Should I Consider a Late-Season Insecticide Application?

KEY POINTS

- A late-season insecticide application is warranted if there is more economic return in additional crop value than the cost of the insecticide application.
- University recommendations can help determine the potential loss due to injury and if an insect population has reached the economic threshold for a control application.
- Proper scouting techniques are needed to identify the insect pest and determine insect pressure before an insecticide application is considered.
- The growth stage of the crop and the insect pest can affect the viability of an insecticide application.
- Some insecticide applications can reduce natural predator populations and increase the possibility of another insect pest becoming a problem later in the season.
- It is important to follow the label to determine post-harvest restrictions and other considerations with an insecticide application.

It can be difficult to determine if a late-season insecticide application is warranted for any crop. The principles of Integrated Pest Management (IPM) can help determine if an insecticide application is necessary to protect the crop from economic loss while limiting the risk to people, property, and the environment.

What is IPM?

According to the U.S. EPA, "Integrated Pest Management (IPM) is an effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices. IPM programs use current, comprehensive information on the life cycles of pests and their interaction with the environment. This information, in combination with available pest control methods, is used to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment".[1]

Should I Consider a Late-Season Insecticide Application?

What are IPM principles?

IPM principles include:

- Field scouting to properly identify the insect pest and the amount of damage caused by the pest(s).
- Determining the pest population based on established calculation procedures.
- Understanding the pest life cycle to determine the best time to schedule an insecticide application, if needed.
- Reviewing established pest economic thresholds and economic injury levels.
- Quantifying the level of damage to a crop as some crops can tolerate a moderate level of defoliation (cosmetic damage) by a pest before the economic threshold is reached.
- Understanding whether the pest distribution is throughout a field or in certain areas like on a field edge.
- Identifying the crop growth stage to determine if the insect damage is at the economic threshold for that growth stage, especially as the crop reaches physiological maturity.
- Determination of the potential damage or loss of yield or crop quality and that this loss is more than the cost of control (economic thresholds).
- Cost of an insecticide application should include the cost of insecticide, labor, and equipment and in some applications, the cost of additional carrier to get adequate spray coverage.
- Consideration for the next crop to be planted (same or different).
- Understanding whether the insecticide can reach the pest to contact or consume the active ingredient. Insects located deep in a corn whorl, cotton boll, or plant stems may not ingest or absorb a lethal dose of a contact insecticide.
- Considering the presence and population of beneficial insects or other natural occurring biological organisms (fungi, viruses) that help control pests and determining if the use of an insecticide will result in another pest problem later in the season due to the reduction of beneficial insects, fungi, and viruses from the initial insecticide application.
- Helping to reduce the environmental impact of unwarranted pesticide use due to “blanket recommendations” not based on identified insect pressure in the fields sprayed.
- Supporting the use of cultural means, biological products, natural occurring predators, and resistant crop products to help manage pest populations before the use of chemical controls.[1,2]

Where can insect thresholds be found?

Agricultural universities often have established thresholds for many of the insect pests found within their respective states. Additionally, extension agents, agronomists and seed representatives can provide important insect management information.

What is the difference between economic injury level and economic threshold?

An economic injury level (EIL) is the point where losses of the crop incurred by a pest begin to exceed the costs of insecticide applications (this includes application and insecticide costs). The economic threshold (ET) is a lower pest population threshold where intervention by insecticides or other means prevents the population from reaching and exceeding the EIL.[3] This ET is determined by experimental work and is usually available from local universities and other sources.

Should I Consider a Late-Season Insecticide Application?

What is the difference between systemic, contact, or translaminar insecticides?

The nature of an insecticide dictates how insects may be controlled. Insects feeding within a stalk, stem, boll, or seed are usually protected from insecticides applied only to the plant's surface tissues.

Contact insecticides help provide protection to plant tissues that the insecticide contacts. Insects must ingest the protected tissue to receive a lethal dose. New tissue that emerges after application is not protected and can be fed upon without ingesting the insecticide. Most foliar insecticides are contact in nature.

