



2019 SYNGENTA
CORN STEWARDSHIP GUIDE

syngenta[®]

SEED STEWARDSHIP IS EVERYONE'S RESPONSIBILITY

Before opening a bag of seed, be sure to read and understand the stewardship requirements applicable to the seed, including refuge requirements. In addition to the information provided on this page, stewardship requirements may be found in the Syngenta Stewardship Agreement that you sign and/or on the bags/tags accompanying the seed. By opening and using a bag of seed, you are reaffirming your obligation to comply with those stewardship requirements.

Insect resistance management (IRM)

Bt corn must have an insect resistance management (IRM) plan.

This is a requirement set by the Canadian Food Inspection Agency (CFIA). It is also a strategy endorsed by leading scientists to reduce the risk of insect populations developing a resistance to Bt corn. Syngenta is committed to following, supporting, and providing growers with relevant information to help them implement the IRM requirements set by the CFIA.

Therefore, all growers must sign a Syngenta Stewardship Agreement before ordering any Agrisure® insect protected corn which, in part, demonstrates their commitment to supporting the best management practices to reduce the potential risk of insects developing resistance to either the European corn borer (ECB) or corn rootworm (CRW) traits.

It is important to recognize that different products may have different insect resistance management requirements.

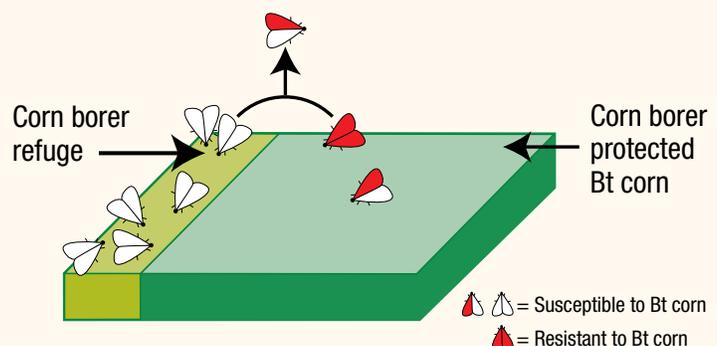


FAILURE TO COMPLY WITH REFUGE REQUIREMENTS MAY:

- Lead to insect resistance
- Slow down the introduction of new corn technologies that provide additional insect protection
- Affect grower access to Agrisure traired products

CORN REFUGE REQUIREMENTS

It is important to plant a refuge for your corn in order that the potential for target pests, such as ECB and CRW, to develop resistance to target proteins is slowed. This is done by providing pests an area for feeding in corn that does not contain the Bt trait, thereby maintaining a population of susceptible insects to mate with those that have developed resistance.





On-farm mixing of any seed is not an approved method of incorporation of refuge into traited seed. Syngenta is pleased to provide hybrids with E-Z Refuge® for built-in compliance. For more information on the refuge requirements for your corn seed, please see the table below:

Products	Minimum refuge requirement	Location and row spacing	Why?
 	20%	Adjacent to or within Bt field (4 row minimum; see planting options on page 3)	<p>Serves as an appropriate refuge for all pests targeted by these traits, including CRW, CRW and ECB, or the Multi-Pest Complex™*</p> <p>Appropriate size to ensure enough susceptible Bt corn refuge mates are available</p>
 	E-Z Refuge	5% appropriate refuge material blended into the bag	<p>Serves as an appropriate refuge for dual Bt traits to control ECB and/or the Multi-Pest Complex*</p> <p>Appropriate amount to ensure enough susceptible Bt corn refuge mates are available</p> <p>Additional convenience to ensure refuge is planted in all fields</p>

*Multi-Pest Complex includes black cutworm, western bean cutworm, fall armyworm, corn earworm and common stalk borer.

