



**2019**  
**PRODUCT**  
**USE GUIDE**

# Introduction

This 2019 Product Use Guide provides technical information about the insect control and herbicide tolerant products and sets forth requirements and guidelines for the use of these products. Please read all of the information pertaining to the technology you will be using, including stewardship and related information.

This technical guide is not a pesticide product label. It is intended to provide additional information and to highlight approved uses from certain product labels. Read and follow all precautions and label instructions on any agricultural or pesticide products that you are using.

## Table of Contents

Stewardship Overview	3
Coexistence	4
Steps for Stewardship of Treated Seed	5
Seed Treatment Stewardship	6
Weed Management	7
Corn Rootworm Best Management Practices	8
Corn Rootworm Management	10
Integrated Pest Management	11
Stewardship Through Insect Resistance Management	12
Insect Resistance Management (IRM) for Bt Corn	12
Structured Refuge Requirements	13
Calculating Structured Refuge	15
Integrated Refuge Corn Products	16
Structured Refuge Corn Products	17
Corn Traits and Technologies	18
Optimum® AcreMax® Insect Protection	19
Optimum® AcreMax® Leptra® Insect Protection	20
Optimum® AcreMax® TRlsect® Insect Protection	21
Optimum® AcreMax® Xtra Insect Protection	22
Optimum® AcreMax® XTreme Insect Protection	23
Optimum® AcreMax® 1 Insect Protection	24
Orome®* Insect Protection	25
Herculex® 1 (HX1) Insect Protection	26
Herculex® XTRA (HXX) Insect Protection	27
Optimum® TRlsect® Insect Protection	29
Optimum® Intrasect® Insect Protection	31
Optimum® Leptra® Insect Protection	32
Optimum® Intrasect® XTreme Insect Protection	33
Optimum® Intrasect® Xtra Insect Protection	34
Optimum® Intrasect® TRlsect® Insect Protection	36

# Stewardship Overview

## A Message about Stewardship

We are committed to the responsible management of all our seed products. By accepting delivery of any product, You agree you are contractually obligated to comply with all laws, regulations, and stewardship requirements described in the Product Use Guide and any product-specific Stewardship Requirements, as each may be amended from time to time, which are incorporated into and are a part of these Terms and Conditions. In addition to all other applicable use restrictions, You agree that all crops and materials containing biotech traits (e.g., grain) may only be (a) exported, transferred or moved to or (b) used, processed, or transferred in jurisdictions where all necessary regulatory authorizations have been granted for those crops and materials for such activities. It may be unlawful to export, transfer, or move materials containing biotech traits across borders into jurisdictions where their import and use is not authorized. Products authorized in the United States may or may not be authorized in all global markets; therefore, the combination of these traits and the grain and certain byproducts (including oil, dried distillers grains, cobs, and husks) from these products may not be authorized in some markets. You are required to discuss trait acceptance and grain purchasing policy with your purchaser or grain handler prior to the delivery and sale of your crop products (e.g., grain or other plant material containing biotech traits) and You should only deliver grain to a purchaser or grain handler that agrees grain and by-products will only be marketed in markets where such products are authorized for the specific use. For more detailed information on the status of a trait or stack, please visit [www.biotradestatus.com](http://www.biotradestatus.com). You further acknowledge and agree that any forward-looking statements related to regulatory approval timelines by their nature address matters that are, to different degrees, uncertain. These forward-looking statements of anticipated regulatory authorization timelines are not guarantees of government agency action and are based on certain assumptions and expectations of future events that may not be realized.

Growers that plant seed with biotech traits agree to the Seed and Technology Use Agreement (TUA) and Terms and Conditions of Purchase to adhere to the stewardship requirements described in this guide, including, without limitation:

- Following directions of use on all seed, pesticide, or other product labels.
- Implementing Insect Resistance Management (IRM) practices, before and after planting, for specific biotech traits as required and the U.S. Environmental Protection Agency (EPA).
- For crops or material containing biotech traits, confirming trait acceptance and intended uses and destinations with grain handlers prior to delivery, or using those products on-farm.
- Not sending seed or other material containing biotech traits into countries where the product is not allowed, including through a third party.
- Following any additional stewardship requirements deemed necessary for a particular product (*e.g., grain or feed use restrictions and geographical planting restrictions*).

Growers are responsible for following the applicable stewardship guidelines and weed resistance management guidelines as set forth in this guide.

## Why is Stewardship Important?

Proper stewardship of products is important because it offers benefits to growers, including:

- Signing the TUA permits access to germplasm and the biotech trait technologies in its seed products.
- Following IRM requirements limits development of insect resistance to incorporated plant protection technologies, and helps to maintain the long-term durability of these technologies.
- Using seed products solely for producing a single commercial crop encourages the development of better, higher-yielding germplasm and additional technologies and innovations, further improving agricultural productivity.

## Our Commitment to Excellence Through Stewardship® [www.excellencethroughstewardship.org](http://www.excellencethroughstewardship.org)

Pioneer is a member of Excellence Through Stewardship® (ETS). Products are commercialized in accordance with ETS Product Launch Stewardship Guidance and in compliance with the Pioneer policies regarding stewardship of those products. Crops and materials containing biotech traits may only be exported to or used, processed, or sold in jurisdictions where all necessary regulatory approvals have been granted for those crops and materials. It is a violation of national and international laws to move materials containing biotech traits across borders into jurisdictions where their import is not permitted. Growers should discuss these issues with their purchaser or grain handler to confirm the purchaser or handler's position on products being purchased. For further information on the approval status of biotech traits, please visit [www.biotradestatus.com](http://www.biotradestatus.com).

Excellence Through Stewardship® is a registered trademark of Excellence Through Stewardship.

# Coexistence

For decades, multiple agricultural systems have successfully coexisted in the United States and around the world, from initial production through supply chains to the ultimate end users. Over time, management practices to facilitate these different agricultural systems have developed and have been continuously improved so that high purity and high quality seed and grain is available to help growers, handlers, and end-users maximize opportunities and take full advantage of the wide variety of technologies available to each. One example of successful coexistence is the production of similar commodities in close proximity, such as field corn, sweet corn, white corn, and popcorn. Coexistence strategies should be designed to meet market requirements using science-based industry standards and management practices, and should be flexible to facilitate diverse options and choice for growers and the food and feed supply chain. This flexibility also should include the ability of coexistence strategies to be modified as changes in products, markets, or practices take place. The on-going success of coexistence has depended upon cooperation, communication, flexibility, and mutual respect for each cropping system among the entire value chain. Over the years, growers have adapted to changes and innovation in agriculture by using new farm management practices, new technologies, and other appropriate practices and can continue to do so into the future.

It is therefore incumbent on all growers to consider and implement management practices to satisfy the relevant marketing and stewardship practices required by the desired end market. By choosing to grow any crop, growers are inherently agreeing to use practices appropriate to ensure the integrity and marketability of those crops for the intended market and that suitable management and stewardship practices are being implemented, considering each neighbors' farm management. This is true regardless of the particular market being served, whether it is specialty crops, identity-preserved crops, organically-produced crops, conventionally produced crops or crops with biotech traits.

For products receiving premiums, the grower is producing a crop supported by a special market price, and therefore assumes responsibility for meeting any applicable market specifications to receive the applicable premium price from that market. Likewise, for products containing biotech traits that may not yet be approved in certain export markets or have special considerations related to production practices (e.g., herbicide application, specialty characteristics), the grower assumes responsibility for the stewardship

conditions and implementation related to use of such technologies. Even though the ultimate responsibility is on the grower producing a crop for a particular market to implement appropriate stewardship practices and requirements, including those communicated by a seed provider, it is also each grower's responsibility to communicate with and be aware of the planting intentions of his or her neighbors to gauge the need for any appropriate management and coexistence practices. By communicating what is being grown on neighboring fields and the potential implications of those crops on each growers' management decisions, growers can utilize some of the following coexistence considerations to limit potential conflicts, while acknowledging the generally recognized and accepted occurrence of the movement of incidental amounts of pollen:

- What is the crop biology and what are the product characteristics, specifically considering whether or not the crop is self-pollinating or cross-pollinating;
- What options exist to arrange or select planting locations and fields to help minimize the potential for outcrossing to or from a particular crop, by considering , for example, appropriateness of buffer rows, environmental windbreaks, or land devoted to conservation;
- What options exist related to staggering planting times to help temporally isolate a given crop from the potential of unintended outcrossing;
- What are cleaning and handling options for a particular crop that could help to minimize the potential for inadvertent comingling during planting, harvesting or cleaning activities, considering the use of planters, combines, seed storage bins, seed hopper/boxes, transportation vehicles, and other equipment pre- and post-harvest; and
- Understanding characteristics of applied technologies or pest management tools and the potential impact to different types of crops planted in the vicinity.

In today's agricultural marketplace, growers share common goals of increasing productivity and profitability, and through planning and proactive management measures, coexistence can help all growers meet their productivity goals and stewardship responsibilities while respecting their neighboring farming operations.

# Steps for Stewardship of Treated Seed



## Follow Directions

Follow directions on treated seed container labeling for handling, storage, planting and disposal practices.



## Eliminate Weeds

Eliminate flowering plants and weeds in and around the field prior to planting.



## Clean and Remove

Completely remove all treated seed left in containers and equipment used to handle harvested grain, and dispose of it properly. Keep all treated seed out of the commodity grain channels.



## Minimize Dust

Use advanced seed flow lubricants that minimize dust.



## BeeAware

At planting, be aware of honey bees and hives located near the field, and communicate with beekeepers when possible.

For detailed information about stewardship of treated seed, check out [www.seed-treatment-guide.com](http://www.seed-treatment-guide.com)



# Seed Treatment Stewardship

Seed treatments, including fungicides, insecticides, nematicides, and amendments, play a critical role in agriculture and the production of a healthy crop. In addition to helping manage against early season pests and diseases, they serve as a viable alternative to foliar and soil applications.

Seed treatment management and responsible stewardship play a vital role in sustaining our environment while maximizing crop health. Responsible stewardship practices help maintain seed and seed treatment integrity, which keeps the active ingredient on the seed to achieve the maximum crop health benefit for the investment. In addition, these practices help minimize the potential for adverse effects on producers and the environment, including pollinators, which may be present at the time of planting.

## Handling

- Always read and follow the label directions and recommendations for proper handling and use of treated seed and seed treatments.
- Use personal protection equipment as recommended on the product label or seed tag.
- Follow all safety precautions as indicated on the label/seed tag.
- Transport and transfer treated seeds safely and in a manner that eliminates the risk of spill and dust.

