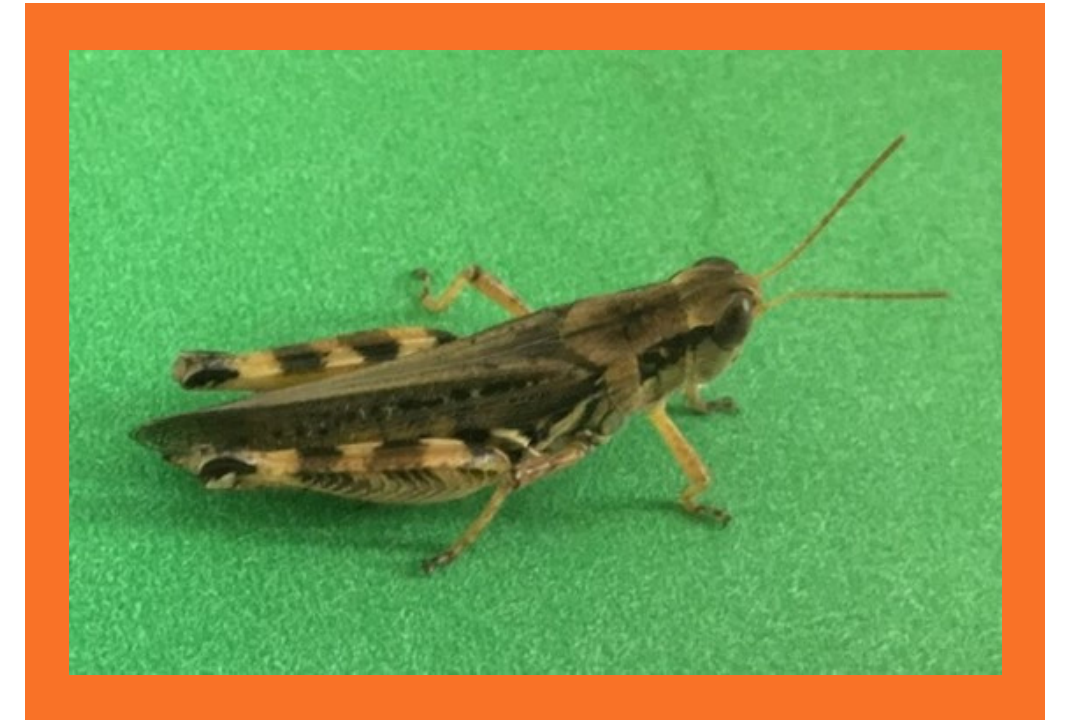


Types of Grasshoppers

Migratory:

- Wide variability in colour and physical characteristics.
- Brown to yellow in colour.
- Dark stripe behind each eye.
- Hind legs have a series of black bands.
- Forewings have small dark rectangular spots.
- Nymphs have black stripes on their heads.
- Feed on grass and broadleaf plants.



