AGRI-FACTS
Practical Information for Alberta's Agriculture Industry

January 2014 Agdex 622-29

Cereal Leaf Beetle

The cereal leaf beetle, *Oulema melanopus* L. (Coleoptera: Chrysomelidae), is an invasive insect from Europe that feeds on cereal crops, including wheat, barley and oats. It was first discovered in North America in 1962 in the state of Michigan. The cereal leaf beetle now is found in most cereal production areas of the United States.

Background

Cereal leaf beetle was first observed in Alberta in 2005, Saskatchewan in 2008 and in Manitoba in 2009. Computer modeling based on current environmental conditions suggests that the cereal leaf beetle could invade all cereal growing areas of Canada.

The cereal leaf beetle feeds on wheat, barley and oats.

The beetle is widespread throughout the southern part of Alberta, from Pincher Creek to Medicine Hat and north to High River and Strathmore. A new population was reported south of Edmonton in 2011.

The potential economic effect of the pest has not been assessed on the Prairies, but significant yield losses have been observed in other parts of North America.

Life cycle

The cereal leaf beetle has a single generation per year.

Adult

In Alberta, cereal leaf beetle overwinters in the adult stage and emerges in mid-April to May. Adult beetles are about 6.3 mm long with a brightly coloured orange-red thorax, yellow/orange legs and metallic blue head and wing covers.

The adults prefer to overwinter in field debris, crevices of bark and rolled leaves. These areas include edges of crops and woodlots, fence rows, sparse woods and dense woods. After emerging, the adults disperse to host crops, feed, mate and lay eggs. Peak egg laying occurs in May.

Eggs

Eggs are laid on the upper surfaces of leaves along the margins or close to the leaf mid-rib. Oats and barley are preferred hosts for egg laying, but spring-planted wheat, winter wheat and other grasses are also hosts.

Eggs are laid singly or in multiple clusters of two or three, touching end to end. Newly laid eggs are bright yellow, but darken to orange-brown and then black before hatching. Eggs are cylindrical and measure 0.4 by 0.9 mm.

The eggs hatch in about 4 to 6 days, and the most favourable developmental temperature is about 21° C. Each female lays about 50 to 275 eggs.

Larvae

While adults can cause crop damage, larvae are the most damaging stage of this insect. Larvae go through four instars (life stages), and they feed mainly on upper leaf surfaces. Larvae have a yellow body with a brown head and three pairs of brown legs. However, the larva may look black on the leaf, like an oil droplet, because the first- to fourth-instar larval stages are smeared with a fecal coat.

Larvae are active from May until July and do not usually move from one plant to another. The larvae feed for 10 to 14 days and then shed their slimy covering, drop to the ground and enter a pre-pupal stage before forming pupa in July.

Pupae and new generation adults

The pre-pupa enter the soil at the base of the host plant and form pupal cases near the roots at a preferred depth of about 5 cm. New generation adults emerge in about three weeks

and feed on various grasses before moving to overwintering sites in the fall.

Host plants and damage

The cereal leaf beetle has a wide host range in cereals and grasses. It prefers oat, barley, wheat, rye, timothy, fescue, grain sorghum and corn. Crop yield and quality are reduced due to lost photosynthetic activity resulting from the feeding damage.

The fourth larval instar causes most of the crop damage, and this stage is responsible for about 70 per cent of all crop damage. Feeding at the flag leaf stage is most damaging to crop yield.

The adult and larvae feed on the plant leaves and chew long strips of tissue between the leaf veins. Adults can eat through the leaf completely while the larvae eat the upper leaf surface and leave a thin membrane of tissue. This feeding pattern can leave a window-pane effect on the leaf. Severe feeding damage can look like frost damage because leaves look whitish.

In other parts of North America, yield reductions of 55 per cent in spring wheat, 23 per cent in winter wheat and 38 to 75 per cent in oat and barley have been reported due to cereal leaf beetle damage.

Monitoring

Producers need to monitor cereal crops in the spring by looking for adult cereal leaf beetle feeding injury. This scouting will provide an early indication of infestations. Continue crop scouting throughout the spring and summer, both before and during the boot stage, to assess for cereal leaf beetle abundance.

Scout for eggs and larvae infestation levels at a minimum of 5 to 10 random sites throughout the crop at least 3 metres away from field margins. Examine 10 consecutive plants per location. Count the number of eggs and larvae per plant (before tillering) or per stem (after tillering). Then, calculate an average number of eggs and larvae per plant.