For more information on pollinator health visit:  
<http://honeybeehealthcoalition.org>

## Planting

- Always follow planter manufacturer recommendations and avoid excess use of talc and graphite.
- Be aware of the environment in and around your field, taking note of nearby bee hives and flowering plants and weeds, which could be attractive to pollinators.
- Limit dust movement from seed packages containing seed treatment. For example, consider factors such as wind speed and direction, and avoid shaking the bottom of the treated seed bag when filling planting equipment.
- Do not transfer treated seed next to active bee hives, at field margins, and adjacent to flowering plants and vegetation.
- For pneumatic planters, direct the exhaust toward the soil surface.
- Ensure all seeds are planted/incorporated into the soil at proper planting depth.
- Follow labeling requirements for disposal/use of unused seed.

## Disposal and Cleanup

- Properly dispose of seed packaging/containers in accordance with state and local regulations and container return policy.
- Clean planting equipment in a manner that minimizes dust.
- Avoid cleaning planting equipment next to active bee hives, at field margins and adjacent to flowering plants and vegetation.

Additional best management practices can be found:  
<http://seed-treatment-guide.com/>

# Weed Management

Growers have widely embraced herbicide tolerance technology because it provides convenient, effective, and economical weed control in crops. However, intensive long term use of any single herbicide mode of action can lead to the development of weeds resistant to that mode of action. Integrated management practices can minimize this risk, while at the same time providing growers with a more consistent and effective weed control program.

## Herbicide Groups

The Weed Science Society of America categorizes herbicides into different groups based on their mode of action. If a given weed population has plants resistant to a herbicide in one group, that weed population may not be able to be effectively managed using only other herbicides in that group. However, that weed population may be able to be managed with a different herbicide from a different herbicide group, whether alone or in combination with a herbicide from that same group, or by using other weed management practices, such as mechanical practices. Note that herbicide classification may not, in all circumstances, address weeds resistant to particular herbicides. Consult your local sales professional, state cooperative extension service, professional consultants, or other qualified individuals to discuss appropriate actions to address specific weeds that appear to show resistance to a particular herbicide.

## Weed Management Techniques and Guidelines

Using varied weed control methods is recommended to help slow the development of resistant weed populations. Such varied weed control methods may include using multiple herbicides that act on weeds through different modes of action with similar spectrum, use of tillage or other mechanical methods, and other practices. Use of tillage must be balanced against possible soil and water conservation issues that aggressive tillage may cause. When using herbicides, studies have shown that using the herbicide in compliance with label directions and at labeled rates is important to slow the development of resistant weeds. Also, scouting for surviving weeds after herbicide application can help identify resistant weeds and provide valuable information on how to manage resistance by using different weed management methods. If resistant weeds are identified, one of the most effective ways to inhibit the development of resistant populations or spread of resistance is to use methods that prevent weeds from reproducing by seed or through vegetative propagation. It is also important to clean equipment between sites, as this slows the spread of weed seed between fields.

When using herbicide tolerant crops it is important to start with a clean field, either by using tillage or a burndown herbicide application. In general:

- Begin the season with a clean, weed-free field.
- Use multiple weed control techniques, such as multiple herbicides with different modes of action, tillage, or other mechanical weed control techniques, considering soil and water conservation issues.
- Use herbicides at their proper rates at the appropriate times and following all label directions.
- If surviving weeds are found, control those weeds before they can set seed or otherwise reproduce.

## Glyphosate-Resistant Weeds

Growers should be aware of and proactively manage possible glyphosate-resistant weeds in any weed control program. If a weed is known to have resistance to glyphosate, a resistant population of that weed will not be controlled by labeled rates and timings of glyphosate. Glyphosate herbicides may not be warranted to cover failure to control glyphosate-resistant weed populations; other weed management practices should be employed to control a population of glyphosate-resistant weeds. For current weed control recommendations for particular glyphosate-resistant weeds, contact your sales professional.

Repeated failure of a specific herbicide to control a particular weed should be reported to your sales professional, as well as the herbicide manufacturer, local retailer, or county extension agent. Approved labels, including supplemental labeling, for herbicides must be in possession of the user at the time of pesticide application and can be obtained by contacting your state's pesticide lead agency.

We support the Take Action effort. Take Action is an industry-wide partnership between university weed scientists, major herbicide providers and organizations representing corn, cotton, sorghum, soybean and wheat growers to help them manage herbicide-resistant weeds. The Take Action effort encourages you to develop a proactive strategy to manage herbicide-resistant weeds that incorporates a diverse set of controls. To find out more about how you can take action, visit [www.iwilltakeaction.com](http://www.iwilltakeaction.com), or contact your local extension office.

## Glyphosate Endangered Species Initiative Requirement

Before applying any glyphosate-based herbicide (unless the only application will be ground application at a rate of less than 3.5 lbs of glyphosate a.e./A), growers must visit the website [www.pre-serve.org](http://www.pre-serve.org) to determine whether any mitigation requirements apply to application of glyphosate as it relates to endangered species. If you are unable to access the website, call 1-800-332-3111 for assistance. Growers must follow any applicable mitigation requirements, which are appropriate for all applications of glyphosate-based herbicides to all crop lands.

# CORN ROOTWORM BEST MANAGEMENT PRACTICES

To effectively manage corn rootworm (CRW), implement a multi-year plan that includes a variety of tactics.

## CROP ROTATION



## PRODUCTS WITH MULTIPLE CRW B.T. TRAITS



## SEED, SOIL OR FOLIAR-APPLIED INSECTICIDES



## ASSESS RISK

- Did you plant the same CRW traits for consecutive years in the same fields?
- Did you notice large populations of CRW beetles?
- Did you observe root injury from CRW larvae?
- Are your fields planted to continuous corn?



# CORN ROOTWORM BEST MANAGEMENT PRACTICES

## Plant the Required Refuge



## Rotate Crops



Rotate at least every 3rd year if any of the following:

- In long-term continuous corn system
- CRW populations are high
- Experiencing problems with CRW trait performance

In areas where rotational-resistant CRW variants exist, such as extended diapause eggs or soybean, CRW management options may be needed the following year

## Rotate Traits



- Use *B.t.* hybrids with multiple modes of action for CRW control whenever possible
- If using a hybrid with multiple modes of action for CRW control is not an option, rotate to a different *B.t.*-traited hybrid that controls CRW
- Use a non-*B.t.*-traited hybrid with insecticide

## Manage CRW with Insecticides



### ADULT CRW MANAGEMENT CONSIDERATIONS

- Scout fields for CRW adults during silking stage (typically July and August) as adult CRW beetles feed on corn silks and may reduce yield
- Foliar sprays may be an option if CRW beetle populations reach an economic threshold for damage ( $\approx 1$  beetle per plant)<sup>1</sup>
- Follow university extension service or local crop consultant recommendations for products, rates, and proper timing of adult spray applications for reducing CRW beetle populations
- Multiple sprays may be necessary

### LARVAL CRW MANAGEMENT CONSIDERATIONS

- The application of an insecticide to the soil surface, in furrows, and/or incorporated into the soil (referred to as "soil applied insecticide," "soil insecticide" or "SAI") is not recommended for control of CRW in *B.t.*-traited corn hybrids(s) except under limited circumstances.
- Consult with extension, crop consultants or other local experts for recommendations when considering a combination of CRW traits and soil applied insecticides.
- SAIs should not be necessary for CRW control with pyramided CRW traited *B.t.* corn hybrid(s).

# Corn Rootworm Management

## The Problem

Corn rootworms have been a primary pest for corn growers for decades, causing an estimated 1 billion dollars in yield and control costs annually<sup>1</sup>. Heavy reliance on individual control tactics, such as insecticides (soil-applied and adult sprays) have led to the development of resistant populations<sup>2</sup>. Rootworms also have developed resistance to cultural practices. Crop rotation has even been rendered occasionally ineffective in some areas due to behavioral changes like egg-laying in soybean (western corn rootworm) and delayed egg hatch in corn (extended diapause in northern corn rootworm)<sup>3</sup>. Rootworms have repeatedly demonstrated a remarkable ability to adapt to management tactics. The development of Bt corn for corn rootworm added another valuable tool for controlling these pests<sup>4</sup>, but like any control tactic, repeated use of the same technology over time may lead to resistance<sup>5</sup>.

## Identifying Rootworm Resistance in Bt Corn

Rootworm resistance to some Bt corn products has been documented<sup>6,7</sup>. Unfortunately, it can be difficult to recognize resistance in the early stages of development. High levels of root injury or lodging on Bt-protected products is often only the first clue; plant injury alone is not definitive proof of resistance. Research data suggests that under very large rootworm populations, Bt-protected plants can sustain significant root feeding in the absence of resistance<sup>8</sup> due to the non-high dose nature and expression patterns of the Bt proteins in the root. Research data also suggests that over the course of repeated exposure to Bt corn (continued product use for several years), increased rootworm survivorship can occur resulting in root injury at smaller rootworm populations, even in the absence of complete resistance<sup>9</sup>. For this reason, it is imperative to use a multi-faceted rootworm management plan that interrupts continuous exposure of the rootworm population against the same tactic year over year, and ultimately slows down the rate at which resistance can evolve. The use of scouting, best management practices, and reporting any unexpected injury to your sales professional for follow-up are the keys to understanding if resistance is evolving in your fields.

## Develop a Rootworm Management Program for your Operation

Research suggests that continuous, uninterrupted use of the same corn rootworm Bt technology can lead to decreased corn rootworm susceptibility to that technology, and may result in reduced product efficacy against these insects. To help maintain the efficacy of Bt corn rootworm products, it is essential to develop a multi-faceted rootworm control management plan. Your sales professional or your local Extension professionals can assist you in developing best management practices for your farming operation. Please contact your sales professional or consult with your local University Extension for more information regarding insect resistance management guidelines, best management practices and to understand whether there has been insect resistance documented in your area. Please refer to the next page for corn rootworm best management practices.

The use of soil-applied insecticides (SAIs) with corn rootworm protected Bt corn is not recommended for control of corn rootworm except under limited circumstances and consultation with extension, crop consultant or other local experts. SAIs should not be necessary for corn rootworm control with pyramided corn rootworm trait Bt corn product(s).

# Integrated Pest Management

When a single control method is used continuously, there is a higher probability that pests will evolve to survive the control method, i.e. become resistant. Integrated Pest Management (IPM) is a science-based strategy and decision making process for controlling pests by using a combination of multiple pest control methods.

## Recommended Pest Control Tactics

Use agronomic management best practices with appropriate seed products to obtain the highest yield benefits. Use seed products, planting technology, and seedling rates that are appropriate for a given crop in a particular geographic area. To the extent possible, avoid crop stress through crop management.

- Use scouting techniques and treatment decisions to ensure maintenance of beneficial insects that provide control of harmful insect pests.
- Use appropriate maturity products and associated harvest schedules, and destroy any crop residue promptly after harvest to minimize evolutionary selection for resistance in late-season infestations.