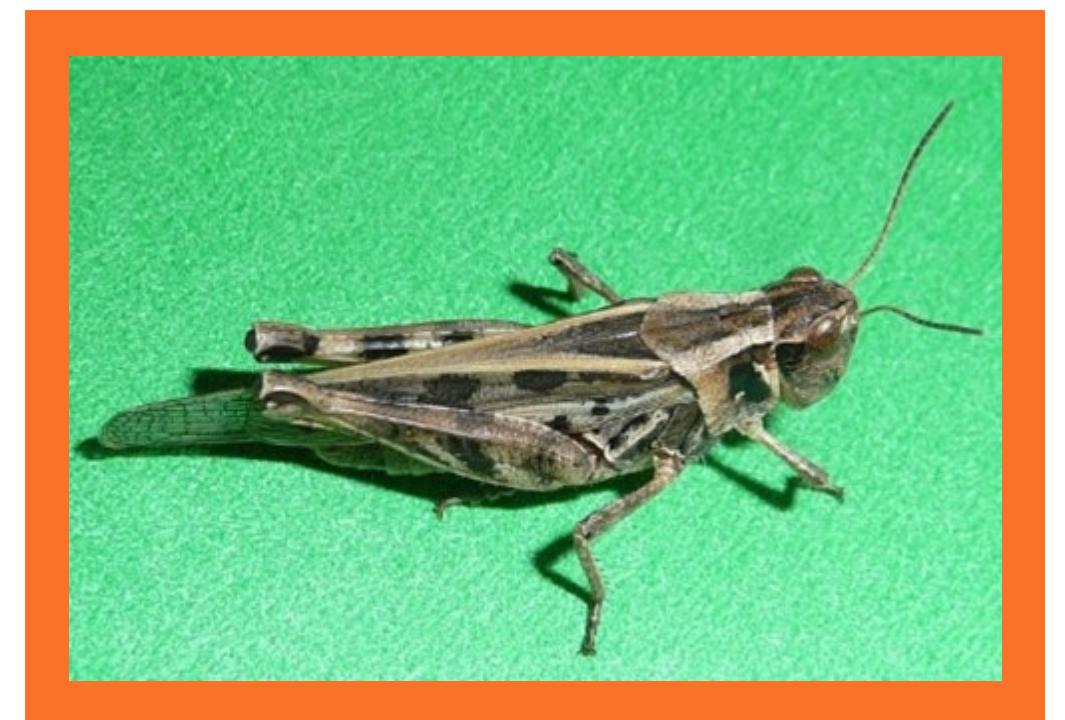
Two-striped:

- Largest of the 4 pest species.
- 2 pale stripes extending from eyes to tip of forewings.
- Solid black stripe on hind legs.
- Nymphs can be green, tan, or yellow/orange in colour.
- Have 2 stripes on the segment behind the head (thorax).
- Most common in heavy texture soils.
- Feed on grasses and broadleaves (prefer broadleaves).



Clear-Winged:

- Also have stripes on their back like the two-striped.
- Look for brown spots on the forewings.
- Wings are clear but have dark patches.
- Grass feeder; tends to leave broadleaves alone.



Packard:

- Adults are grey to dark yellow.
- Have light stripes from just behind the eyes.
- Last 2 segments of the legs can be blue/green.
- Found in light textured soils.
- Feeds on grasses and broadleaves.



