

Resistance Prevention – Managing Western Bean Cutworm and Mycotoxins in Corn

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Western bean cutworm (WBC) has become a serious pest of corn in Eastern Canada resulting in yield loss and contamination of grain by mycotoxins. Only two main tools are now available to manage WBC: foliar insecticides and Vip3A transgenic corn. With so few WBC management options, resistance to these tools is a real concern. In Ontario, WBC quickly developed resistance to the Cry1F Bt protein found in Herculex and SmartStax hybrids. Herbicide tolerant weeds in Ontario are a good reminder of the importance of resistance management. The key to resistance management for WBC is rotation of management tools whether they are insecticidal or transgenic (Bt) modes of action.

Protect against mycotoxins

WBC damage in corn increases the risk of infection by Fusarium fungi leading to mycotoxin contamination. Although Fusarium fungi frequently infect corn ears through the silk channel in the absence of insect feeding, even slight WBC damage provides additional entry points for fungal spores to infect the ear. These fungi produce mycotoxins, most importantly deoxynivalenol (DON or vomitoxin), which creates significant problems when marketing grain or feeding corn to livestock, especially swine.

To reduce the risk of mycotoxins, ask your seed dealer for hybrids that are less susceptible to Fusarium. Manage WBC by using a Vip3A hybrid or by scouting and using insecticide when needed. Protect from Fusarium infection by using an application of a triazole-containing fungicide such as Caramba, Proline or Headline AMP. These **fungicides should be applied when silks are fully emerged, and before browning**, directing application to the silks and ear zone. Spraying fungicides at pre-tassel, tasseling without silks, or after silk browning provides no protection against Fusarium. Strobilurin fungicides, such as Headline, applied for foliar disease protection may result in increased amounts of DON in grain corn if applied without a triazole fungicide.

Tank-mixing fungicide and WBC insecticide is a good option in non-Vip3A corn if the WBC threshold is met. If tank-mixing, target the application at full silk emergence when most WBC larvae will be present in the silk or ear tip. Good silk coverage is important for both the fungicide and insecticide to control this pest complex, therefore, ground application may be more effective than aerial application.

Using Transgenic corn

Vip3A is the only Bt trait available to control WBC, currently only available in Agrisure Viptera hybrids, sold by Syngenta. WBC are resistant to Cry1F Bt in our region, therefore Herculex, Optimum Acremax, SmartStax, PowerCore hybrids do not control WBC. ([Link](#) to trait table). The risk of resistance by WBC to the Vip3A trait is a possibility, and insect resistance management (IRM) plans are being developed. IRM recommendations will be available for the 2019 growing season.

Using Insecticides

A key strategy to avoid insecticide resistance is to **apply insecticide only when needed**, therefore, scouting is critical. There is only one generation of WBC per year with peak egg laying following shortly after peak flight. Peak flight timing varies by region. Southwestern counties tend to peak during the third and fourth week of July, with peak flight progressing eastward into the first and second week of August for counties in Central and Eastern Ontario. Use traps and follow the WBC trap network to determine peak flight for your region each year. (www.cornpest.ca/wbc-trap-network).

There is no relationship between trap captures and the number of egg masses laid in a field; therefore, **individual fields must be scouted for WBC egg masses**. Scouting should begin once moths are active and corn reaches the pre-tassel stage. Moths prefer to lay eggs in pre-tassel corn, therefore this is the most important time to begin scouting. Scout every 5 days during the pre-tassel and tasseling stage for approximately 2 weeks. As soon as a cumulative total of 5% of plants contain an egg mass, the threshold has been reached and insecticide application is needed. Target application close to full silking when fresh silks are present. Applications during pre-tassel to early tassel stage may be premature if moths are still actively laying eggs in the field. Vegetative stage corn (without a developing tassel) is not at risk of WBC infestation as young larvae cannot survive on leaf tissue; they need pollen, silk, and kernels to live. There is no advantage to insecticide use in a Vip3A hybrid. Monitoring the effectiveness of insecticide treatments is important; therefore, scout for damage in August or September and report poor insecticide performance.

Applying insecticides only when needed protects beneficial insects, such as predators (lady beetles, lacewings, syrphid flies, etc.) and parasitoids (wasps and flies) that target WBC and other corn insect pests. Bees can forage on corn pollen during tasseling. To minimize their exposure, applications after 8 p.m. are the safest unless there is evidence of a strong temperature inversion or high humidity. This allows the spray to dry before the bees are exposed to it the next day. Daytime treatments, when bees are foraging, are most hazardous. If you plan to spray during the day, contact beekeepers who have bees within 5 km of the spray site so that they may take any possible protective action.

To avoid resistance, **rotate insecticide classes or modes of action targeting WBC each year**. Currently, Coragen, which belongs to the diamide insecticide class (IRAC Group 28), is the most widely-used product in Ontario. Widespread, repeated use of Coragen may lead to resistance. Other insecticide options that provide excellent control of WBC include: Delegate, which belongs to the spinosyn class (IRAC Group 5), Matador, which belongs to the pyrethroid class (IRAC group 3a) and Voliam Xpress, which contains two classes (diamide class IRAC group 28 and pyrethroid class IRAC group 3a). Do not use the same class of insecticide year after year. If Voliam Xpress is used in one season, rotate to an insecticide product with a different mode of action, e.g. Delegate, the following year.

If you see unexpected damage to Vip3A or insecticide-treated corn from WBC, notify the seed or insecticide provider and OMAFRA, or the University of Guelph below:

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Managing Western Bean Cutworm and Preventing Resistance

To Manage WBC:

- Scout for WBC egg masses
 - Begin scouting when moths are active.
 - Target corn fields in the pre-tassel and tasseling stage and scout for fresh egg masses every 5 days for approx. 2 weeks.
- Only apply insecticide when 5% cumulative threshold is met – target the application close to full silk stage. Applications during pre to early tassel stage may be premature if moth flight and egg laying are still taking place.

To Prevent Resistance:

- **ROTATE** WBC control options yearly:
 - Vip3A Bt corn
 - Coragen insecticide (IRAC Group 28)
 - Matador insecticide (IRAC Group 3a)
 - Delegate insecticide (IRAC Group 5)
 - Voliam Xpress insecticide (IRAC Group 28 + Group 3a)

If you see unexpected damage to Vip3A or insecticide-treated corn from WBC, notify the seed or insecticide provider and Tracey Baute at OMAFRA or Dr. Art Schaafsma or Dr. Jocelyn Smith at the University of Guelph (see contacts above).

For Vip3A hybrids:

- Do not apply insecticide; there is no additional control of WBC
- Select a Fusarium tolerant hybrid or apply triazole fungicide at full silking to reduce mycotoxins

Watch for resistance

- Monitor for unexpected damage by WBC in late August

For all other corn hybrids:

- Scout for WBC egg masses.
 - Begin in late July in pre-tassel corn to full silk stage and scout every 5 days for approximately 2 weeks until 5% of plants have fresh egg masses
 - Apply insecticide/fungicide tank-mix when threshold is reached, applying at full silking to reduce mycotoxins

Avoid Resistance!

- Only apply insecticide when 5% threshold is reached.
- Rotate insecticide modes of action each year
- Monitor for unexpected damage by WBC in late August