

Lesser Grain Borer

The lesser grain borer (*Rhyzopertha dominica*) is a grain-feeding insect found sporadically in southern Alberta. It is distributed worldwide, and in Canada, it has been reported from British Columbia, across the prairies and into Ontario and Quebec.

However, this insect is rare in Canadian stored grain, and it is unlikely the insect can survive the entire winter in farm bins in western Canada.

Background

The adult lesser grain borer is a strong flier and may have arrived in Canada in wind-borne migration from the United States or in imported infested grain.

The insect pest bores directly into the kernel and can cause more damage than the rusty grain beetle and the red flour beetle. It needs high temperature grain to reproduce and survive.

The lesser grain borer tends to gather where the grain mass is compacted; therefore, an effective method of control is to move or turn the grain frequently.

In Alberta, the lesser grain borer is a declared pest in the Pest and Nuisance Control Regulation (AR 184/2001) under the *Agricultural Pests Act*. The Canadian Grain Commission also considers the lesser grain borer to be a primary pest.

The *Canada Grain Act* states there is zero tolerance for any primary insects (those that feed on whole, sound grain) in grain delivered to elevators. Insect-infested crops in storage quickly lose weight and quality and may cost individual producers thousands of dollars in lost income.

Life cycle

The lesser grain borer develops through four life stages: egg, larva, pupae and adult.

Adult

The adult beetle is dark reddish-brown with a cylindrical body about 3 mm long. The antennae have a distinctly shaped, loose, three-segmented club. The head of the beetle is hidden beneath the pronotum, or shield, covering the mid-section of the insect. The adult may live up to 240 days and is a strong flier.

Eggs

The female lays her eggs one at a time or in batches of up to 30 and can lay up to 500 eggs over 3 or more months. The optimal conditions for egg laying are temperatures of 20° C to 34° C and 14 per cent grain moisture content. However, the young can also develop in very dry grain if temperatures are above 30° C.

Larva and pupae

The larva is white, and as it matures, it becomes C-shaped and immobile. The normal development time for the lesser grain borer to develop from egg to adult is 58 days, but it can develop to an adult in 25 days under optimal conditions, around 30° C. The larva feeds and pupates inside a tunnel in the grain kernel. When the adult emerges, it chews its way out of the grain kernel.

Host crops and damage

The lesser grain borer is one of the most destructive beetles infesting grain in North America and around the world. Lesser grain borers attack most kinds of stored

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grains, but are especially damaging to wheat, barley and corn and can damage other commodities such as seeds, drugs, wood and paper products.

Both adult and larval stages cause distinctive and heavy damage. The adults and larvae bore into the kernels to feed on the germ and endosperm, leaving behind a fine powder, shells of bran and particles of feces. The lesser grain borer typically consumes 17 to 20 per cent of each kernel it damages, while by comparison, the rusty grain beetle only consumes 4 per cent of the kernel at the germ.

Monitoring

Proper identification of lesser grain borer beetles is important as they often look similar to other pests but have different behaviours and pest status. Producers need to be sure to determine which species is present before taking remedial action.

Regular monitoring of stored grain for lesser grain borer, other pests and grain quality is important for determining the presence and potential for serious infestations. Although the lesser grain borer has rarely been a problem in stored grain in Alberta, because the temperatures cool too fast in the fall, adults are strong fliers and have been found flying outside grain-handling facilities. The lesser grain borer tends to gather where the grain mass is compacted, so the pest could become a problem if stored grain is not managed properly.

Look for the presence of lesser grain borer or damaged kernels in stored grain. Signs of infestation include the following:

- large amounts of flour
- tunnels and irregularly shaped holes in the grain kernels
- a sweet odour in the grain

Probe traps can be used for detecting most insects in stored grain, although these traps are not very effective for lesser grain borer because of the pest's limited mobility in stored grain. Probe traps should be placed near the top centre of a storage bin, which is usually where the first indication of an infestation will be found because of warmer temperatures and moisture. Leave the traps for about a week and then check for adults or larvae. Continue placing the traps to monitor for infestations.

During the first 60 days of grain storage, monitor once every 7 to 10 days, and then adjust the monitoring frequency depending on the conditions and quality of stored grain. Grain in the centre of large, unaerated bins (6 m diameter and larger) remains near the harvest temperature into mid-to-late winter.

Economic thresholds

The *Canada Grain Act* states there is zero tolerance for any primary insects, which includes the lesser grain borer, in grain delivered to elevators.

Control

Cultural control

The adult lesser grain borer is a strong flier and can move to other locations. However, the lesser grain borer needs high-temperature grain to reproduce and survive. Since the pest tends to gather where grain mass is compacted, an effective method of control is to continuously aerate or turn the grain frequently. The lesser grain borer will be killed quickly at temperatures just below freezing (0° C).

To kill all stored-product insects, such as the lesser grain borer and the rusty grain beetle, certain grain temperatures need to be reached and maintained:

- -20° C for one week
- -15° C for four weeks
- -10° C for eight weeks
- -5° C for 12 weeks

It is important to note that unless aeration is used to cool the entire grain mass in a bin, there will be warmer areas created by natural convection currents.

For further information, look at the article on the Canadian Grain Commission's web page called "Protection of farm-stored grains, oilseeds and pulses from insects, mites and moulds" at: <http://www.grainscanada.gc.ca/storage-entrepote/aafc-aac/pfsg-pgef-eng.pdf>

Prevention is always the most economical and efficient method of controlling these pests. Once the pests are distributed within the grain mass, fumigation is the only method of managing the problem.

Chemical control

Phostoxin fumigation can be used to control lesser grain borer and other stored grain insects. The active ingredient is aluminum phosphide, a restricted-use pesticide only available through provincially licensed persons for uses covered by their applicator's certification.

In Alberta, certification is required to purchase phosphine gas products. Recognized certification includes both the Farmer Certificate and Fumigation Pesticide Applicator certificate. Holders of both certifications must receive the Grain Fumigation factsheet from the vendor.

See Alberta Agriculture and Rural Development's Phosphine Fumigation FAQ (frequently asked questions) for further information: [http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/faq8661](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/faq8661)

Best management practices

- Prevent losses from lesser grain borer by storing grain crops properly; preventing infestations is easier, safer and less expensive than controlling them.
- Clean grain storage facilities and the area around them before storing grain.
- Monitor stored grain regularly for signs of heating or infestation.
- Use probe traps and check regularly for insect infestations.
- Clean grain handling equipment before using to prevent new infestations.
- Aerate or turn the grain frequently to cool the stored grain and control or eliminate insect pests. Fan aeration is preferable if available.
- Always store grain crops in cool, dry, clean uninfested bins that are weatherproof and well aerated to prevent losses, maintain quality and assure saleability.

Acknowledgments

Developed by Scott Meers
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With thanks to Dr. Noel White, Agriculture and Agri-Food Canada and Brent Elliott, Canadian Grain Commission, for manuscript review.

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