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Chemical Control of Soil Insect Pests of Corn

ENTOMOLOGY FACT SHEET

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Several kinds of insects spend at least part of their lives in the soil. Some feed on seeds, roots, or other underground plant parts. Some feed on above-ground parts of plants but seek shelter in the soil during part of the day. Most soil insects are scavengers, living on decomposing organic matter and occasionally being found in wounded areas of plants previously damaged by insects and disease. Feeding on all of these insects are various predators which may often be very beneficial in controlling pests.

Soil insect pests may cause direct damage by feeding on the plants or may cause injury primarily by allowing disease organisms to enter. Excluding corn rootworms, these insects are most injurious during germination or seedling stages of corn.

In Minnesota, the following soil pests may be found damaging corn:

CORN ROOTWORMS - Corn rootworms are the most damaging soil insects which infest corn in Minnesota. Eggs are laid in August around the base of corn plants and hatch during mid-June of the following year. Larvae feeding on the corn roots contribute to an increased susceptibility to lodging and decreased yield. Corn rootworms are discussed in Entomology Fact Sheet 14, Controlling Corn Rootworms.

WIREWORMS - These hard shelled, slender worms vary in color from light tan to dark brown. Wireworms feed on germinating seeds, roots, and underground stem parts. This injury results in loss of stand and stunted plants which yield poorly.

Wireworm infestations usually are quite localized, recurring on certain fields or even parts of fields. Eggs are laid in dense grassy areas, and infestations are rare in fields under continuous cultivation. However, many of our common wireworm species require several years to complete their life cycle, so problems may persist for several years following a grass crop. Wireworm adults are the familiar click beetles or "skipjacks."

WHITE GRUBS - These large, whitish, c-shaped grubs injure plants by feeding on roots, and seedlings may be killed by this injury. Older plants can be stunted and can be susceptible to lodging due to root pruning. Corn planted on newly broken, infested sod or grassland is most often damaged. Usually infestations are localized along field edges which border trees and shrubs that are fed upon by the adult stages of the insect.

In Minnesota, most white grubs have a life cycle which spans four growing seasons. Eggs are laid in grassy areas during late June and July. The eggs hatch and the small larvae feed in on plant roots, causing little injury. In the second and third years, the larvae continue to grow and feed on roots throughout the growing season. In the fourth year there is a short period of heavy feeding by the

large, late instar larvae from late April to early June, following which the grubs pupate in the soil. In Minnesota, greatest damage to corn results from the feeding of these large grubs, which can cause extensive stand reductions. Much of the white grub population in the state is synchronized, so most injury to seedling corn is reported every third year (1979, 1982, 1985).

The adult stage of white grubs is the familiar May beetle or June beetle.

BILLBUGS - Billbugs are weevils (snout beetles) which can damage corn when they puncture the plant stem in the process of egg laying. If the wound injures the growing point, small plants may be killed. Larger plants generally outgrow billbug feeding, and the plants show a typical injury symptom characterized by a regular series of holes in the expanding leaves. However, larvae of some species of billbug may feed inside the corn stem, resulting in a stunted, poorly yielding plant. The adult billbugs hide around the base of the plant during the day and are difficult to find.

Billbug injury to corn is rare in Minnesota. Most infestations occur in newly broken land following a sod crop or in newly drained low, wet areas of a field.

SEED CORN MAGGOTS - These small yellow-white fly maggots feed on the seed, often destroying the germ. Surviving plants that are infested may produce weak seedlings which fail to grow vigorously.

Root maggot egg laying is usually heaviest in fields where animal manures have been spring-applied or where a cover crop has been turned under. If cool conditions persist after planting, resulting in a slow rate of germination and plant growth, root maggot damage is intensified.

The adult stage of the seed corn maggot is a small medium-sized gray fly, similar to a house fly. It may commonly be found resting on weeds along field edges during the day.

SEED CORN BEETLES - These are small, black and tan beetles which feed primarily on weed seeds and small insects. Occasionally corn seed may be attacked and stand losses can result from the injury. As with the seed corn maggot, damage is most widespread during seasons with cool weather following planting, due to the slow rate of corn germination under cool temperatures.

CUTWORMS - Although some destructive cutworm species may feed above ground, most spend considerable time in the soil and are therefore classed with the soil insects. There are several species of cutworms which may be injurious to Minnesota corn and these different species have habits which affect their injury and control. For example, "climbing" cutworms such as dingy, darksided, and black cutworms tend to feed on corn leaves for part of their

life and thus may be controlled with insecticides. "Subterranean" cutworms, such as glassy cutworm and hop vine borer feed below ground or within the plant so that they cannot be adequately controlled with insecticides. Under dry soil conditions, all cutworms tend to seek moist conditions and will feed within plants or below the soil surface. Minnesota cutworms are discussed in more detail in Entomology Fact Sheet 48, Controlling Cutworms in Field Crops.