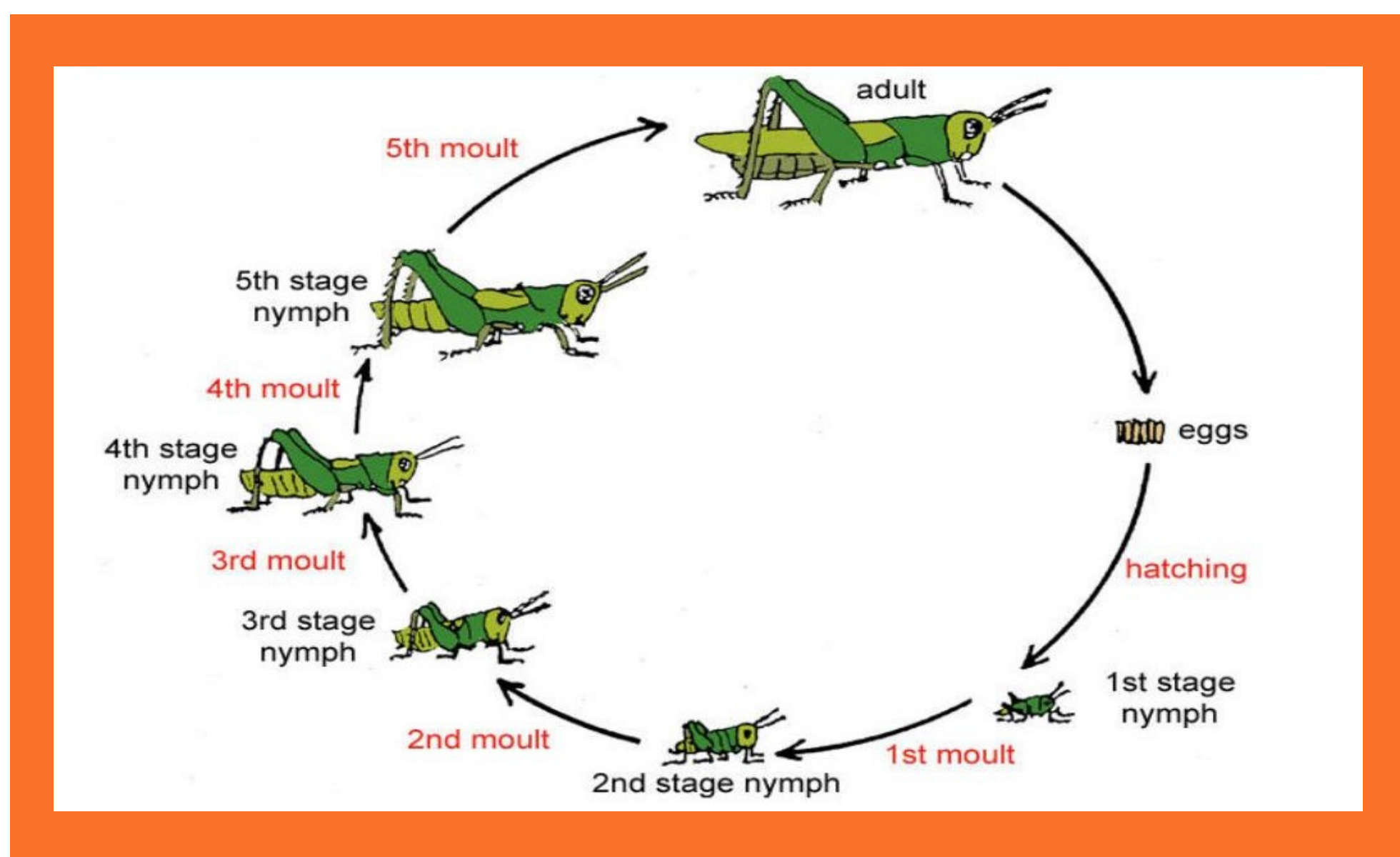
Note: If a grasshopper is spotted flying before June, it is not a threat to the crop. If a grasshopper is flying and you can see the colour of its wings (i.e. they are black, red, yellow, or orange) it is not a pest. Grasshoppers that make noises (i.e. clacks, clatters, or sings) are not pests (pest grasshoppers are silent).

The Grasshopper Lifecycle

Only one lifecycle of grasshoppers occurs per year across the Canadian prairies.

Eggs are laid in batches within the soil to overwinter.

Grasshoppers will begin to emerge as nymphs (small grasshoppers with short wing buds) in early to late June. They will then progress through various instar stages until they are considered full-sized adults, between 20 and 80 millimeters in length.



Scouting, Damage, & Thresholds

There are 3 scouting techniques for assessing grasshopper presence and damage.

1. The most common method is utilizing “meter-square counts” which involves counting the number of grasshoppers that jump in front of you in the field. Pick a spot that is about 5 paces in front of you and as you walk to that spot, count the number of grasshoppers that move away from the area. Repeat this 5 times, walking in a Z or W pattern (don’t walk straight).
2. Defoliation is the second way to measure economic threshold for grasshoppers, and it involves selecting 2 plants at random from 5 different areas of the field and estimating the percentage of defoliation. The defoliation method is most commonly used in soybeans.
3. Use a sweep net. Using a sweep net to scout for grasshoppers is typically done earlier in the season to determine the instar stages of the pests present, and when an insecticide application may be warranted.

Damage

Grasshopper damage occurs as torn strips or chewed bits of individual leaves; later in the season, feeding can shift to clipping heads of cereal crops or pod-chewing in pulse crops.

Thresholds

Threshold levels can vary between crop types and fields based on many factors such as crop stage.

One rule of thumb some people go by is 10 grasshoppers per meter-square across all crops. However, in cereal crops the threshold may be between 8 and 13 grasshoppers per square meter, or 18 to 20 grasshoppers per square meter and visible crop damage early in the season!