- Minimize over-wintering pests through use of soil management practices that encourage destruction of those pests.
- Use crop rotation and multiple modes of action in pest control activities to delay the onset of resistance in pest populations. If crop rotation is not possible or practical, or if rotation is used but high pest populations are still observed, use of multiple modes of action (such as Optimum<sup>®</sup> AcreMax<sup>®</sup> XTreme insect protection) is highly recommended to reduce the likelihood of resistance development.

## Monitoring Pests

It is important to carefully monitor fields for all pests to determine whether treatment with a pest control method is needed. Scouting techniques and remedial pest control treatments should address the fact that larvae must hatch and feed before incorporated plant protection technologies have an effect on the pests. Scouting should be performed regularly, particularly after periods of heavy or sustained egg laying (especially during bloom), to determine whether larval survival is significant in a particular field.



<sup>1</sup>Tinsley, N. A., R. E. Estes, P. M. Schrader and M. E. Gray. 2014. Evaluating multiple approaches for managing western corn rootworm larvae with seed blends. J. Applied Entomol., doi: 10.1111/jen.12134.

<sup>2</sup>Meinke, L. J., B. D. Siegfried, R. J. Wright, and L. D. Chandler. 1998. Adult susceptibility of Nebraska western corn rootworm (Coleoptera: Chrysomelidae) populations to selected insecticides. J. Econ. Entomol. 91:594-600.

<sup>3</sup>Krysan J., D. Foster, T. Branson, K. Ostlie, and W. Cranshaw. 1986. Two years before the hatch: rootworms adapt to crop rotation. Bull. Entomol. Soc. Am. 32: 250-253.

<sup>4</sup>James C. 2012. Global status of commercialized biotech/GM crops: 2012. International Service for the Acquisition of Agri-biotech Applications Brief No. 44. ISAAA, Ithaca, NY.

<sup>5</sup>Tabashnik, B. E., D. Mota-Sanchez, M. E. Whalon, R. M. Hollingworth, and Y. Carrière. 2014. Defining terms for proactive management of resistance to Bt crops and pesticides. J Econ Entomol. 107: 496-507.

<sup>6</sup>Gassmann, A. J., J. L. Petzold-Maxwell, R. S. Keweshan, M. W. Dunbar. 2011. Field-evolved resistance to Bt maize by western corn rootworm. PLoS ONE 8, e22629.

<sup>7</sup>Gassmann A. J., J. L. Petzold-Maxwell, E. H. Clifton, M. W. Dunbar, A. M. Hoffmann, et al. 2014. Field-evolved resistance by western corn rootworm to multiple Bacillus thuringiensis toxins in transgenic maize. Proc. Natl. Acad. Sci. USA 111: 5141-5146.

<sup>8</sup>Gray, M. E., K. L. Steffey, R. E. Estes, and J. B. Schroeder. 2007. Responses of transgenic maize hybrids to variant western corn rootworm larval injury. J. Applied Entomol. 131: 386-390.

<sup>9</sup>Nowatzki, T. M., S. A. Lefko, R. R. Binning, S. D. Thompson, T. A. Spencer and B. D. Siegfried. 2008. Validation of a novel resistance monitoring technique for corn rootworm (Coleoptera: Chrysomelidae) and event DAS-59122-7 maize. J. Applied Entomology, doi: 10.1111/j.1439-0418.2008.01270.x.

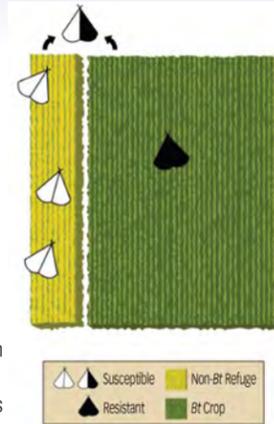
# Stewardship Through Insect Resistance Management

## Insect Resistance Management (IRM) for Bt Corn

Following an insect resistance management (IRM) program is an essential part of good stewardship. The aim of an IRM program is to reduce the probability of target insects developing increased tolerance to the insecticidal Bt proteins, thus maximizing the longevity and effectiveness of these valuable traits in an environmentally-conscious way. Sustainable preservation of this technology places individual responsibility on everyone in the seed distribution system, from the seed supplier to the grower planting the seed. Additionally, IRM is a legal obligation as requirements have been incorporated into the registrations granted by the EPA for all Bt corn products.



There are two types of refuge for products with the Bt trait: integrated and structured. Some Bt products have an integrated refuge with refuge seed blended in the bag, while other Bt products require a structured refuge. A structured refuge requires a grower to plant a portion of a field with another product that does not contain the insect-control traits of the Bt product. Grower-blended seed mixtures are not approved for use with any Bt hybrids to satisfy grower refuge requirements. Refuge requirements vary by product type and EPA-designated non-cotton and southern corn/cotton growing regions, as detailed on the following page. The southern corn/cotton growing regions are listed on the following page.



A decrease in susceptibility or field-evolved resistance of some insect populations to certain technology traits in corn has been observed in different geographies which may result in lower than expected efficacy. To help extend durability of this technology, We recommend you implement Integrated Pest Management (IPM) practices such as crop rotation, cultural and biological control tactics (including rotating sources of Bt-protected corn traits), pest scouting, and appropriate use of pest thresholds when employing management practices such as insecticide application. You must also plant the required refuge when using this technology. Please contact your sales professional or consult with your local University Extension for more information regarding insect resistance management guidelines, best management practices and to understand whether there has been a shift in susceptibility or insect resistance documented in your area.

### IRM Compliance Assurance Program (CAP)

We require all growers purchasing hybrids with a Bt trait sign a *Technology Use Agreement*. By signing, the grower agrees to implement an IRM program—including planting a corn refuge and following EPA-mandated use requirements—as outlined in the PUG. Failure to follow these IRM requirements can result in the grower losing access to structured refuge products.

The EPA requires Bt corn seed providers to conduct on-farm visits as part of a comprehensive Compliance Assurance Program (CAP) to assess whether growers are following the IRM requirements. These on-farm assessments are conducted by an independent third party and directed toward areas at high risk of insect resistance based on pest pressure, Bt corn market penetration, or insufficient refuge seed purchase.

The CAP also outlines consistent standards developed by the EPA and Bt corn registrants for responding to growers who have not followed the IRM requirements to bring them into full compliance. These responses include:

- Notifying the grower by letter of IRM compliance deviations.
- Conducting a compliance assistance visit with the grower prior to planting to assist the grower in planning and implementing a proper IRM program.
- Conducting a compliance assessment visit with the grower the following growing season to assess IRM compliance.
- Providing the grower additional IRM educational materials.
- A grower found with a second incident of non compliance with refuge requirements within a five-year period will be denied access the next year to the registrant's structured refuge Bt corn products.

This Product Use Guide (PUG) contains important information on how to implement a proper IRM plan. If you have questions after reviewing this document, or if you wish to register a tip or complaint about a grower who may not be following the IRM refuge requirements, please contact your sales professional.

### IRM Requirements

IRM programs address: (1) the amount of refuge, (2) the required proximity of hybrids with the Bt traits to the refuge, (3) the use of insecticides in the refuge, and (4) the design and management of the refuge.

### What is a Refuge?

A refuge is a block or strip of corn that does not contain a Bt trait for controlling corn pests. The purpose of this refuge is to maintain a population of corn pests that is susceptible to Bt proteins. Potentially-resistant insects emerging from Bt fields can mate with susceptible insects from the refuge resulting in Bt-susceptible offspring.

## Southern Corn/Cotton Growing Regions

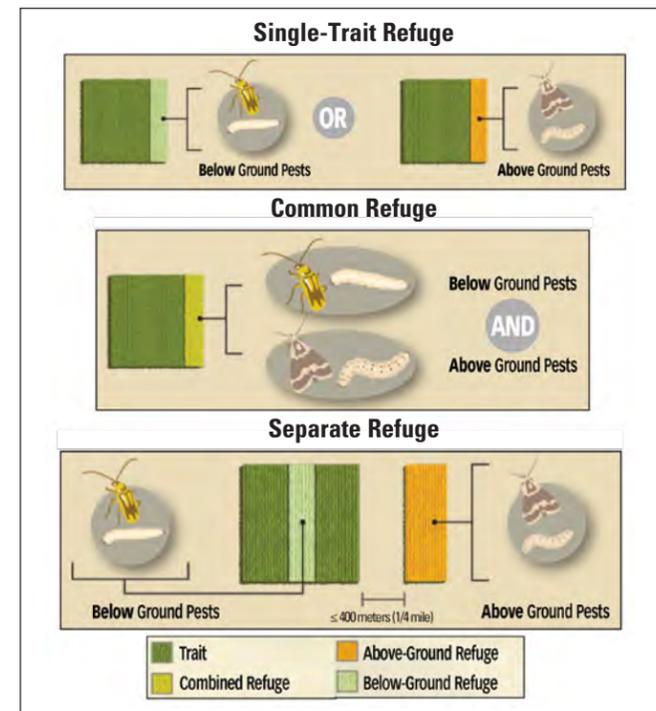
<b>ALABAMA</b> All Counties	<b>MISSISSIPPI</b> All Counties	<b>OKLAHOMA</b> Counties of: Beckham Caddo Comanche Custer Greer Harmon Jackson Kay Kiowa Tillman Washita	<b>SOUTH CAROLINA</b> All Counties	Hardin Haywood Lake Lauderdale Lincoln Madison Obion Rutherford Shelby Tipton	<b>TEXAS</b> All Counties Except: Carson Dallam Hansford Hartley Hutchinson Lipscomb Moore Ochiltree Roberts Sherman	<b>VIRGINIA</b> Counties of: Dinwiddie Franklin City Greensville Isle of Wight Northampton Southampton Suffolk City Surry Sussex
<b>ARKANSAS</b> All Counties	<b>MISSOURI</b> Counties of: Dunklin New Madrid Pemiscot Scott Stoddard	<b>NORTH CAROLINA</b> All Counties	<b>TENNESSEE</b> Counties of: Carrroll Chesters Crockett Dyer Fayette Franklin Gibson Hardeman			
<b>FLORIDA</b> All Counties						
<b>GEORGIA</b> All Counties						
<b>LOUISIANA</b> All Counties						

## Structured Refuge Requirements

In **non-cotton** growing areas, the structured refuge requirements are 5% or 20% of corn acres planted for corn borer-protected products and 20% for corn rootworm-protected products. In **cotton** growing areas, the structured refuge requirements are 20% or 50% of corn acres planted for corn borer-protected products and 20% for corn rootworm-protected products.