CONTROL AND PREVENTION

Except for cutworms and rootworms, there is no practical chemical control treatment for soil insects after plant emergence. An application of an effective soil insecticide before planting or at planting time is necessary for controlling most soil insect problems. Insecticide seed treatments or planter box treatments may be sufficient for some pest problems, such as seedcorn maggots, seed corn beetles, and light wireworm infestations.

It is usually difficult to predict if there will be a problem with soil insects. Cropping sequence will be the best guide for determining the potential for injury. For example, if corn follows corn, rootworms will probably be the most important

problem, so a rootworm insecticide should be used. Corn following a sod crop will be most likely injured by wireworms, white grubs, glassy cutworms, or billbugs, and these pests should be considered when choosing the appropriate insecticide. When planting fields with much decomposing organic matter, particularly if the soil is cool, use of a seed corn maggot treatment is advisable. Cutworm infestations will be spotty and have little relationship to crop history or cultural practice. Therefore, the recommended cutworm control practice is to scout fields following plant emergence and to use a post-emergence insecticide rescue treatment when problems are detected.

Insecticides recommended for soil insect control in Minnesota are listed below.

CAUTION

These insecticides are potentially dangerous and must be used with care. Avoid exposure to skin, lungs, mouth, and eyes. Wear protective clothing when directed to do so on the label. Do not eat or smoke while handling pesticides or until after washing thoroughly.

Insect	Insecticide	Rate (lbs active ingredient/acre)	Placement	Comments	
Corn rootworm larvae	carbofuran (Furadan)	1.0 ^a	Band, furrow		
	chlorpyrifos (Lorsban)	1.0 ^a	Band, furrow		
	ethoprop (Mocap)	1.0 ^a	Band	Do not allow granules to contact seed	
	fonofos (Dyfonate)	1.0 ^a	Band	Do not allow granules to contact seed	
	isofenphos (Amaze)	1.0 ^a	Band		
	phorate (Thimet)	1.0 ^a	Band	Do not allow granules to contact seed	
Wireworms	terbufos (Counter)	1.0 ^a	Band, furrow		
	carbofuran (Furadan)	2.0	As for rootworms		
	chlorpyrifos (Lorsban)	2.0	Band, furrow, broadcast PPI		
	ethoprop (Mocap)	1.0	As for rootworms		
	fonofos (Dyfonate)	1.0	As for rootworms		
	fonofos (Dyfonate)	4.0	Broadcast PPI	Liquid form is Restricted Use	
	isofenphos (Amaze)	1.0	Band, furrow	Labeled for control of low to moderate wireworm infestations-	
	phorate (Thimet)	1.0			
	terbufos (Counter)	1.0	As for rootworms		
	diazinon	1 1/2 oz ai/bu	Seed treatment	Control of light infestations. Check planter plates frequently if using graphite mixtures. Use slurry treatment with cyclo planter	
White grubs	chlorpyrifos (Lorsban)	2.0	Band, furrow, broadcast PPI		
	isofenphos (Amaze)	1.0	Band, furrow		
	terbufos (Counter)	2.0	Band, furrow		
Billbugs	chlorpyrifos (Lorsban)	2.0	Band, furrow	Granules at planting	
	chlorpyrifos (Lorsban)	1.0	Broadcast	Spray for post-emergence rescue treatments when damage appears	
Seed corn maggot	chlorpyrifos (Lorsban)	1.0	As for rootworms		
	fonofos (Dyfonate)	1.0	As for rootworms		
	isofenphos (Amaze)	1.0	As for rootworms		
	terbufos (Counter)	1.0	As for rootworms		
	chlorpyrifos	1 oz ai/bu	Seed treatment) If using diazinon or Lorsban) graphite mixtures, check planter plates frequently to make sure material is not sticking. Use slurry treatment with cyclo planter.	
	diazinon	1/2 oz ai/bu	Seed treatment		
Seed corn beetles	fonofos (Dyfonate)	1.0	As for rootworms		
	isofenphos (Amaze)	1.0	As for rootworms		
	phorate (Thimet)	1.0	As for rootworms		
	diazinon	1 1/2 oz ai/bu	As for seed corn maggot		
Cutworms	carbaryl (Sevin)	2	Spray directed at plant base		
	carbaryl (Sevin)	1-2	Bait broadcast		
	chlorpyrifos (Lorsban)	1-1 1/2	Broadcast spray		
	fenvalerate (Pydrin)	0.1-0.2	Broadcast spray	Restricted Use compound	
	Pemcap-M	1.0	Broadcast spray	Restricted Use compound	
	trichlorfon (Dylox, Proxol)	1.0	Spray directed at plant base		
	trichlorfon (Dylox, Proxol)	1.0	Bait broadcast		
	Some soil insecticides (Dyfonate, Lorsban, Mocap) used as planting time treatments for corn rootworm are labeled for cutworms and may give control of light to moderate cutworm infestations.				

^a Recommended rate is based on 40-inch row spacing; use higher rate with narrower spacings. Based on 1000 row feet use 6 oz of a 20 G formulation, 8 oz of a 15 G formulation, and 12 oz of a 10 G formulation.

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