REFUGE CALCULATOR

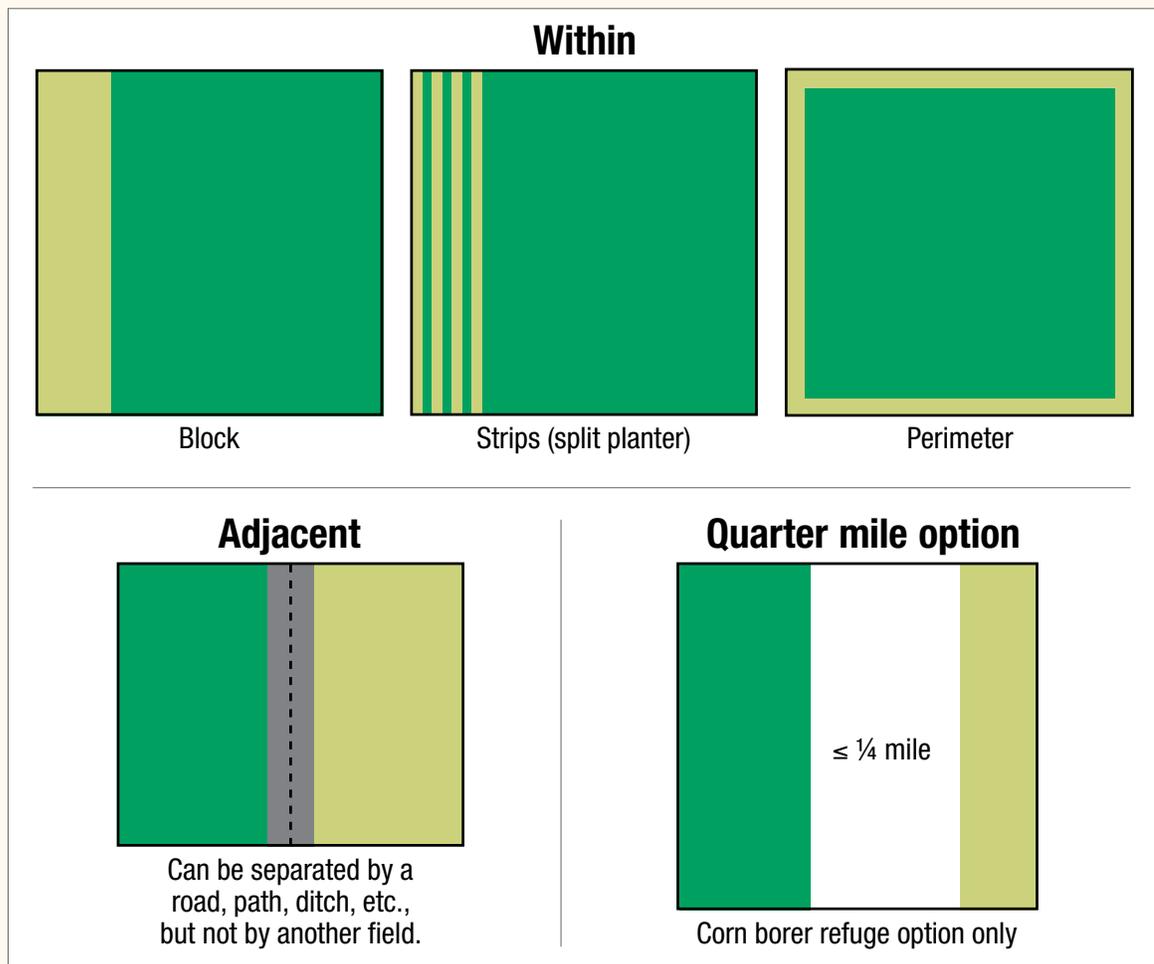
For corn varieties that are not available as E-Z Refuge, the Canadian Corn Pest Coalition, in collaboration with the Ontario Corn Committee, the Canadian Seed Trade Association and industry, have developed a web-based calculator to help growers develop a plan to meet the minimum refuge requirements for each Bt corn hybrid on their farm. The calculator can be accessed at www.refugeselector.ca. Remember: when calculating a refuge area, the calculation must be based on total corn acres.

REFUGE PLANTING OPTIONS

Depending on the pest for which the refuge is being designed, there are various designs of refuge planting that will be effective. It can be planted in the following configurations:

- Block within the Bt field
- Strips within the Bt field
- Perimeter around the Bt field
- Block adjacent to the Bt field
- Separate block within a quarter mile of the field (ECB only)

NOTE: A neighbour's field that does not contain Bt traits does NOT meet the refuge requirements.



SCOUTING IS ESSENTIAL!

Proper observation of your fields, as well as other integrated pest management strategies, will also aid in increasing the longevity of insect traits in the field. In order to first determine potential pest impact, a grower should consider pest populations in the area, crop damage from insect feeding seen in the previous year, and the rotation of the crop to consider pest overwintering habitats.

Scout refuge plantings to determine the level of insect pressure in your field. Then scout the Agrisure hybrids to note their effectiveness and look for signs of damage that may indicate resistance to either the Bt trait or the CRW trait. If concerns arise, please contact your local Syngenta Agronomic Sales Representative immediately for further field investigation.

