

Insights on Insecticide Application

For many of us working in the crop production sector, the insect component of the scouting season tends to make us the most anxious. The inherent variability and general unpredictability of insect pressure contributes to this anxiety; the knowledge that severe insect outbreaks have the potential to cause significant economic damage only further compounds it. Although nobody wants their crop yield to get eaten, the decision to apply an insecticide is not one that should not be taken lightly. Spraying an insecticide should only occur after carefully considering several questions: Has the pest reached its threshold density? Is the crop still within its window of damage? How does the insect attack the plant? And lastly, how close am I to harvest? Only after these questions have been answered should a pesticide application be considered.

Has the pest reached its economic threshold?

The economic injury level is the smallest population of insects that will cause damage equal to the cost of pest management. The economic threshold is the density of insects at which control should be considered to prevent the insect population from reaching the economic injury level. The economic threshold can fluctuate in response to current grain prices and the cost of spraying: the higher the commodity price, the lower the economic threshold. The host crop can also influence the economic threshold (Table 1). If the insect does not reach the economic threshold then it will not pay to spray.

Table 1. Average economic thresholds of common insects and their host crops

	Aphids	Bertha Armyworm	Diamondback Moth	Grasshopper	Flea Beetle	Midge
Lentils	40 sweep ₁	-	-	2 m ²	-	-
Cereal	-	-	-	8-12 m ²	-	<u>Quality:</u> 1 midge 8-10 heads ⁻¹ ; <u>Yield:</u> 1 midge 4-5 heads ⁻¹
Canola	-	15-20 m ²	2-3 plant ¹	7-12 m ²	25% defoliation	-

Economic thresholds are also a critical part of the insecticide application equation because not all insects are bad. In any given crop, there are beneficial insects which are natural enemies to the crop-damaging pests in the field. These beneficial insects can help keep other pest populations in check, but insecticide applications generally work to control all the insects in the field—including the good ones. Knocking out beneficial insects with an early application of insecticide can be detrimental later in the season because if the targeted crop pest does return to the field it can easily increase its population without the threat of its natural enemies. Under these circumstances the damaging insect population can reach even higher levels than before it was sprayed with the initial insecticide application.

Is the spray timing correct?

Spraying an insecticide at the correct timing is just as important as applying herbicides within the correct window. If applications are made outside of this optimal time period, efficacy and return on investment may be compromised. Spraying within the window of crop damage is also necessary because spraying past this point typically does not prevent additional damage and will not result in any economic return. For example, with wheat midge, once the glumes have closed on the head of the wheat plant, the midge cannot lay any more eggs so no additional damage can occur. The threshold to spray for flea beetles in canola is 25% defoliation; however, if the growing conditions are good, canola will typically be able to outgrow the damage by the 3 to 4 leaf stage. Paying attention to the crop stage, and its period of insect vulnerability, could potentially save an unnecessary pesticide application.

How does the insect attack the given plant?

The numerous different insects that we have the unfortunate pleasure of dealing with on the prairies can be categorized into two main feeding habits: sap feeders and defoliators (Figure 1). Sap feeders, such as lygus bugs, aphids, and leaf hoppers, pierce the tissue and suck the fluids out of plants. The defoliators are biting insects that

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chew on plant material and include pests such as flea beetles, bertha armyworms, and grasshoppers. Understanding how a pest attacks and feeds on the plant allows for the selection of the appropriate product and application methods, which is crucial for its effective control.

Many of our primary insecticide products, such as Matador and/or Silencer, have some contact activity which allow them to control a wide range of pests without relying on their feeding habits. Other products, such as Coragen, depend on the insects' feeding habits for efficacy. Coragen relies on good spray coverage to ensure as much of the foliage as possible is covered since it requires the pest to ingest the insecticide by eating a treated leaf. Because of its activity, Coragen is less effective at controlling sucking insects, such as aphids, that will not chew on the infected leaf surfaces.



Figure 1. Images of crop pests categorized into their feeding habits. (Top): Sap Feeders; lygus bug (left), pea aphids (right). (Bottom): Defoliators; crucifer flea beetles (left), bertha armyworm (right). Adapted from Philip, 2015.

How close am I to harvest?

The Preharvest Interval (PHI) is the number of days that have to pass between the last application of the pesticide and harvest. Harvest, in this case, is considered the cutting of the crop and includes either swathing or straight combining. Products differ greatly in their PHIs and may range from 1-30 days. The PHI for a specific pesticide can also vary depending on the crop and the rate being used. If the PHI on label is disregarded there is a chance that the pesticide could be over the MRL (Maximum Residue Limit) and affect the marketability of that grain.

Responsible insecticide application should always be the goal. Although it may be tempting, “just-in-case” insecticide applications are not in the best interest of your crop or the sustainability of your farm. That said, we also cannot afford to sit back and relax when an insect outbreak is suspected because, in some crop scenarios, the crop damage can be extensive in a short period of time. If the pest has reached its economic threshold, the host crop is still within its window of damage, there is an understanding of the pests' feeding habits, and the time until harvest is long enough, an insecticide should be chosen and applied at the correct timing to result in a positive economic return for your farm.