Translaminar insecticides move into the leaf at the point of contact creating a reservoir of active ingredient that helps provide protection for a longer period. In contrast to systemic materials, translaminar materials only move a short distance, not throughout the plant.

Systemic insecticides are absorbed and move within the plant; however, movement may be slow to reach new shoot growth before insect damage occurs. Additionally, systemic insecticides tend to move upward in a plant from the point of application contact with the plant. Insects feeding below the point of contact may not ingest a lethal dose. A few systemic insecticides can move both directions throughout the plant.[4]

What late-season corn insects may warrant an insecticide application?

Corn earworm, corn leaf aphids, corn rootworm beetles, European corn borer, southwestern corn borer, fall armyworm, grasshoppers, Japanese beetles, southern corn borer, stink bugs, and western bean cutworms are the most common corn pests that may warrant a late-season insecticide application. Also due to the extended egg laying and larval hatch period of the corn earworm, the use of insecticides to control this pest has not been economically viable for most commercial field corn production. Banks grass mites and two spotted mites are two common late-season mite pests that may warrant a miticide application to help reduce the potential for economic crop loss.

*If non-*Bt (Bacillus thuringiensis) *protected corn is being injured by corn earworm and western bean cutworm, should corn products with* Bt *protection for corn earworm and western bean cutworm be treated with a precautionary insecticide?*

Some *Bt* corn products provide better control of certain late season worm species than other *Bt* corn products, so it is important to correctly identify the pest and know which *Bt* products control which pests. Built on the proven VT Double PRO® Technology, Trecepta® Technology gives you broad spectrum control against corn borers (European and southwestern), fall armyworm, western bean cutworm, black cutworm and corn earworm. However, *Bt* protected fields should be scouted, along with non-*Bt* protected fields.

Depending on the pest, a systemic insecticide may be considered for *Bt* and non-*Bt* corn products that have reached economic thresholds of injury. However, the most commonly used insecticides for late-season corn insect control are contact insecticides. This is why it is especially important to monitor insect pressure throughout the growing season and time applications while the crop and pest are at a growth stage for lethal control of the pest.

Should I Consider a Late-Season Insecticide Application?

Table 1. Late-season corn pests from VT to R6.							
	Corn Growth Stage						
	VT	R1	R2	R3	R4	R5	R6
Below Ground Insect Pests							
Corn Rootworm Larvae							
Above Ground Insect Pests							
Corn Earworm							
Corn Leaf Aphid							
Corn Rootworm Adults							
European Corn Borer							
Fall Armyworm							
Grasshoppers							
Japanese Beetle							
Southwestern Corn Borer							
Southern Corn Borer							
Stink Bugs							
Western Bean Cutworm							
Above Ground Non-Insect Pests							
Banks Grass Mite							
Two Spotted Mite							
Table 1. 2021 Identification of Late Season Corn Insects. Bayer publication https://www.cropscience.bayer.us/articles/bayer/identification-late-season-corn-insects							

What late-season soybean insects may warrant an insecticide application?

Bean leaf beetles, Japanese beetles, spider mites, soybean aphids, stink bugs, grasshoppers, soybean podworm (corn earworm), velvetbean caterpillars, thistle caterpillars, blister beetles, woollybear caterpillar, green cloverworms, soybean loopers, and cabbage loopers are the dominant insects (adults, larvae, nymphs) that may warrant an insecticide application to help reduce the potential for economic plant damage and/or help maintain soybean seed quality. [5] There are other late-season pests that can be found in a soybean field, but these pests are often not found at economic thresholds or like the dectes stalk borer that are found in the soybean stalk. This is why an insecticide application is not recommended for control of this pest, but cultural controls are often more effective.

What late-season cotton insects may warrant an insecticide application?