Growers should rotate every year if:

- Fields have been in long-term continuous corn systems
- Target insect populations are high
- There have been problems with insect resistant trait performance

Rotation to crops such as soybeans, alfalfa or small grains will aid in removing the pests' food source and cause a population shift.

USE OF INSECTICIDES

In some cases, additional control measures for insect pests may be required. Foliar insecticide may be an option if target pest populations reach an economic threshold. Always follow proper labelled guidelines for pesticide applications.

Additionally, growers may decide to use seed-applied insecticides, which represent one of the most advanced forms of crop protection technology available, offering growers a targeted, environmentally sustainable means of pest management. Applied directly to the seed only where needed, seed-applied insecticides require less active ingredient per acre compared to foliar and soil-applied pesticides, and minimize off-target drift, reducing the impact on non-target organisms. Always read and follow label directions.

Syngenta is committed to protecting pollinators and continues work to develop and implement additional solutions to address dust generated when planting treated corn and soybean seeds and to further efforts on other bee health issues. Best management practices for the handling of seed treated with an insecticide are an important tool to help maximize the benefits of seed treatments and protect bees and other non-target insects at the same time. For more information, please visit www.beehealth.ca.

UNEXPECTED DAMAGE

Even in traited fields, small amounts of insect feeding damage may occur; however, any damage above threshold is considered to be unexpected damage (UXD). If you observe UXD in your field(s), it is imperative that you report this damage to your local Syngenta Representative for follow up, as it is mandatory that these cases be reported to the CFIA appropriately. Syngenta will facilitate investigation as to whether the damage is related to insect resistance, and provide you with information on strategies for minimizing pest damage going forward.

It is important to note that threshold levels of pest damage vary both by pest and by single versus stacked trait usage. For more information, visit:

- Corn rootworm education – Information on CRW provided by the University of Nebraska-Lincoln at <http://crweducation.unl.edu/>.
- Interactive node injury scale – Information provided by Iowa State at: <http://www.ent.iastate.edu/pest/rootworm/nodeinjury/nodeinjury.html>

FURTHER INSECT RESISTANCE MANAGEMENT RESOURCES

There are several resources available to assist with insect resistance management in Canadian fields:

- Seed bags and tags – Seed bag labels and bag tags provide product and stewardship information and customer service contact information.
- Canadian Corn Pest Coalition – A group of industry, academic, government, and extension specialists that work together for better understanding and management of corn pests and their associated traits. To view recommended planting layouts, maps and configurations, as well as information on corn pests and other management strategies, please visit www.cornpest.ca.
- For information related to western bean cutworm, please visit www.syngenta.ca/wbc
- For information related to corn rootworm, please click visit www.syngenta.ca/crw
- Further product stewardship and weed management information can also be found at the following:
 - Syngenta Customer Interaction Centre – 1-87-SYNGENTA (1-877-964-3682)
 - CropLife Canada – www.croplife.ca