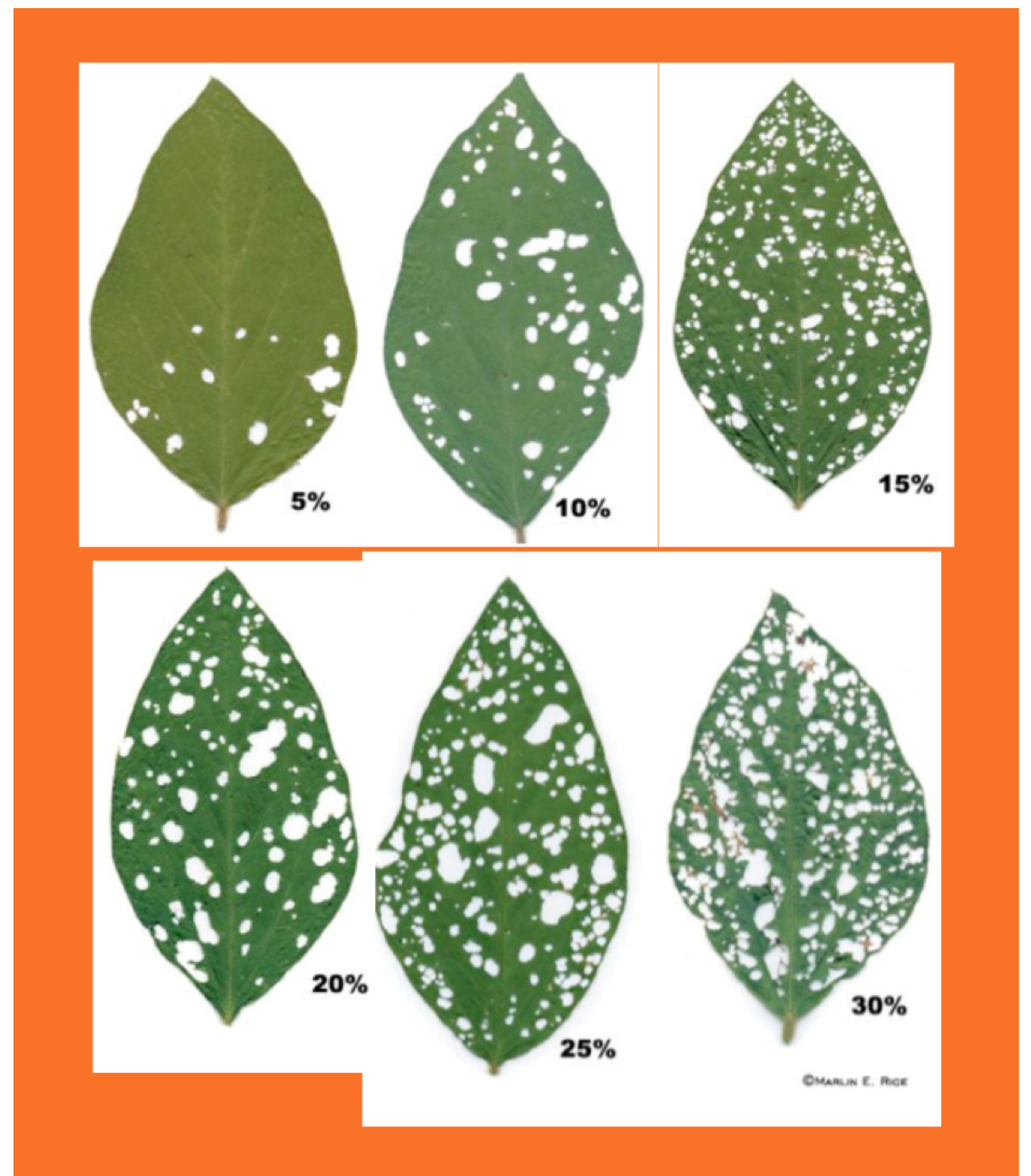


Table 1. Relationship between estimated grasshopper density and expected damage to field crops.