Bollworm, tobacco budworm, cotton aphids, cowpea aphids, green peach aphids, stink bugs, verde plant bug, and beet armyworms are the dominant insects (adults, larvae, nymphs) that may warrant an insecticide application to help reduce the potential for economic plant damage and/or help maintain cotton boll quality.[6]

Should I Consider a Late-Season Insecticide Application?

Can planting date affect crop injury?

Yes. For late-planted crops, the plant's growth stage may be more vulnerable to injury when the pest's population reaches its peak. As an example, a late-planted corn field that silks after other nearby fields could draw rootworm beetles from the nearby fields. The sheer number of beetles could cause extensive silk feeding and result in poorly filled ears. Additionally, if corn is planted in the same field the following year the potential for rootworm larval feeding the next year may increase because of the number of eggs laid by the adults the previous year. Rootworm larval survivability is greatly affected by soil type so this may not be a problem in very sandy soil types due to larval mortality in these soils.

Should a producer apply an insecticide after observing foliar feeding?

Most crops can sustain considerable foliar feeding before reaching economic injury levels. Leaf feeding can appear to be much worse than the actual percentage of tissue lost. Scouting should continue through the growing season to determine the extent of feeding based on foliar feeding diagrams and threshold information that includes plant maturity to determine if an insecticide application is warranted.

Should a producer tank-mix an insecticide and fungicide to reduce application costs?

Though the two pesticides may be compatible as a tank mix (review pesticide labels for compatibility and labeled applications), optimum application timing for each pesticide is critical to help maximize the effectiveness of each pesticide. Additionally, producers should only apply insecticides when the economic threshold for an insect has been reached. A precautionary application can reduce profit, kill beneficial insects needlessly, increase the potential for the development of insecticide resistance, and potentially increase environmental exposure.

How do I determine return on investment (ROI) for an insecticide application?

Return on investment is a ratio that measures the profitability of an investment (insecticide application) by comparing the gain or loss to its cost. To determine the ROI of on insecticide application it is important to determine a realistic yield goal realistic market price for the crop. A crop that has been contracted has a determined price, but in the absence of a contract price, the market price may need to be adjusted during the growing season to estimate price at harvest. The expected production per acre multiplied by the expected value per bushel, ton, or bale determines the value per acre, for the basis value in ROI calculations. From the basis value, take the anticipated loss of yield or dockage per acre without an insecticide treatment and subtract that value from the original basis value per acre to determine the basis without the control. For a positive ROI for an application, it will take the basis value per acre minus the insecticide application (insecticide plus application per acre) to be larger than the basis with no control. Any change in projected yield, market price, or cost of an insecticide application can change the potential ROI from positive to negative, to breakeven. A common rule of thumb is that as the commodity price increases, your economic thresholds will decrease.

Should I Consider a Late-Season Insecticide Application?

Sources:

[1] Integrated pest management (IPM) principles. 2023. United States Environmental Protection Agency. https://www.epa.gov/safepestcontrol/integrated-pest-management-ipm-principles

[2] Steps of integrated pest management (IPM). 2022. PennState Extension. https://extension.psu.edu/steps-of-integrated-pest-management-ipm/.

[3] Reisig, D. 2022. Insect management. AG-835. NC State Extension. https://content.ces.ncsu.edu/north-carolina-soybean-production-guide/soybean-insect-management.

[4] Krauskopf, D.M. 2007. Contact, systemic and translaminar: How insecticides move in plants. Michigan State University Extension. https://www.canr.msu.edu/news/contact_systemic_and_translaminar_how_insecticides_move_in_plants.

[5] Zukoff, A., McCornack, B.P. and Whitworth, R.J. 2024. Soybean insect pest management. Kansas State University Agricultural Experiment Station and Cooperative Extension Service. https://bookstore.ksre.ksu.edu/download/soybean-insect-pest-management-2024_MF743

[6] Mid-season and late-season pests (cotton). Texas A&M University. Extension Entomology. https://extensionentomology.tamu.edu/resources/management-guides/managing-cotton-insects-in-texas/mid-season-and-late-season-pests/.

Legal Statements