Economic thresholds – when to take action

Action or economic threshold levels have not been determined for Alberta, but are established in Montana and North Dakota. In Alberta, cereal leaf beetle has not reached economic thresholds. Growers are cautioned to avoid unnecessary insecticide application as the parasitic wasp, *Tetrastichus julis*, continues to keep the beetle's population low, highlighting the importance of only spraying at economic threshold levels.

In Montana and North Dakota, economic thresholds are an average of three eggs and/or larvae per tiller before the boot stage. At the flag leaf stage, the economic threshold is an average of one larva per flag leaf. Larvae are the target for insecticide treatment.

Control

In Alberta, natural biological control by *T. julis* has kept the insect below economic threshold levels.

Cereal leaf beetle was previously regulated by the Canadian Food Inspection Agency, which resulted in restrictions on the movement of hay from infested to non-infested areas and requirements for hay fumigation. These restrictions are no longer in place, and cereal leaf beetle is no longer a regulated pest in Canada.

Environmental

High temperatures affect pre-pupae negatively while variations in humidity are undesirable for adults. Computer modeling shows the cereal leaf beetle may survive across cereal growing areas of Canada.

Biological

Natural enemies of the cereal leaf beetle include insect predators like lady beetles, parasitoids, mites and some bird species.

In western Canada, especially in Alberta, the *T. julis* parasitoid is established and appears to have kept cereal leaf beetle populations under control. The parasitoid was discovered in local cereal leaf beetle larvae populations, and no intentional releases were required in the south. In other areas where the beetle has invaded and lacks the parasitoid, relocation of the wasp may be necessary

The parasitoid lays about four to six eggs into the host larva. As many as 16 T. julis larvae have been observed developing inside one cocoon; however, it is more common to have 4 to 6 parasitoids per host larva.

Tetrastichus julis attacks all instars, but the young larvae are the preferred target. Parasitism occurs starting in mid-late May and continues as long as larval hosts are available. The wasp has two generations, and the highest parasitism rates are usually in June. Parasitized cereal leaf beetle larvae drop to the soil and form their earthen cocoons, but they die before reaching the pupal stage.

In western Canada, as elsewhere, *T. julis* has dispersed along with the beetle, and a steady increase in the

parasitization levels suggests it may keep this pest from reaching injurious levels.

Chemical

In other parts of North America, the control of the cereal leaf beetle initially relied heavily on insecticides; however, natural parasitoids are now helping control infestations. In Montana, insecticide applications for cereal leaf beetle peaked in 1997, but since then, only localized infestations have occurred.

In Alberta, the use of insecticides has not been necessary, and their use may adversely affect parasitoids that are currently keeping cereal leaf beetle populations under economic thresholds. Producers spraying insecticide for other pests such as wheat midge and grasshoppers should consider the potential adverse effects on natural enemies of the cereal leaf beetle and other pests. Pests are often kept at low levels mainly through the actions of parasitoid wasps.

Please refer to Alberta Agriculture's current *Crop Protection* guide (Blue Book), Agdex 606-1, for products registered for cereal leaf beetle control. http://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/All/agdex32

Cultural

Good soil fertility that promotes a healthy plant stand improves the crop's ability to withstand economic damage. Nitrogen fertility promotes crop vigour and potassium promotes early crop maturity.

Best management practices

- Plant crops with good fertility to promote a healthy plant stand that can better overcome feeding damage.
- Monitor for cereal leaf beetles as part of regular crop scouting.
- Pay particular attention during scouting throughout the spring and summer before and during the boot stage to assess for cereal leaf beetle abundance.
- In Alberta, cereal leaf beetle has not yet reached economic thresholds.
- Avoid insecticide applications if at all possible as the parasitic wasp, *T. julis*, continues to keep the beetle's population low.
- Growers outside the main infestation area in southern Alberta should report observations of new populations to the Alberta Insect Pest Monitoring Network at bugs.r.us@gov.ab.ca or the Alberta Pest Surveillance System at 310-APSS (310-2777).

Acknowledgements

Scott Meers
Alberta Agriculture and Rural Development

With thanks to Hector Carcamo, Agriculture and Agri-Food Canada for manuscript review.

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Alberta Ag-Info Centre
Call toll free 310-FARM (3276)

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