## Structured Refuge Planting Options for Above-Ground, Below-Ground, and Above+Below-Ground Products

A **single-trait refuge** is one that can be used for corn rootworms or corn borers, but not both. A **common refuge** is a single field that serves as a refuge for both corn borers and corn rootworms simultaneously. A **separate refuge** is a refuge designed exclusively for corn borers or exclusively for corn rootworms—i.e., a stacked Bt product can require two separate refuges.



## Select Similar Hybrid for Structured Refuge

One key to establishing an effective refuge is selecting an appropriate hybrid—one that is agronomically similar to the Bt hybrid. This helps ensure that the refuge hybrid has the same likelihood of attracting adult insects as the Bt field. The refuge hybrid should match the Bt hybrid in maturity, early vigor and plant height.

## Refuge Management

Management practices in the refuge acres and Bt corn acres must be as similar as possible to promote parallel hybrid development.

- To be effective, the refuge must be the correct size and distance from the Bt field, and be planted with a similar hybrid under similar management practices.
- Plant the refuge at the same time as the Bt hybrid.
- Fertility programs, including starter and sidedress, should be similar.
- Use the same tillage system in the Bt field and the refuge. Different tillage operations may result in dissimilar residue levels on the soil surface. Soil temperature differences could then lead to dramatic early development differences between the Bt field and the refuge.
- Reducing inputs on the refuge or planting it on marginal land also decreases the effectiveness of the refuge.
- If the refuge is planted on rotated ground, the trait corn must also be planted on rotated ground. If the refuge is planted on continuous corn ground, the trait corn may be planted on either continuous corn ground or rotated ground. It is also recommended that growers planting continuous corn plant the refuge in the same location each year.
- Practice Integrated Pest Management (IPM) to preserve the natural enemies of corn borer, corn rootworm and other insect pests. Natural predators such as ground beetles and ants can help reduce corn rootworm larvae populations. Bt corn insect protection aids IPM because it affects only target insects and allows beneficial insects to thrive.
- Popcorn can be used as a refuge option, but sweet corn and/or silage corn cannot.

## Field Monitoring

Monitoring Bt fields for insect resistance development is an integral part of an IRM plan. If resistant populations are detected early, alternative control measures can be quickly implemented to reduce the population and halt the spread of resistance. Because of its importance in maintaining the effectiveness of Bt technology, the EPA mandates activity monitoring as a condition of registration of Bt products. We require customers to monitor Bt fields for unexpected levels of insect damage and report any high level of suspected insect damage to a representative for further investigation. Acres planted with Bt hybrids should be correctly marked at planting to prevent confusion when monitoring.

## Structured Refuge Configuration

Because Bt corn growers use different management practices, considerable flexibility is allowed in laying out the refuge. Several of these refuge patterns are described below.

Surveys indicate that most farmers plant the refuge within the Bt field. This closer proximity increases refuge effectiveness and maximizes Bt acreage in the field.

### Refuge Within the Bt Field:

- Block
- Perimeter or Border
- 4-row Strips Required

### Separate-Field Refuge Distance Requirements:

- Appropriate refuges must be planted on every farm with a field that contains Bt corn—i.e., you cannot use a neighbor's field to satisfy the refuge requirements.
- For corn borer-Bt products, refuge must be planted within 1/2 mile of each Bt corn field.
- For corn rootworm-Bt products, refuge must be planted adjacent to Bt hybrids; it can be separated by a ditch or a road but not by another field.

# Calculating Structured Refuge



Refer to this diagram for the examples below.

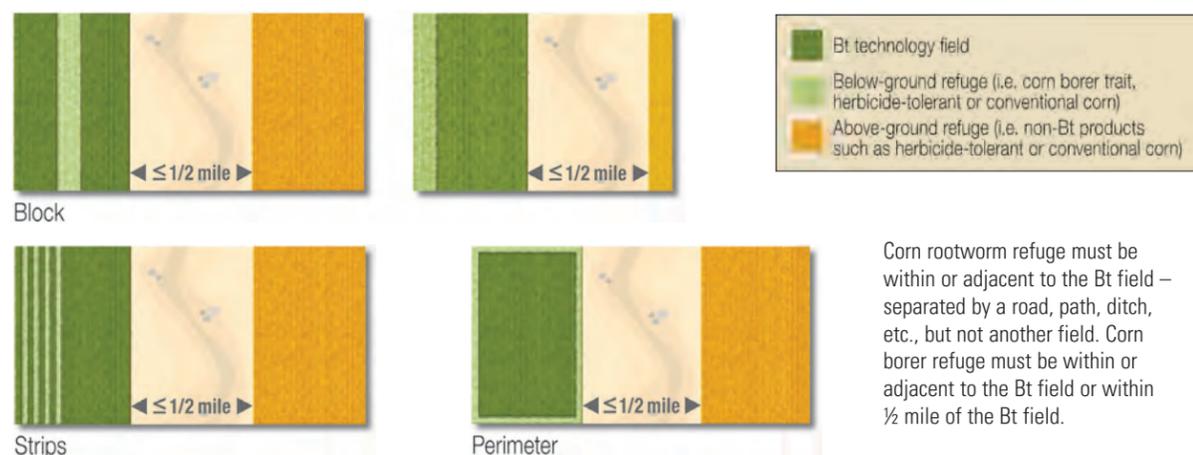
- A** Total Corn Acres<sup>†</sup>
- B** Refuge Acres
- C** Bt Acres
- %** Percent of Required Refuge— 5% 20% or 50%  
Based on total corn acres

<sup>†</sup>Includes all corn acres that are infield or adjacent to each other and will be allocated to the Bt product and its associated refuge.

## Single-Trait (Corn Borer or Corn Rootworm) and Common Refuge Configurations



## Separate Refuge Configurations



## THE CORRECT WAY TO CALCULATE

Example shown is for a 20% refuge product.

**START** with the **TOTAL** number of corn acres you want to plant in an area.

Multiply by the **PERCENT** of refuge required for the Bt trait.

This is your minimum **REFUGE ACRES.**

Example **A** 200 × **%** 20% = **B** 40 ✓

Your Field \_\_\_\_\_ × \_\_\_\_\_ = \_\_\_\_\_

Next, subtract your refuge acres from your total corn acres.

This is your maximum **Bt ACRES.**

Example **A** 200 – **B** 40 = **C** 160

Your Field \_\_\_\_\_ – \_\_\_\_\_ = \_\_\_\_\_

Insect Resistance Management  
**REFUGE CALCULATOR**

Brought to you by  
NATIONAL CORN GROWERS ASSOCIATION

6 EASY STEPS  
GET STARTED HERE

This refuge calculator is a tool intended to illustrate refuge calculations discussed more fully in the applicable manufacturer's Insect Resistance Management Grower Guide (IRM Grower Guide) for planting certain corn products in the United States. This refuge calculator does not replace or supplement the applicable IRM Grower Guide in any way — growers must read the applicable IRM Grower Guide prior to planting for information on planting and Insect Resistance Management.

Powered by  
AG Integrated

Download your free Insect Resistance Management (IRM) corn refuge calculator at [www.irmcalculator.com](http://www.irmcalculator.com).

# Integrated Refuge Corn Products

Integrated refuge products will be treated  for the major component and  for the minor component. Bt genes for corn borer and/or corn rootworm protection help corn growers produce higher yields with better quality grain in an environmentally-conscious way. We offer many structured and integrated refuge products. This page contains integrated refuge products marketed under the following definitions:

### Definitions:

- AM** – Optimum® AcreMax® product
- AMT** – Optimum® AcreMax® TRIsect® product
- AMX** – Optimum® AcreMax® Xtra product
- AMXT** – Optimum® AcreMax® XTreme product
- AML** – Optimum® AcreMax® Leptra product
- HX1** – Herculex® I insect trait
- HXRW** – Herculex® RW insect trait
- HXX** – Herculex® XTRA insect trait
- LL** – LibertyLink® (glufosinate) herbicide resistance
- RR2** – Roundup Ready® Corn 2 (glyphosate) herbicide resistance
- RW** – Agrisure® RW trait
- YGCB** – YieldGard® Corn Borer insect trait

PRODUCT NAME	INSECT PROTECTION	INTEGRATED COMPONENTS
<b>REFUGE REQUIREMENT: 20% CORN BORER REFUGE IN COTTON REGION</b>		
		<b>INTEGRATED</b> ● 95% (YGCB, HX1, LL, RR2) ● 5% (LL, RR2)
		<b>INTEGRATED</b> ● 95% (AVBL, YGCB, HX1, LL, RR2) ● 5% (LL, RR2)
		<b>INTEGRATED</b> ● 90% (RW, YGCB, HX1, LL, RR2) ● 10% (LL, RR2)
		<b>INTEGRATED</b> ● 90% (YGCB, HXX, LL, RR2) ● 10% (LL, RR2)
		<b>INTEGRATED</b> ● 95% (RW, YGCB, HXX, LL, RR2) ● 5% (LL, RR2)
		<b>INTEGRATED</b> ● 95% (RW, YGCB, HXX, LL, RR2) ● 5% (LL, RR2)
<b>REFUGE REQUIREMENT: NO ADDITIONAL ROOTWORM REFUGE REQUIRED</b>		
		<b>INTEGRATED</b> ● 90% (HXRW, LL, RR2) ● 10% (LL, RR2)

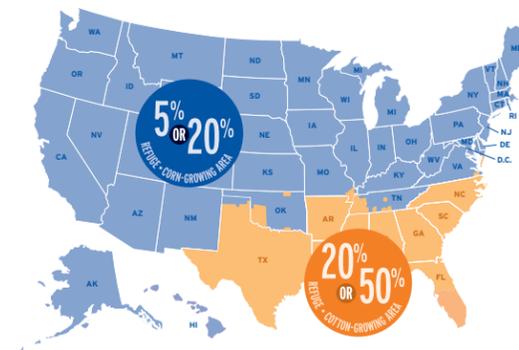
Not all products are available in all areas.