0-2 / m ² = None to Very Light	8-12 / m ² = Moderate (action threshold)*
2-4 / m ² = Very Light	12-24 / m ² = Severe
4-8 / m ² = Light	> 24 / m ² = Very Severe

*More than 2 grasshoppers per m² can cause losses in lentils and flax at the flower and pod stages.

Control Options

There are several grasshopper control options for the various crop types grown in the Red River Valley - from active ingredients such as chlorantraniliprole and deltamethrin to lambda-cyhalothrin and malathion. The control options have a variety of benefits and challenges, especially in terms of efficacy, mode of action, and application timing.

Chlorantraniliprole

Chlorantraniliprole is an active ingredient from the diamide class. It is absorbed through ingestion, binding to a specific receptor in the muscles of insects, called the ryanodine receptor. At this point, muscle cells will begin to leak calcium, eventually causing the insect to become paralyzed and die. Sources state that chlorantraniliprole is also toxic to insect eggs, larvae, and pupae on contact.

Feeding can cease within 7 minutes after spraying chlorantraniliprole, but it can take 4+ days for grasshoppers to die once they become lethargic and immobile. Continued feeding should not be an issue between the time of consumption and death.

Products containing chlorantraniliprole claim to have a residual period between 7 and 21 days, and the ability to control insects from hatch to adult.

Deltamethrin

Deltamethrin is a pyrethroid absorbed through both contact and ingestion. It disrupts the natural function of the nervous system in insect pests, causing them to weaken and die. It is recommended that products containing deltamethrin be sprayed when grasshoppers are in the 2-4 nymphal stage (prior to wing development). These products claim to have a residual period up to 10 days, however they can have decreased efficacy in excessive heat. Control may also be limited on grasshoppers residing under leaves.

Lambda-Cyhalothrin

Similarly to deltamethrin, lambda-cyhalothrin is a pyrethroid absorbed through both contact and ingestion with similar effects. Source indicate lambda-cyhalothrin may have a half-life of just 5 days. It is recommended to spray products containing lambda-cyhalothrin when grasshoppers are relatively small still (again, the 2-4 nymphal stage).

Control Options (cont.)

Malathion

Malathion is an organophosphate that works on contact by binding to an enzyme in the space between nerves. Upon binding to the enzyme, malathion prevents nerve signals from stopping - the constant nerve signals make it so the insects cannot move or breathe normally until they die. Sources indicate products containing malathion have a residual period between 2 and 18 days.

In summary, spray decisions should be based on a number of factors, including insect presence, stage of development, level of defoliation, crop stage, and weather patterns. Perimeter spraying can be enough to manage grasshopper populations and minimize economic damage some years, although this is highly dependent on the factors listed. Regular scouting is the best way to monitor populations and assess spray timing and thresholds.

Contact insecticides such as deltamethrin, lambda-cyhalothrin, and malathion, should be applied to maximize direct contact with the grasshoppers for the greatest effect. These products should be sprayed when grasshoppers are actively feeding - in temperatures between 21 and 27°C, under clear skies with little to no wind. The majority of daily feeding takes place in the morning.

Resources & References

https://prairiepest.ca/2022/week-6/#post_12878

https://prairiepest.ca/2022/week-5/#post_12780

<https://drive.google.com/file/d/0B76STh680wP1aVNkWEFBNU1ObzA/view?resourcekey=0-ONRW0wQeu11NgakQYryBzw>

<https://www.manitobapulse.ca/2021/07/assessing-grasshopper-damage/>

https://saskpulse.com/files/technical_documents/220601_Grasshoppers_in_Pulse_Crops.pdf

<https://www.canolacouncil.org/canola-encyclopedia/grasshoppers/>

<https://mbcropalliance.ca/news/grasshoppers-forecast-monitoring-and-management>

<http://npic.orst.edu/factsheets/chlorantraniliprole.html>

<http://npic.orst.edu/factsheets/DeltaGen.html>

<https://authorzilla.com/2YlaD/lambda-cyhalothrin-oregon-state-university.html>

<http://npic.orst.edu/factsheets/malagen.html>

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