will require greater care in checking the fields in the future. Growers are urged

Table 1. Guide to checking small grains for insects

When	Where	What	Why
Before fitting	Surrounding fields	Sod, weeds, and old pasture	Expect armyworms, billbugs, and stalk borer
	Field itself	Sod, weeds, and poor drainage	Expect white grubs, wireworms, billbugs, grain thrips, and stalk borer
Fitting	Date of planting	Fly-free date	Hessian fly
	Plow furrow	Thick bodied grubs: Slender larvae:	White grubs Wireworms
Seedling and tillering plants	Soil in area of poor stand	Thick bodied grubs: Slender larvae:	White grubs Wireworms
	Whorls	Dark snout beetles	Billbugs
	Leaf sheaths of stunted plants	Legless maggots Ovoid, active insects	Hessian fly Grain thrips
	Bases of stems	Frassy holes	Stalk borer
	Areas of stunted yellowish plants	Groups of small, soft-bodied insects	Greenbug (spring) Corn leaf aphid (fall)
	Leaves	Blue beetles with red necks: Small yellowish eggs: Black, slug-like larvae:	Cereal leaf beetle adult Cereal leaf beetle eggs Cereal leaf beetle larvae
Taller and headed plants	Leaves and head	Margins of leaves eaten or heads clipped off	Armyworms
	Heads	Groups of small, soft-bodied insects	English grain aphid
	Dried heads or lodged stems	Frassy holes in stems: Headless maggots in stems: Legless grubs in stems: Hard pupae in leaf sheaths:	Stalk borer Wheat stem maggot Billbugs Hessian fly

to periodically check their fields now, both as a guide to immediate control and also to familiarize themselves with checking fields.

Insecticides should be applied when the small cereal leaf beetle larvae are first easily seen in the field. This will best protect the crop from losses caused by the cereal leaf beetle. If most of the larvae of the cereal leaf beetle are large and the field already shows heavy damage before the pest is discovered, do not spray the field. The damage has already been done, the insecticide cost will be wasted, and there is danger to parasites that could be helpful in future years.

Armyworm

Armyworms are cylindrical worms, with a definite head, three pairs of jointed legs just behind the head, and five pairs of fleshy legs near the rear end. They range in color from tan to nearly black, usually with a broad pale stripe down each side. The larvae overwinter in the soil or plant debris. They pupate early in the spring and emerge as adult miller moths. Adults lay their eggs in clusters on the leaves of grains or grasses

and fold and seal the leaf over the eggs. They most frequently lay their eggs in dense grasses and heavy stands or lodged areas of grains (especially rye). Such areas in the field or in adjoining fields should be especially well checked for the presence of the worms. The larvae that hatch from the eggs feed on the leaves of the grasses and grains by chewing the margins of the leaves at night. The armyworm also feeds at the tips of the stems of tall plants and causes the head to dry or fall off. The armyworms hide during the day in the soil and litter around the bases of a plant. Their feeding and pellet-castings are easily seen, however, and a search in the area where these are common will soon disclose the worms. The worms will feed during the day and "march" in "armies" from field to field when they are abundant. It is this marching habit that has given them the common name of armyworm.

The insecticide may be applied as sprays or granules. The area affected and a generous margin around it (20 to 40 feet) only need to be treated if the worms are found in just one area of the field. A 20-40 ft treated band around the field will stop the armyworm from marching into the field and adjoining fields of grasses.

Table 2. Insecticides recommended for control of insect pests of small grain crops

Pest	Application	Insecticide	Lb active insecticide/A	Limits of use
Whiteworm & white grub	Preplant soil	Parathion	4	Do not use on rye. Do not enter field for 48 hours after treatment. Do not contaminate ponds or streams.
		Chlordane	4	Non-dairy farms only. Do not graze treated fields.
Armyworms	Foliage	Parathion	$\frac{3}{8}$	Do not use on rye; 15 days for all other small grains.
		Malathion	$1\frac{1}{4}$	7 days.
		Carbaryl (Sevin)	1	0 days. Do not apply after boot stage.
		Trichlorfon (Dylox)	1	Do not use on rye. Grain, 21 days; feed or forage, 0 days.
Greenbug, corn leaf aphid, and English grain aphid	Foliage	Demeton (Systox)	$\frac{1}{4}$	Do not use on rye; 2 applications per season. Allow 14 days between applications. Grain, 30 days; feed or forage, 21 days.
		Malathion	1	7 days.
		Parathion	$\frac{3}{8}$	Do not use on rye. 15 days.
Cereal leaf beetle	Foliage	Malathion	1	7 days.
		Carbaryl (Sevin)	1	0 days; do not apply after heads start to form.
		Azinphosmethyl (Guthion)	$\frac{1}{2}$	30 days, 1 application per season.
		Endosulfon (Thiodan)	$\frac{1}{4}$	Do not feed treated forage to dairy cattle nor animals being finished for slaughter. Do not apply after heads begin to form.
	ULV aerial spray Foliage	Malathion	$\frac{6}{10}$	7 days.
Billbug, stalk borer, and grain thrips		Carbaryl (Sevin)	1	0 day. Do not apply after boot stage.

Table 3. Hessian fly-free dates for Michigan

County	Earliest seeding date (Sept.)	County	Earliest seeding date (Sept.)	County	Earliest seeding date (Sept.)	County	Earliest seeding date (Sept.)
Alcona	6	Eaton	16	Lapeer	15	Ogemaw	10
Allegan	20	Emmet	4	Leelanau	8	Osceola	10
Alpena	9	Genesee	17	Lenawee	25	Oscoda	7
Antrim	4	Gladwin	12	Livingston	16	Otsego	6
Arenac	13	Grand Traverse	8	Macomb	18	Ottawa	19
Barry	18	Gratiot	15	Manistee	13	Presque Isle	8
Bay	14	Hillsdale	19	Mason	13	Roscommon	7
Benzie	16	Huron	13	Mecosta	12	Saginaw	16
Berrien	23	Ingham	17	Midland	15	Sanilac	15
Branch	19	Ionia	16	Missaukee	9	St. Clair	16
Calhoun	19	Iosco	7	Monroe	21	St. Joseph	23
Cass	22	Isabella	11	Montcalm	15	Shiawassee	16
Charlevoix	3	Jackson	16	Montmorency	7	Tuscola	15
Cheboygan	4	Kalamazoo	20	Muskegon	18	Van Buren	22
Clare	12	Kalkaska	5	Newaygo	15	Washtenaw	18
Clinton	17	Kent	18	Oakland	16	Wayne	18
Crawford	6	Lake	13	Oceana	16	Wexford	9