# Structured Refuge Corn Products

Bt genes for corn borer and/or corn rootworm protection help corn growers produce higher yields with better quality grain in an environmentally-conscious way. We offer many structured and integrated refuge options. This page contains the structured refuge products marketed under the following definitions:

### Definitions:

- AM1** – Optimum® AcreMax® 1 product
- CHR** – Optimum® TRIsect® product
- CYHR** – Optimum® Intrasect® TRIsect® product
- CYXR** – Optimum® Intrasect® XTreme product
- HX1** – Herculex® I insect trait
- HXX** – Herculex® XTRA insect trait
- LL** – LibertyLink® (glufosinate) herbicide resistance
- RR2** – Roundup Ready® Corn 2 (glyphosate) herbicide resistance
- RW** – Agrisure® RW trait
- YGCB** – YieldGard® Corn Borer insect trait
- YHR** – Optimum® Intrasect® product
- VYHR** – Optimum® Leptra® product



PRODUCT NAME	INSECT PROTECTION	COMPONENTS
<b>REFUGE REQUIREMENT: 20% CORN BORER REFUGE IN CORN BELT, 50% IN COTTON REGION</b>		
		<b>STRUCTURED</b> ● 90% (HXX, LL, RR2) ● 10% (HX1, LL, RR2)
		<b>STRUCTURED</b> ● 100% (HX1, LL, RR2)
		<b>STRUCTURED</b> ● 100% (HXX, LL, RR2)
		<b>STRUCTURED</b> ● 100% (RW, HX1, LL, RR2)
<b>REFUGE REQUIREMENT: 5% REFUGE REQUIRED IN CORN BELT, 20% IN COTTON REGION</b>		
		<b>STRUCTURED</b> ● 100% (YGCB, HX1, LL, RR2)
		<b>STRUCTURED</b> ● 100% (AVBL, YGCB, HX1, LL, RR2)
		<b>STRUCTURED</b> ● 100% (RW, YGCB, HXX, LL, RR2)
<b>REFUGE REQUIREMENT: 20% REFUGE REQUIRED IN CORN BELT AND COTTON REGION</b>		
		<b>STRUCTURED</b> ● 100% (YGCB, HXX, LL, RR2)
		<b>STRUCTURED</b> ● 100% (RW, YGCB, HX1, LL, RR2)

Not all products are available in all areas.

# Corn Traits and Technologies (as of May 2019)

Efficacy levels based on Pioneer and/or independent university entomologist results against susceptible insect populations. Product responses can vary by location, pest population, environmental conditions, and agricultural practices.

# Various factors, including pest pressure, reduced susceptibility, and insect resistance in some pest populations may affect efficacy of certain corn technology products in some regions. To help extend durability of these technologies, we recommend you implement Integrated Pest Management (IPM) practices such as crop rotation, cultural and biological control tactics (including rotating sources of Bt-protected corn traits), pest scouting, and appropriate use of pest thresholds when employing management practices such as insecticide application. You must also plant the required refuge when using these technologies. Please contact your sales professional or consult with your local university extension for more information regarding insect resistance management guidelines, best management practices and to understand whether there has been a shift in susceptibility or insect resistance with certain pests documented in your area.

\* Western bean cutworm has been removed from the Pioneer product use statement for several corn products that contain Herculex® I (Cry1F) but lack another mode of action for western bean cutworm due to a wide-spread decrease in susceptibility indicating the possibility of field-evolved resistance to Cry1F in most geographies.

Technology Segment Identifiers	Corn Technology Traits	Insect Efficacy Levels												
		European Corn Borer#	Corn Earworm#	Western Bean Cutworm*	Fall Armyworm#	Black Cutworm	Southwestern Corn Borer #	Lesser Cornstalk Borer	Sugarcane Borer	Southern Cornstalk Borer	Stalk Borer (Common)	Western Corn Rootworm#	Northern Corn Rootworm	Mexican Corn Rootworm
RR2	Roundup Ready® Corn 2													
LL	LibertyLink®													
Q, LL, RR2	Qrome® (Corn Borer/Rootworm)	C	S		C	C	C	C	C	C	S	C	C	C
VYHR, LL, RR2	Optimum® Leptra® (Corn Borer/Corn Earworm)	C	C	C	C	C	C	C	C	C				
CHR, LL, RR2	Optimum® TRIssect®, LibertyLink, Roundup Ready Corn 2 (Corn Borer/Rootworm)	C	S		C	C	C	C	C	C		C	C	C
YHR, LL, RR2	Optimum® Intrasect®, LibertyLink, Roundup Ready Corn 2 (Corn Borer)	C	S		C	C	C	C	C	C	S			
YXR, LL, RR2	Optimum® Intrasect® Xtra, LibertyLink, Roundup Ready Corn 2 (Corn Borer/Rootworm)	C	S		C	C	C	C	C	C	S	C	C	C
CYXR, LL, RR2	Optimum® Intrasect® XTreme, LibertyLink, Roundup Ready Corn 2 (Corn Borer/Rootworm)	C	S		C	C	C	C	C	C	S	C	C	C
CYHR, LL, RR2	Optimum® Intrasect® TRIssect®, LibertyLink, Roundup Ready Corn 2 (Corn Borer/Rootworm)	C	S		C	C	C	C	C	C	S	C	C	C
AM, LL, RR2	Optimum® AcreMax®, LibertyLink, Roundup Ready Corn 2 (Corn Borer)	C	S		C	C	C	C	C	C	S			
AM1, LL, RR2	Optimum® AcreMax® 1, LibertyLink, Roundup Ready Corn 2 (Corn Borer/Rootworm)	C	S		C	C	C	C	C	C		C	C	C
AML, LL, RR2	Optimum® AcreMax® Leptra®, Liberty Link, Roundup Ready Corn 2 (Corn Borer/Corn Earworm)	C	C	C	C	C	C	C	C	C				
AMX, LL, RR2	Optimum® AcreMax® Xtra, LibertyLink, Roundup Ready Corn 2 (Corn Borer/Rootworm)	C	S		C	C	C	C	C	C	S	C	C	C
AMXT, LL, RR2	Optimum® AcreMax® XTreme, LibertyLink, Roundup Ready Corn 2 (Corn Borer/Rootworm)	C	S		C	C	C	C	C	C	S	C	C	C
AMT, LL, RR2	Optimum® AcreMax® TRIssect®, LibertyLink, Roundup Ready Corn 2 (Corn Borer/Rootworm)	C	S		C	C	C	C	C	C	S	C	C	C
AMRW, LL, RR2	Optimum® AcreMax® RW, LibertyLink, Roundup Ready Corn 2 (Corn Rootworm)											C	C	C
HX1, LL, RR2	Herculex® I, LibertyLink, Roundup Ready Corn 2 (Corn Borer)	C	S		C	C	C	C	C	C				
HXX, LL, RR2	Herculex® XTRA, LibertyLink, Roundup Ready Corn 2 (Corn Borer/Rootworm)	C	S		C	C	C	C	C	C		C	C	C

C = Controlled S = Suppressed Blank = Not Labeled  
All scores of integrated refuge products are based upon the major component.

## Insect Resistance Management Grower Guide

# Optimum® AcreMax® Insect Protection

(AM/LL/RR2)

### Insect Resistance Management (IRM) Requirements

**IMPORTANT: READ PRIOR TO PLANTING**



**WHAT IS OPTIMUM® ACREMAX® INSECT PROTECTION TECHNOLOGY?** Products containing Optimum® AcreMax® Insect Protection provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, sugarcane borer, stalk borer, and corn earworm. Please contact your sales professional for more information regarding insect resistance management guidelines, best management practices and corn products for your area and to understand whether there has been a shift in susceptibility or insect resistance documented in your area.

#### REFUGE PERCENTAGE

**NON-COTTON GROWING AREAS:** No additional refuge acres are required because the refuge for Optimum AcreMax Insect Protection is in the bag.

**SOUTHERN CORN/COTTON GROWING AREAS:** On each farm, plant up to 80% of the corn acres with Optimum AcreMax Insect Protection products. Plant at least 20% of the corn acres to a corn borer refuge.

**REFUGE DESIGN:** The corn borer refuge for each field may be arranged in a number of configurations that allow the grower to easily incorporate an effective refuge into a farming operation. The refuge should be sown on the same day, or with the shortest window possible between planting dates. In cotton-growing areas, the following refuge requirements must be followed:

- The refuge may be planted in-field, adjacent to (e.g., across the road), or as a separate block within 1/2 mile of the Optimum AcreMax Insect Protection corn field.
- In-field refuge options include: blocks, perimeter strips (i.e., along the edges or headlands), or in-field strips.
- When planting the refuge in strips across the field or as a perimeter, refuges must be at least four rows wide.
- Please note: Use of a neighbor's field does not satisfy the refuge requirement.

#### INSECTICIDE USE

**NON-COTTON GROWING AREAS:** Foliar insecticide treatments for control of European corn borer, corn earworm, southwestern corn borer, fall armyworm, black cutworm, western bean cutworm, lesser corn stalk borer, southern corn stalk borer, and sugarcane borer may be applied only if economic thresholds are reached for one or more of these pests. Foliar insecticide treatments are also permitted for control of corn rootworm adults if economic thresholds are reached.

**SOUTHERN CORN/COTTON GROWING AREAS:** Foliar insecticide treatments for control of European corn borer, corn earworm, southwestern corn borer, fall armyworm, black cutworm, western bean cutworm, lesser corn stalk borer, southern corn stalk borer, and sugarcane borer may be applied only if economic thresholds are reached for one or more of these pests. In addition, the refuge can be protected from CRW damage by an appropriate seed treatment or soil insecticide; however, insecticides labeled for adult CRW control must be avoided in the refuge during the period of CRW adult emergence.

Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants).

Microbial Bt insecticides must not be applied on the refuge.

#### SALES AND PLANTING RESTRICTIONS

**CALIFORNIA RESTRICTION:** The planting of Optimum AcreMax Insect Protection hybrids is prohibited in certain California counties. Contact your sales professional for additional details.

**PUERTO RICO RESTRICTION:** The sales, distribution, and planting of Optimum AcreMax Insect Protection products are prohibited in Puerto Rico.

**PRODUCT USE STATEMENT:** This seed is a blend of 5% refuge seed and 95% seed containing the Herculex® I Insect Protection gene that produces a *Bacillus thuringiensis* (Bt) Cry1F protein and the YIELDGARD® Corn Borer gene that produces a Bt Cry1Ab protein that provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, sugarcane borer, stalk borer, and corn earworm. Product responses may vary by location, pest population, environmental conditions, and agricultural practices. These proteins and the genetic material necessary for their production in corn are registered under EPA Reg. No. 29964-12.

**YOU MUST SIGN A TECHNOLOGY AGREEMENT, READ THE PRODUCT USE GUIDE PRIOR TO PLANTING AND FOLLOW INSECT RESISTANCE MANAGEMENT (IRM) REQUIREMENTS.**

**PATENT STATEMENT:** The Herculex I Insect Resistance technology incorporated into these seeds is protected under one or more U.S. patents. The purchase of these seeds includes a limited license to produce a single corn crop in the United States (or other applicable country). The use of seed from such a crop or the progeny thereof for propagation or seed multiplication or for production or development of a hybrid or different variety of seed is strictly prohibited.

The purchase of these seeds with the YieldGard® Corn Borer gene includes a limited license to produce a single corn crop in the United States. This license does not extend to the use of seed from such crop or the progeny thereof for propagation or seed multiplication. Furthermore, the use of such seed or the progeny thereof for propagation or seed multiplication or for production or development of a hybrid or different variety of seed is strictly prohibited.

