



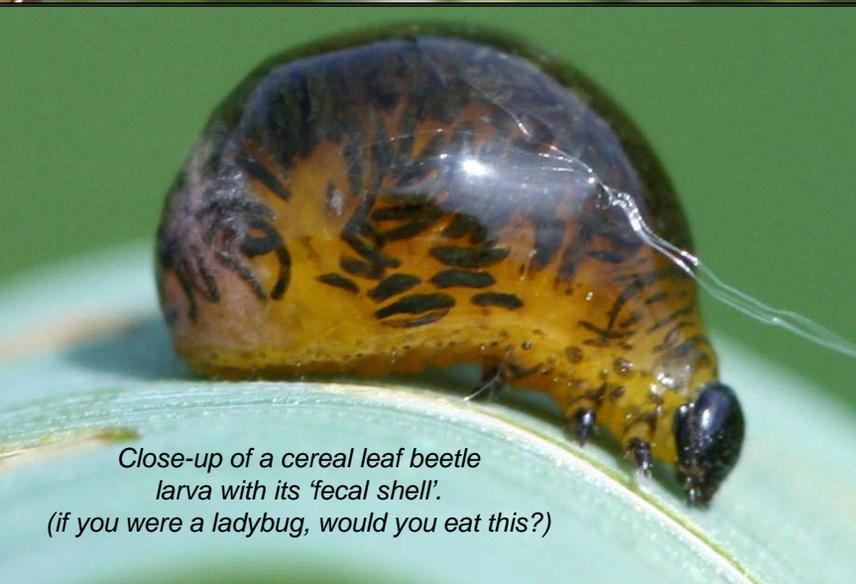
Cereal leaf beetle

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The cereal leaf beetle (CLB) was the first major insect pest introduced directly into the Midwest from the old world and one of the first insect invaders to take advantage of the 'jet age' of travel. It was identified from fields in Berrien County, Michigan in 1962; by that time, it had likely been in the region for a decade. It has since spread across the Midwest to the east coast and into several western states, and is still establishing in western Canadian provinces.

After its introduction, CLB became a key defoliating pest of small grains until the USDA and land grant universities released several parasitoids in the 1960s-70s. These natural enemies effectively controlled CLB in many parts of the Midwest, thus it became a non-issue for most growers. In the last few years, however, CLB numbers seem to be trending upwards. This suggests that the biocontrol is being disrupted, but it is not certain how. Perhaps the lifecycles of CLB and its parasitoids are moving out-of-synch due to the warming climate. The ease of including an insecticide in fungicide applications to wheat could be disrupting parasitoid populations as well.

CLB adults are distinctive, with dark-blue wing covers, a red thorax, and reddish legs. They overwinter in crop residue and along field edges under tree bark or vegetation. Beetles emerge in late March-April to feed on grasses and mate. In late April-May, females lay 1-2 eggs at a time on the upper leaf surface of small grains. They prefer younger grasses, so infestations in oats and spring wheat tend to be greater than in winter wheat. Larvae are yellow, fat, and hump-backed, but appear black and slimy because of a unique defense mechanism, a fecal shell covering the body. This slimy covering reduces water loss and deters predators, and can be 1/3rd of the body weight.



*Close-up of a cereal leaf beetle larva with its 'fecal shell'.
(if you were a ladybug, would you eat this?)*



Wasp larvae emerging from a parasitized CLB larva

cereal leaf beetle host plants

(spring sown grains are preferred over winter sown)

winter & spring wheat
oats barley rye speltz
corn (summer adult feeding)

quackgrass foxtail
orchard grass rye grass

Larvae feed for 2-3 weeks, with peak populations occurring in late-May into early June. Larvae feed by scraping the leaf surface; when defoliation is severe, plants or parts of fields appear white or frosted. Larvae do not feed on the grain head directly, but damage to the flag leaf after boot stage reduces grain fill. While severe defoliation across an entire field is rare in Michigan, hot-spots can be impressive. Infestations tend to be greater along field edges and near tree lines where adults overwintered.



A tiny CLB larva scraping a leaf



Severe feeding by multiple larvae can remove nearly all green tissue from the leaf surface (above). This results in leaves appearing white. Entire parts of fields may show a frosted appearance (below)



Typical CLB feeding in Michigan winter wheat is light (above), involving isolated plants and a few larvae.



Hot spots can have impressive numbers of CLB. The damaged (white) swath in this spring wheat field had larval counts of ~2 per plant, compared to almost no larvae in the green uninfested area by the road. In the previous season, the two fields just to the south of this area were planted to winter wheat (larval host) and corn (adult feeding). Note the tree lines across the road and in the distance, likely overwintering spots for beetles.

Larvae pupate underground in late May-June for 2-3 weeks. New adults emerge in June. They briefly feed on grasses, small grains, or corn, but move to field edges to spend the rest of the summer in an inactive state. They overwinter in the same locations. Thus there is only one generation per year, with the main damage occurring in May and June due to larval feeding.

Factors which may increase the chance or severity of a cereal leaf beetle infestation

- *Current crop* is oats and wheat vs other grains
- *Planting date* is in the spring
- *Crop mix* includes fall & spring sown grain growing in the same neighborhood
- *Landscape* has small fields with nearby woodlots and tree lines for adult overwintering
- *Weather* was mild in the winter, with a lot of snow cover
- *Insecticide use* involves routine tank-mixing of insecticide with fungicides on wheat

Management

In the 1960s-70s, prior to the establishment of parasitoids, losses of 12-15% in winter wheat and 30-75% in oats from CLB were reported. The thresholds established at that time differ between small plants early in the season versus fields which are heading. Catching an infestation early means finding infested fields before they turn white from damage. Risk factors which increase the chance of having CLB in a field are listed on the previous page. If more growers in Michigan begin to plant spring wheat, and/ or parasitism rates really are decreasing, CLB will continue to increase.

Considerations for management

- CLB larvae feed voraciously on upper leaves, thus exposure to insecticide isn't a problem.
- If an infestation coincides with disease pressure, most insecticides can be tank-mixed with fungicides. However....
- Conventional insecticides sprayed for CLB in small grains will kill beneficials.
- Since infestations typically start at the field edge, it is possible to treat only the part of the field over-threshold. This balances the need to treat with preserving the local parasitoid population.

Thresholds

Early-season

- reduce general defoliation
- threshold: 3 or more eggs and / or larvae per stem

At heading

- protect the flag leaf
- threshold: 1 larva per flag leaf

What does threshold look like?

See below and far right



no larvae



2 larvae per flag leaf