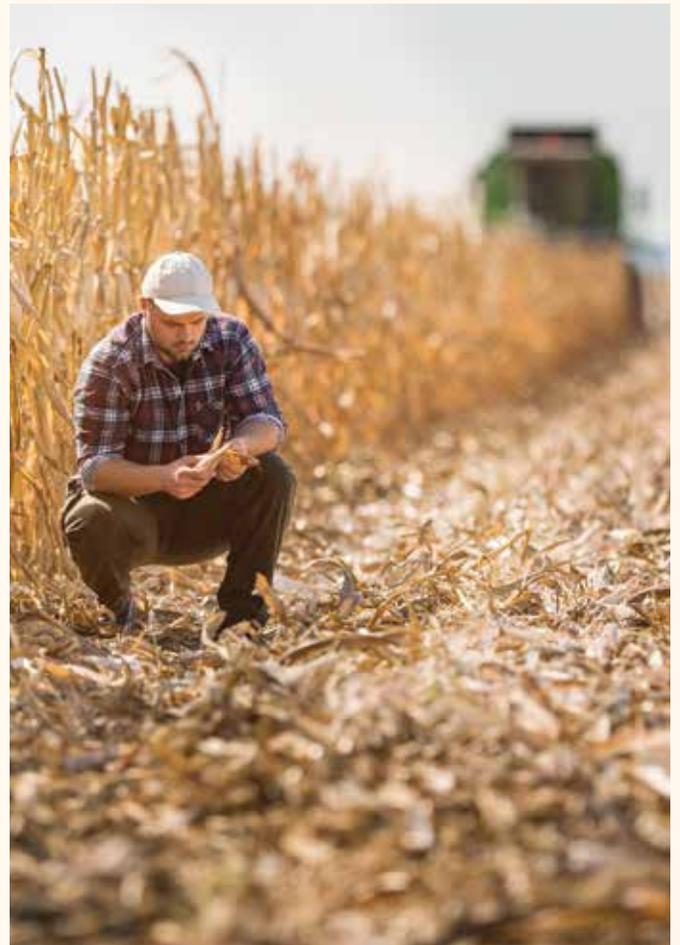
Weed management

Herbicide-tolerant traited corn must have a resistance management plan.

This is a requirement set by the CFIA. It is also a strategy endorsed by leading scientists to reduce the risk of weed populations developing resistance to certain herbicides, which is already happening with glyphosate in Canada. Syngenta is committed to following, supporting, and providing growers with relevant information to help them implement appropriate resistance management plans for herbicide-tolerant traits.

All growers must sign a Syngenta Stewardship Agreement before ordering any herbicide-tolerant seed which, in part, demonstrates their commitment to supporting the best management practices to reduce the potential risk of developing resistance of weeds to any herbicide.

Failure to follow these resistance management guidelines may speed the development of herbicide-resistant weeds in fields, thereby decreasing the trait and herbicide tools available to growers.



SET YOURSELF UP FOR SUCCESS

Best practices for managing herbicide resistance in your fields can be found at www.manageresistancenow.ca.

Syngenta recommends the following tips for appropriate integrated weed management, including:

- *Start with clean fields* – Plant into weed-free fields and keep fields as weed-free as possible.
- *Utilize multiple herbicide modes of action (MOA)* – Use a herbicide program that encompasses multiple herbicide MOA with overlapping efficacy on the toughest-to-control or most problematic weed species in your field in rotation, sequence, or mixture.
- *Apply herbicides properly* – Apply post-emergence herbicides at the proper weed size or stage using the labelled rate with the recommended adjuvants to control the toughest or most problematic weed species in the field. Glufosinate-ammonium and glyphosate tolerance are the two most commonly used herbicide resistant traits. With these herbicides, it is important to remember that they need to be incorporated into a well-rounded herbicide resistance management plan in order to maintain trait and chemical usefulness for years to come.
- *Use good agronomic practices* – Practicing good agronomy can facilitate weed management by increasing crop competitiveness with weeds. In corn, incorporating the use of seed-applied fungicides and insecticides, proper fertility, and proper plant and row spacing can all promote corn growth and early canopy closure.
- *Incorporate mechanical weed control* – Where appropriate, growers may wish to incorporate tillage and row cultivation into their cropping practices in order to reduce weed emergence.
- *Scout fields for weeds* – Scouting fields routinely before and after herbicide applications is essential for proper weed management and identification of any problematic weeds or escapes (i.e. those weeds expected to be controlled), and helps ensure that weed control is achieved. Be sure to report any suspected weed resistance to your Syngenta Representative immediately. They will facilitate investigation as to resistance and work with you to develop a plan for your field(s).
- *Reduce weed seed bank* – Weeds should not be allowed to survive and reproduce in growers' fields. Escapes should be eliminated with cultivation, hand removal, or spot application of a herbicide with a different MOA, before they can reproduce or set seed.

Always use pesticide products in accordance with labelled use directions.



ROTATE YOUR CROPS

Where possible, rotate the crops grown in your field year-on-year. Crop rotation can be an important tool to introduce diversity into an integrated weed management program. Crops differ in their competitiveness with weeds and have different planting dates and cultural practices, which add diversity in the system. Crop rotation can also allow herbicide diversity on a given field.

FURTHER WEED RESISTANCE MANAGEMENT RESOURCES

Several sources of information are available to growers to support and guide the use of appropriate crop management practices and the relevant herbicide products:

- *Herbicide product labels* – Herbicide product labels are the formal and legal method of communicating the registered use directions for use on the herbicide tolerant corn products. In addition to directions for proper product use, the labels include specific recommendations for integrated weed management and herbicide-resistant weed management. For more information on Syngenta herbicides, and to view product labels, visit www.syngenta.ca.
- Further product stewardship and weed management information can also be found at the following:
 - Syngenta Customer Interaction Centre – 1-87-SYNGENTA (1-877-964-3682)
 - www.manageresistancenow.ca



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