## Insect Resistance Management Grower Guide

# Optimum® AcreMax® Leptra® Insect Protection

(AML/LL/RR2)

### Insect Resistance Management (IRM) Requirements

**IMPORTANT: READ PRIOR TO PLANTING**



**WHAT IS OPTIMUM® ACREMAX® LEPTRA® INSECT PROTECTION?** Hybrids containing Optimum® AcreMax® Leptra® Insect Protection provide protection or suppression against susceptible corn earworm, European corn borer, southwestern corn borer, black cutworm, fall armyworm, western bean cutworm, lesser corn stalk borer, southern corn stalk borer, stalk borer, and sugarcane borer. Please contact your sales professional for more information regarding insect resistance management guidelines, best management practices and corn products for your area and to understand whether there has been a shift in susceptibility or insect resistance documented in your area.

#### REFUGE PERCENTAGE

**NON-COTTON GROWING AREAS:** No additional refuge acres are required because the refuge for Optimum AcreMax Leptra Insect Protection is in the bag.

**SOUTHERN CORN/COTTON GROWING AREAS:** On each farm, plant up to 80% of the corn acres with Optimum AcreMax Leptra Insect Protection products. Plant at least 20% of the corn acres to a corn borer refuge.

**REFUGE DESIGN:** The corn borer refuge for each field may be arranged in a number of configurations that allow the grower to easily incorporate an effective refuge into a farming operation. The refuge should be sown on the same day, or with the shortest window possible between planting dates. In cotton-growing areas, the following refuge requirements must be followed:

- The refuge may be planted in-field, adjacent to (e.g., across the road), or as a separate block within 1/2 mile of the Optimum AcreMax Leptra Insect Protection products.
- In-field refuge options include: blocks, perimeter strips (i.e., along the edges or headlands), or in-field strips.
- When planting the refuge in strips across the field or as a perimeter, refuges must be at least four rows wide.
- Please note: Use of a neighbor's field does not satisfy the refuge requirement.

#### INSECTICIDE USE

- Insecticides for the control of European corn borer, southwestern corn borer, corn earworm, black cutworm, fall armyworm, and western bean cutworm may be applied to the refuge only if economic thresholds are reached for one or more of these insects.
- Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants).
- Microbial Bt insecticides must not be applied on the refuge.
- If the refuge is treated, the Bt corn must also be treated.

#### SALES AND PLANTING RESTRICTIONS

**CALIFORNIA RESTRICTION:** The planting of Optimum AcreMax Leptra Insect Protection products is prohibited in certain California counties. Contact your sales professional for additional details

**MAINE RESTRICTION:** The sales, distribution, and planting of Optimum AcreMax Leptra Insect Protection products are prohibited in Maine.

**PRODUCT USE STATEMENT:** This seed is a blend of 5% refuge seed and 95% seed containing the Herculex® I Insect Protection gene that produces a Bacillus thuringiensis (Bt) Cry1F protein, the YIELDGARD® Corn Borer gene that produces a Bt Cry1Ab protein, and the Agrisure Viptera® gene that produces a Vip3Aa20 protein that provide protection or suppression against susceptible corn earworm, European corn borer, southwestern corn borer, black cutworm, fall armyworm, western bean cutworm, lesser corn stalk borer, southern corn stalk borer, stalk borer, and sugarcane borer. Product responses may vary by location, pest population, environmental conditions, and agricultural practices. These proteins and the genetic material necessary for their production in corn are registered under EPA Reg. No. 29964-26.

#### **YOU MUST SIGN A TECHNOLOGY AGREEMENT, READ THE PRODUCT USE GUIDE PRIOR TO PLANTING AND FOLLOW INSECT RESISTANCE MANAGEMENT (IRM) REQUIREMENTS.**

**PATENT STATEMENT:** The Herculex I Insect Resistance technology incorporated into these seeds is protected under one or more U.S. patents. The purchase of these seeds includes a limited license to produce a single corn crop in the United States (or other applicable country). The use of seed from such a crop or the progeny thereof for propagation or seed multiplication or for production or development of a hybrid or different variety of seed is strictly prohibited. This license does not extend to the use of seed from such crop or the progeny thereof for propagation or seed multiplication. Furthermore, the use of such seed or the progeny thereof for propagation or seed multiplication or for production or development of a hybrid or different variety of seed is strictly prohibited.

Agrisure technology incorporated into these seeds is commercialized under a license from Syngenta Crop Protection AG under one or more U.S. patent numbers. This license does not extend to the use of seed from such crop or the progeny thereof for propagation or seed multiplication. Furthermore, the use of such seed or the progeny thereof for propagation, seed multiplication, production or development of a hybrid or different variety of seed, research, breeding or crossing, is strictly prohibited. Resale or transfer of this seed is strictly prohibited.

® YIELDGARD is a registered trademark used under license from Monsanto Co. Herculex® I Insect Protection technology by Dow AgroSciences and Pioneer Hi-Bred.

® Herculex and the HX logo are registered trademarks of Dow AgroSciences LLC. Agrisure Viptera® is a registered trademark of, and used under license from, a Syngenta Group Company. Agrisure® technology incorporated into these seeds is commercialized under a license from Syngenta Crop Protection AG.

## Insect Resistance Management Grower Guide

# Optimum® AcreMax® TRIsect® Insect Protection

(AMT/LL/RR2)

### Insect Resistance Management (IRM) Requirements

**IMPORTANT: READ PRIOR TO PLANTING**



**WHAT IS OPTIMUM® ACREMAX® TRISECT® INSECT PROTECTION TECHNOLOGY?** Products containing Optimum® AcreMax® TRIsect® Insect Protection provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, and sugarcane borer, stalk borer, and corn earworm; and also provide protection from larval injury caused by susceptible western corn rootworm, northern corn rootworm, and Mexican corn rootworm. Please contact your sales professional for more information regarding insect resistance management guidelines, best management practices and corn products for your area and to understand whether there has been a shift in susceptibility or insect resistance documented in your area.

#### REFUGE PERCENTAGE

**NON-COTTON GROWING AREAS:** No additional refuge acres are required because the refuge for Optimum AcreMax TRIsect Insect Protection is in the bag.

**SOUTHERN CORN/COTTON GROWING AREAS:** On each farm, plant up to 80% of the corn acres with Optimum AcreMax TRIsect Insect Protection products. Plant at least 20% of the corn acres to a corn borer refuge.

**REFUGE DESIGN:** The corn borer refuge for each field may be arranged in a number of configurations that allow the grower to easily incorporate an effective refuge into a farming operation. The refuge should be sown on the same day, or with the shortest window possible between planting dates. In cotton-growing areas, the following refuge requirements must be followed:

- The refuge may be planted in-field, adjacent to (e.g., across the road), or as a separate block within 1/2 mile of the Optimum AcreMax TRIsect Insect Protection corn field.
- In-field refuge options include: blocks, perimeter strips (i.e., along the edges or headlands), or in-field strips.
- When planting the refuge in strips across the field or as a perimeter, refuges must be at least four rows wide.
- Please note: Use of a neighbor's field does not satisfy the refuge requirement.

#### INSECTICIDE USE

**NON-COTTON GROWING AREAS:** Foliar insecticide treatments for control of European corn borer, corn earworm, southwestern corn borer, fall armyworm, black cutworm, western bean cutworm, lesser corn stalk borer, southern corn stalk borer, and sugarcane borer may be applied only if economic thresholds are reached for one or more of these pests. Foliar insecticide treatments are also permitted for control of corn rootworm adults if economic thresholds are reached.

**SOUTHERN CORN/COTTON GROWING AREAS:** Foliar insecticide treatments for control of European corn borer, corn earworm, southwestern corn borer, fall armyworm, black cutworm, western bean cutworm, lesser corn stalk borer, southern corn stalk borer, and sugarcane borer may be applied only if economic thresholds are reached for one or more of these pests. In addition, the refuge can be protected from CRW damage by an appropriate seed treatment or soil insecticide; however, insecticides labeled for adult CRW control must be avoided in the refuge during the period of CRW adult emergence.

Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants).

Microbial Bt insecticides must not be applied on the refuge.

#### SALES AND PLANTING RESTRICTIONS

**CALIFORNIA RESTRICTION:** The planting of Optimum AcreMax TRIsect Insect Protection hybrids is prohibited in certain California counties. Contact your sales professional for additional details

**PUERTO RICO RESTRICTION:** The sales, distribution, and planting of Optimum AcreMax TRIsect Insect Protection hybrids are prohibited in Puerto Rico.

**PRODUCT USE STATEMENT:** This seed is a blend of 10% refuge seed and 90% seed containing the Herculex® I Insect Protection gene that produces a *Bacillus thuringiensis (Bt) Cry1F* protein and also contains the YIELDGARD® Corn Borer gene that produces a *Bt Cry1Ab* protein; and the Agrisure® RW gene that produces a *Bt mCry3A* protein that provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, sugarcane borer, stalk borer, and corn earworm; and also provide protection from larval injury caused by susceptible western corn rootworm, northern corn rootworm and Mexican corn rootworm. Product responses may vary by location, pest population, environmental conditions, and agricultural practices. These proteins and the genetic material necessary for their production in corn are registered under EPA Reg. No. 29964-23.

#### **YOU MUST SIGN A TECHNOLOGY AGREEMENT, READ THE PRODUCT USE GUIDE PRIOR TO PLANTING AND FOLLOW INSECT RESISTANCE MANAGEMENT (IRM) REQUIREMENTS.**

**PATENT STATEMENT:** The Herculex I Insect Resistance technology incorporated into these seeds is protected under one or more U.S. patent numbers. The purchase of these seeds includes a limited license to produce a single corn crop in the United States (or other applicable country). The use of seed from such a crop or the progeny thereof for propagation or seed multiplication or for production or development of a hybrid or different variety of seed is strictly prohibited. Agrisure RW technology incorporated into these seeds is commercialized under a license from Syngenta Crop Protection AG, under one or more U.S. patent numbers. This license does not extend to the use of seed from such crop or the progeny thereof for propagation or seed multiplication. Furthermore, the use of such seed or the progeny thereof for propagation seed multiplication, production or development of a hybrid or different variety of seed, research, breeding or crossing, is strictly prohibited. Resale or transfer of the seed is strictly prohibited.

