

Grasshoppers – Biology, Control, and Scouting

John Gavloski, Soils and Crops Branch, Manitoba Agriculture and Food, Carman, Manitoba, R0G 0J0
E-mail: jgavloski@gov.mb.ca

Grasshopper populations were higher last year than they have been in several years. An August surveys of egg-laying populations predicts that populations may be at least as high, if not higher for next year. Knowing this, there are several steps that farmers and agronomists can take to try to minimize the damage that occurs next year. Careful observations the previous fall and in late spring / early summer are important in minimizing damage and the cost of grasshopper control. Another consideration is the weather conditions, which can influence the population of grasshoppers, and how much damage they do to the crop.

How Does Weather Affect Grasshopper Populations?

The number of grasshoppers hatching in the spring will be affected by the weather the previous summer and fall. Warm and dry summer and fall conditions will mean that there has been more opportunity for grasshoppers to lay their maximum amount of eggs. As well, there is some embryonic development that will occur in the egg before the colder weather sets in. Warmer conditions will mean that the embryonic development is further along before development ceases for the winter. The further along the development is going into winter, the earlier the eggs will hatch the next year. Earlier hatch means grasshoppers that are feeding on younger, less tolerant crops.

Warm and dry spring and summer days favor early and rapid grasshopper development. As well as affecting their ability to cause more harm to crops, this also means they will become adults and start laying eggs for the previous year sooner. So it is easy to see how several years of hot, dry conditions can build a grasshopper population up to outbreak levels.

A common question over the winter will be “what affect will cold weather have on the overwintering grasshoppers”? This depends on how cold the soil temperature is at about 5 cm below surface level. This will be affected by the amount of snow cover. Studies by Agriculture Canada scientists have determined that temperatures of -15°C or less at about 5 cm below the soil surface are required for substantial mortality of grasshopper eggs. So if the winter wheat in the area has survived the winter well, grasshopper eggs likely have too. Also consider that grasshopper eggs are often laid in areas where snowfall tends to accumulate.

Know the egg bed areas where grasshoppers congregated the previous fall.

The species of grasshoppers that are considered crop pests overwinter as eggs, although some non-economic species overwinter as nymphs (young grasshoppers). Most of the eggs are normally deposited in a variety of non-crop areas including ditches, fencerows, shelterbelts and weedy areas. Eggs will also be laid in some late-season crops, weedy fields, headlands, pastures and alfalfa. These areas will be where egg pods are concentrated and the majority of grasshoppers will hatch the following spring. Observing where grasshoppers are congregating and laying eggs in the fall will help in determining where monitoring the next season should be concentrated.

Late spring / early summer monitoring is critical

Starting in late-May, monitor roadsides, field edges, and areas where grasshoppers clustered in late summer to lay eggs. Walking in these areas and looking carefully for grasshopper activity in the plant material, which should still be small, will help to determine if hatch has begun and how heavy the population is. If possible, try to monitor these areas at least once a week beginning in late May and estimate the number of grasshoppers per m^2 .

Why early season control is best

- 1.) Grasshoppers are concentrated early in the season. Until grasshoppers become adults and have fully developed wings, they can not fly. When populations are still young and concentrated around the field edges and roadsides, often control measures applied to just the field edges or roadside areas where they have emerged in large numbers is enough to provide control. If control is delayed too long and grasshoppers become adults, they can move into fields rapidly, potentially resulting in farmers having to spray whole fields to control grasshoppers.
- 2.) Many insecticides do not work well against adult grasshoppers. Insecticide labels often specify that control should be directed at young grasshoppers.
- 3.) It's cheaper. For those insecticides that will provide adequate control of adult grasshoppers, usually a much higher rate is required than if control was against the juvenile stages. This increased rate that is required also increases the cost of controlling grasshoppers.

To sum up, scout for grasshoppers early in the season, and don't just react to a problem once it has developed to the point where it can't be ignored. If grasshopper populations are high early in the season, treat the grasshoppers before they become adults.

Does Time of Seeding Affect the Risk of Grasshopper Damage?

Younger plants do not withstand grasshopper feeding as well as older, well-established plants. So the more developed the plants are when grasshoppers hatch and find their way into the field, the more tolerant they will be to the feeding. Good growing conditions will also help make the plants more tolerant to grasshopper feeding. Crops that are seeded late and stressed because of poor growing conditions are at higher risk of economical damage by grasshoppers. Also, early-seeded crops mature early, and migrating grasshoppers are less likely to be attracted to them as they are to lush young foliage.

Tillage and Grasshopper Control

Tillage manages grasshopper populations primarily by eliminating the green plants on which grasshoppers feed. Tillage is of little value if used for the sole purpose of physically destroying grasshopper eggs or exposing them to desiccation or predation. Excessive tillage is harmful in that it will reduce soil moisture levels and increase the risk of soil erosion.

Will burning grasslands help control grasshoppers?

Burning grasslands in the fall is reported to have no effect on grasshopper eggs. Burning may even benefit grasshoppers by providing the small nymphs which hatch in the spring with easier access to sunshine and warmth on cooler days and by inhibiting the development of protozoan and fungal diseases of grasshoppers.

Natural Enemies of Grasshoppers

Next to weather, natural enemies are the most important factors controlling grasshopper populations. In some localized areas, natural enemies may even be a more important factor than the weather.

Egg Predators: Among the most important predators of grasshopper eggs are bee flies, blister beetles, ground beetles, and crickets. Some species of bee flies and blister beetles will deposit their eggs in the soil near grasshopper eggs, which enables the larvae to easily find grasshopper eggs to consume. When bee flies and blister beetles are abundant, they may destroy up to 80% of the grasshopper eggs in a localized area.

Nymph and Adult Predators: Spiders, robber flies, some wasps and many birds may feed on grasshoppers and consume them in large numbers. The effect of these predators on the total grasshopper population is not fully known.

Parasites of Grasshoppers: Grasshopper eggs are sometimes parasitized by the wasp *Scelio calopteni*. Grasshopper nymphs and adults are sometimes parasitized by sarcophagid and tachinid flies. As well, horsehair worms (which are long, whitish and extremely slender) sometimes parasitize grasshoppers. The eggs of this parasite are ingested by crickets and grasshoppers. After hatching, the worm penetrates the grasshopper's body cavity and grows in length. When the weakened host falls into water, the worm exits and swims away.

Diseases: A fungal disease, *Entomophagus grylli*, occurs naturally in the Canadian prairies, infecting grasshoppers, especially during seasons when the humidity is high. Infected grasshoppers typically climb to the top of stems and wrap their legs around them and then die. The body is filled with fungal spores. As it disintegrates, the sticky spores transfer to other grasshoppers, killing them.

A protozoan, *Nosema locustae*, can infect grasshoppers if the grasshoppers ingest infected vegetation or an already diseased grasshopper. A grasshopper population infected with this organism may be reduced from 5 to 40% in one year. *N. locustae* can reduce feeding rates to as low as one-third of normal. This parasite also appears to affect grasshopper populations by reducing the number of eggs laid.