## Insect Resistance Management Grower Guide

# Optimum® AcreMax® Xtra Insect Protection

(AMX/LL/RR2)

### Insect Resistance Management (IRM) Requirements

**IMPORTANT: READ PRIOR TO PLANTING**



**WHAT IS OPTIMUM® ACREMAX® XTRA INSECT PROTECTION TECHNOLOGY?** Products containing Optimum® AcreMax® Xtra Insect Protection provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, sugarcane borer, stalk borer, and corn earworm; and also provide protection from larval injury caused by susceptible western corn rootworm, northern corn rootworm, and Mexican corn rootworm. Please contact your sales professional for more information regarding insect resistance management guidelines, best management practices and corn products for your area and to understand whether there has been a shift in susceptibility or insect resistance documented in your area.

#### REFUGE PERCENTAGE

**NON-COTTON GROWING AREAS:** No additional refuge acres are required because the refuge for Optimum AcreMax Xtra Insect Protection is in the bag.

**SOUTHERN CORN/COTTON GROWING AREAS:** On each farm, plant up to 80% of the corn acres with Optimum AcreMax Xtra Insect Protection products. Plant at least 20% of the corn acres to a corn borer refuge.

**REFUGE DESIGN:** The corn borer refuge for each field may be arranged in a number of configurations that allow the grower to easily incorporate an effective refuge into a farming operation. The refuge should be sown on the same day, or with the shortest window possible between planting dates. In cotton-growing areas, the following refuge requirements must be followed:

- The refuge may be planted in-field, adjacent to (e.g., across the road), or as a separate block within 1/2 mile of the Optimum AcreMax Xtra Insect Protection corn field.
- In-field refuge options include: blocks, perimeter strips (i.e., along the edges or headlands), or in-field strips.
- When planting the refuge in strips across the field or as a perimeter, refuges must be at least four rows wide.
- Please note: Use of a neighbor's field does not satisfy the refuge requirement.

#### INSECTICIDE USE

**NON-COTTON GROWING AREAS:** Foliar insecticide treatments for control of European corn borer, corn earworm, southwestern corn borer, fall armyworm, black cutworm, western bean cutworm, lesser corn stalk borer, southern corn stalk borer, and sugarcane borer may be applied only if economic thresholds are reached for one or more of these pests. Foliar insecticide treatments are also permitted for control of corn rootworm adults if economic thresholds are reached.

**SOUTHERN CORN/COTTON GROWING AREAS:** Foliar insecticide treatments for control of European corn borer, corn earworm, southwestern corn borer, fall armyworm, black cutworm, western bean cutworm, lesser corn stalk borer, southern corn stalk borer, and sugarcane borer may be applied only if economic thresholds are reached for one or more of these pests. In addition, the refuge can be protected from CRW damage by an appropriate seed treatment or soil insecticide; however, insecticides labeled for adult CRW control must be avoided in the refuge during the period of CRW adult emergence.

Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants).

Microbial Bt insecticides must not be applied on the refuge.

#### SALES AND PLANTING RESTRICTIONS

**CALIFORNIA RESTRICTION:** The planting of Optimum AcreMax Xtra Insect Protection products is prohibited in certain California counties. Contact your sales professional for additional details.

**PUERTO RICO RESTRICTION:** The sales, distribution, and planting of Optimum AcreMax Xtra Insect Protection products are prohibited in Puerto Rico.

**PRODUCT USE STATEMENT:** This seed is a blend of 10% refuge seed and 90% seed containing the Herculex® XTRA Insect Protection genes that produce a *Bacillus thuringiensis (Bt)* Cry1F protein and the *Bt* Cry34Ab1 and Cry35Ab1 proteins and also contains the YIELDGARD® Corn Borer gene that produces a *Bt* Cry1Ab protein that provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, sugarcane borer, stalk borer, and corn earworm; and also provide protection from larval injury caused by susceptible western corn rootworm, northern corn rootworm, and Mexican corn rootworm. Product responses may vary by location, pest population, environmental conditions, and agricultural practices. These proteins and the genetic material necessary for their production in corn are registered under EPA Reg. No. 29964-11

**YOU MUST SIGN A TECHNOLOGY AGREEMENT, READ THE PRODUCT USE GUIDE PRIOR TO PLANTING AND FOLLOW INSECT RESISTANCE MANAGEMENT (IRM) REQUIREMENTS.**

**PATENT STATEMENT:** The Herculex I and Herculex RW Insect Resistance technologies incorporated into these seeds are protected under one or more U.S. patents. The purchase of these seeds includes a limited license to produce a single corn crop in the United States (or other applicable country). The use of seed from such a crop or the progeny thereof for propagation or seed multiplication or for production or development of a hybrid or different variety of seed is strictly prohibited.

## Insect Resistance Management Grower Guide

# Optimum® AcreMax® XTreme Insect Protection

(AMXT/LL/RR2)

### Insect Resistance Management (IRM) Requirements

**IMPORTANT: READ PRIOR TO PLANTING**



**WHAT IS OPTIMUM® ACREMAX® XTREME INSECT PROTECTION TECHNOLOGY?** Products that contain Optimum® AcreMax® XTreme Insect Protection products provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, stalk borer, sugarcane borer, and corn earworm; and also provide protection from larval injury caused by susceptible western corn rootworm, northern corn rootworm, and Mexican corn rootworm. Please contact your sales professional for more information regarding insect resistance management guidelines, best management practices and corn products for your area and to understand whether there has been a shift in susceptibility or insect resistance documented in your area.

#### REFUGE PERCENTAGE

**NON-COTTON GROWING AREAS:** No additional refuge acres are required because the refuge for Optimum AcreMax XTreme Insect Protection products is in the bag.

**SOUTHERN CORN/COTTON GROWING AREAS:** On each farm, plant up to 80% of the corn acres with Optimum AcreMax XTreme Insect Protection products. Plant at least 20% of the corn acres to a corn borer refuge.

**REFUGE DESIGN:** The corn borer refuge for each field may be arranged in a number of configurations that allow the grower to easily incorporate an effective refuge into a farming operation. The refuge should be sown on the same day, or with the shortest window possible between planting dates. In cotton-growing areas, the following refuge requirements must be followed:

- The refuge may be planted in-field, adjacent to (e.g., across the road), or as a separate block within 1/2 mile of the Optimum AcreMax XTreme Insect Protection corn field.
- In-field refuge options include: blocks, perimeter strips (i.e., along the edges or headlands), or in-field strips.
- When planting the refuge in strips across the field or as a perimeter, refuges must be at least four rows wide.
- Please note: Use of a neighbor's field does not satisfy the refuge requirement.

#### INSECTICIDE USE

**NON-COTTON GROWING AREAS:** Foliar insecticide treatments for control of European corn borer, corn earworm, southwestern corn borer, fall armyworm, black cutworm, western bean cutworm, lesser corn stalk borer, southern corn stalk borer, and sugarcane borer may be applied only if economic thresholds are reached for one or more of these pests. Foliar insecticide treatments are also permitted for control of corn rootworm adults if economic thresholds are reached. Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants). Microbial Bt insecticides must not be applied to non-Bt corn refuge plants.

**SOUTHERN CORN/COTTON-GROWING AREAS:** Insecticide treatments for control of European corn borer, corn earworm, southwestern corn borer, fall armyworm, black cutworm, western bean cutworm, lesser corn stalk borer, southern corn stalk borer, and sugarcane borer may be applied only if economic thresholds are reached for one or more of these pests. Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants).

Microbial Bt insecticides must not be applied on the refuge.

#### SALES AND PLANTING RESTRICTIONS

**CALIFORNIA RESTRICTION:** The planting of Optimum AcreMax XTreme Insect Protection products is prohibited in certain California counties. Contact your sales professional for additional details.

**PUERTO RICO RESTRICTION:** The sales, distribution, and planting of Optimum AcreMax XTreme Insect Protection products are prohibited in Puerto Rico.

**PRODUCT USE STATEMENT:** This seed is a blend of 5% refuge seed and 95% seed containing the Herculex® XTRA Insect Protection genes that produce a *Bacillus thuringiensis (Bt)* Cry1F protein and the *Bt* Cry34Ab1 and Cry35Ab1 proteins; the Agrisure® RW trait that includes a gene that produces a *Bt* mCry3A protein, and the YIELDGARD® Corn Borer gene which produces a *Bt* Cry1Ab protein that provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, stalk borer, sugarcane borer, and corn earworm; and also provide protection from larval injury caused by susceptible western corn rootworm, northern corn rootworm and Mexican corn rootworm. Product responses may vary by location, pest population, environmental conditions, and agricultural practices. These proteins and the genetic material necessary for their production in corn are registered under EPA Reg. No. 29964-16.

**YOU MUST SIGN A TECHNOLOGY AGREEMENT, READ THE PRODUCT USE GUIDE PRIOR TO PLANTING AND FOLLOW INSECT RESISTANCE MANAGEMENT (IRM) REQUIREMENTS.**

**PATENT STATEMENT:** The Herculex I and Herculex RW Insect Resistance technologies incorporated into these seeds are protected under one or more U.S. patents. The purchase of these seeds includes a limited license to produce a single corn crop in the United States (or other applicable country). The use of seed from such a crop or the progeny thereof for propagation or seed multiplication or for production or development of a hybrid or different variety of seed is strictly prohibited. Agrisure RW technology incorporated into these seeds is commercialized under a license from Syngenta Crop Protection AG, under one or more U.S. patent numbers. This license does not extend to the use of seed from such crop or the progeny thereof for propagation or seed multiplication. Furthermore, the use of such seed or the progeny thereof for propagation seed multiplication, production or development of a hybrid or different variety of seed, research, breeding or crossing, is strictly prohibited. Resale or transfer of the seed is strictly prohibited.

## Insect Resistance Management Grower Guide

# Optimum® AcreMax® 1 Insect Protection

(AM1/LL/RR2)

### Insect Resistance Management (IRM) Requirements

**IMPORTANT: READ PRIOR TO PLANTING**



**WHAT IS OPTIMUM® ACREMAX® 1 INSECT PROTECTION TECHNOLOGY?** Products that contain the Optimum® AcreMax® 1 Insect Protection technology provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, sugarcane borer, and corn earworm; and also provide protection from larval injury caused by susceptible western corn rootworm, northern corn rootworm, and Mexican corn rootworm. Please contact your sales professional for more information regarding insect resistance management guidelines, best management practices and corn products for your area and to understand whether there has been a shift in susceptibility or insect resistance documented in your area.

#### REFUGE PERCENTAGE

**NON-COTTON GROWING AREAS:** On each farm, plant up to 80% of the corn acres to Optimum AcreMax 1 Insect Protection products. Plant at least 20% of the corn acres to a corn borer refuge.

**SOUTHERN CORN/COTTON GROWING AREAS:** On each farm, plant up to 50% of the corn acres with Optimum AcreMax 1 Insect Protection products. Plant at least 50% of the corn acres to a corn borer refuge.

**REFUGE DESIGN:** The corn borer refuge for each field may be arranged in a number of configurations that allow the grower to easily incorporate an effective refuge into a farming operation. The refuge should be sown on the same day, or with the shortest window possible between planting dates. Options include:

- The refuge may be planted in-field, adjacent to (e.g., across the road), or as a separate block within 1/2 mile of the Optimum AcreMax 1 Insect Protection corn field.
- In-field refuge options include: blocks, perimeter strips (i.e., along the edges or headlands), or in-field strips.
- When planting the refuge in strips across the field or as a perimeter, refuges must be at least four rows wide.
- Please note: Use of a neighbor's field does not satisfy the refuge requirement.

#### INSECTICIDE USE

- Insecticides for the control of European corn borer, southwestern corn borer, corn earworm, black cutworm, fall armyworm, and western bean cutworm may be applied to the refuge only if economic thresholds are reached for one or more of these insects.
- Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants).
- Microbial Bt insecticides must not be applied on the refuge.
- If the refuge is treated, the Bt corn must also be treated.
- The Optimum AcreMax 1 Insect Protection and refuge seed can both be treated with a soil applied, foliar applied or seed applied insecticides for corn rootworm control.

#### SALES AND PLANTING RESTRICTIONS

**CALIFORNIA RESTRICTION:** The planting of products with Optimum AcreMax 1 Insect Protection is prohibited in certain California counties. Contact your sales professional for additional details.

**PUERTO RICO RESTRICTION:** The sales, distribution, and planting of products with Optimum AcreMax 1 Insect Protection are prohibited in Puerto Rico.

**RODUCT USE STATEMENT:** This seed is a blend of 10% refuge seed and 90% seed containing the Herculex® XTRA Insect Protection gene that produces a *Bacillus thuringiensis* (Bt) Cry1F protein and the *Bt* Cry34Ab1 and Cry35Ab1 proteins and 10% seed containing the Herculex® I Insect Protection gene that produces a *Bt* Cry1F protein that provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, sugarcane borer, and corn earworm; and also provide protection from larval injury caused by susceptible western corn rootworm, northern corn rootworm and Mexican corn rootworm. Product responses may vary by location, pest population, environmental conditions, and agricultural practices. These proteins and the genetic material necessary for their production in corn are registered under EPA Reg. No. 29964-6.

**YOU MUST SIGN A TECHNOLOGY AGREEMENT, READ THE PRODUCT USE GUIDE PRIOR TO PLANTING AND FOLLOW INSECT RESISTANCE MANAGEMENT (IRM) REQUIREMENTS.**

**PATENT STATEMENT:** The Herculex I and the Herculex RW Insect Resistance technologies incorporated into these seeds are protected by one or more U.S. patents. The purchase of these seeds includes a limited license to produce a single corn crop in the United States (or other applicable country). The use of seed from such a crop or the progeny thereof for propagation or seed multiplication or for production or development of a hybrid or different variety of seed is strictly prohibited.

## Insect Resistance Management Grower Guide

# Qrome® Insect Protection

(Q/LL/RR2)

### Insect Resistance Management (IRM) Requirements

**IMPORTANT: READ PRIOR TO PLANTING**



**WHAT IS QROME® INSECT PROTECTION TECHNOLOGY?** Qrome® Insect Protection products provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, stalk borer, sugarcane borer, and corn earworm; and also provide protection from larval injury caused by susceptible western corn rootworm, northern corn rootworm, and Mexican corn rootworm. Please contact your sales professional for more information regarding insect resistance management guidelines, best management practices and corn products for your area and to understand whether there has been a shift in susceptibility or insect resistance documented in your area.

#### \*QROME STEWARDSHIP GUIDANCE

Qrome products are approved for cultivation in the U.S. and Canada and have also received approval in a number of countries. We continue to pursue additional import approvals for Qrome, including in China, in accordance with Excellence Through Stewardship product launch guidance. Grain and certain by-products produced from Qrome cannot be marketed in unapproved locations, including China, until the applicable approval is granted. Growers can refer to <http://www.biотradestatus.com/> for updated information on import country approvals.

Until further notice, Qrome products can only be sold to and planted by growers who agree to use the grain as feed for livestock on their own farming operation or agree to only sell their grain directly to producers who agree to feed this grain to their livestock. No export of grain produced from Qrome products is currently permitted as part of stewardship requirements.

#### REFUGE PERCENTAGE

**NON-COTTON GROWING AREAS:** No additional refuge acres are required because the refuge for Qrome Insect Protection products is in the bag.

**SOUTHERN CORN/COTTON GROWING AREAS:** On each farm, plant up to 80% of the corn acres with Qrome Insect Protection products. Plant at least 20% of the corn acres to a corn borer refuge.

**REFUGE DESIGN:** The corn borer refuge for each field may be arranged in a number of configurations that allow the grower to easily incorporate an effective refuge into a farming operation. The refuge should be sown on the same day, or with the shortest window possible between planting dates. In cotton-growing areas, the following refuge requirements must be followed:

- The refuge may be planted in-field, adjacent to (e.g., across the road), or as a separate block within 1/2 mile of the Qrome Insect Protection corn field.
- In-field refuge options include: blocks, perimeter strips (i.e., along the edges or headlands), or in-field strips.
- When planting the refuge in strips across the field or as a perimeter, refuges must be at least four rows wide.
- Please note: Use of a neighbor's field does not satisfy the refuge requirement.

#### INSECTICIDE USE

**NON-COTTON GROWING AREAS:** Foliar insecticide treatments for control of European corn borer, corn earworm, southwestern corn borer, fall armyworm, black cutworm, western bean cutworm, lesser corn stalk borer, southern corn stalk borer, and sugarcane borer may be applied only if economic thresholds are reached for one or more of these pests. Foliar insecticide treatments are also permitted for control of corn rootworm adults if economic thresholds are reached. Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants). Microbial Bt insecticides must not be applied to non-Bt corn refuge plants.

**SOUTHERN CORN/COTTON-GROWING AREAS:** Insecticide treatments for control of European corn borer, corn earworm, southwestern corn borer, fall armyworm, black cutworm, western bean cutworm, lesser corn stalk borer, southern corn stalk borer, and sugarcane borer may be applied only if economic thresholds are reached for one or more of these pests. Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants).

Microbial Bt insecticides must not be applied on the refuge.

**QROME PRODUCT STEWARDSHIP AGREEMENT (QPSA):** All plantings of Qrome products shall include execution by the grower of a QPSA noting that Qrome products can only be sold to and planted by growers who agree to use the grain as feed for livestock on their own farming operation OR agree to only sell their grain directly to producers who agree to feed this grain to their livestock.

#### SALES AND PLANTING RESTRICTIONS

**CALIFORNIA RESTRICTION:** The planting of Qrome Insect Protection products is prohibited in certain California counties. Contact your sales professional for additional details.

**MAINE RESTRICTION:** The sales, distribution, and planting of Qrome products are prohibited in Maine.

**PUERTO RICO RESTRICTION:** The sales, distribution, and planting of Qrome Insect Protection products are prohibited in Puerto Rico.

**PRODUCT USE STATEMENT:** This seed is a blend of 5% refuge seed and 95% seed containing: the Herculex® XTRA Insect Protection genes that produce a *Bacillus thuringiensis* (Bt) Cry1F protein and the *Bt* Cry34Ab1 and Cry35Ab1 proteins; the Agrisure® RW trait that includes a gene that produces a Bt mCry3A protein, and the YIELDGARD® Corn Borer gene which produces a Bt Cry1Ab protein that provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, stalk borer, sugarcane borer, and corn earworm; and also provide protection from larval injury caused by susceptible western corn rootworm, northern corn rootworm and Mexican corn rootworm. Product responses may vary by location, pest population, environmental conditions, and agricultural practices. These proteins and the genetic material necessary for their production in corn are registered under EPA Reg. No. 29964-21

**YOU MUST SIGN A TECHNOLOGY AGREEMENT AND QROME PRODUCT STEWARDSHIP AGREEMENT, READ THE PRODUCT USE GUIDE PRIOR TO PLANTING AND FOLLOW INSECT RESISTANCE MANAGEMENT (IRM) REQUIREMENTS.**

**PATENT STATEMENT:** The Herculex I and Herculex RW Insect Resistance technologies incorporated into these seeds are protected under one or more U.S. patents. The purchase of these seeds includes a limited license to produce a single corn crop in the United States (or other applicable country). The use of seed from such a crop or the progeny thereof for propagation or seed multiplication or for production or development of a hybrid or different variety of seed is strictly prohibited. Agrisure RW technology incorporated into these seeds is commercialized under a license from Syngenta Crop Protection AG, under one or more U.S. patent numbers. This license does not extend to the use of seed from such crop or the progeny thereof for propagation or seed multiplication. Furthermore, the use of such seed or the progeny thereof for propagation, seed multiplication, production or development of a hybrid or different variety of seed, research, breeding or crossing, is strictly prohibited. Resale or transfer of the seed is strictly prohibited.

® YIELDGARD is a registered trademark used under license from Monsanto Co.

Herculex® I Insect Protection technology by Dow AgroSciences and Pioneer Hi-Bred.® Herculex is a registered trademark of Dow AgroSciences LLC. Agrisure® is a registered trademark of, and used under license from, A Syngenta Group company.

Agrisure® technology incorporated into these seeds is commercialized under a license from Syngenta Crop Protection AG

## Insect Resistance Management Grower Guide

# Herculex® I (HX1) Insect Protection

(HX1/LL/RR2)

### Insect Resistance Management (IRM) Requirements

**IMPORTANT: READ PRIOR TO PLANTING**



**WHAT IS HERCULEX® I INSECT PROTECTION TECHNOLOGY?** Hybrids that contain the Herculex® I (HX1) trait provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, sugarcane borer, and corn earworm. Please contact your sales professional for more information regarding insect resistance management guidelines, best management practices and corn products for your area and to understand whether there has been a shift in susceptibility or insect resistance documented in your area.

#### REFUGE PERCENTAGE

**NON-COTTON GROWING AREAS:** On each farm, plant up to 80% of the corn acres with hybrids with the HX1 trait. Plant at least 20% of the corn acres to a corn borer refuge.

**SOUTHERN CORN/COTTON GROWING AREAS:** On each farm, plant up to 50% of the corn acres with hybrids with the HX1 trait. Plant at least 50% of the corn acres to a corn borer refuge.

**REFUGE DESIGN:** The corn borer refuge for each field may be arranged in a number of configurations that allow the grower to easily incorporate an effective refuge into a farming operation. The refuge should be sown on the same day, or with the shortest window possible between planting dates. Options include:

- The refuge may be planted in-field, adjacent to (e.g., across the road), or as a separate block within 1/2 mile of the HX1 trait.
- In-field refuge options include: blocks, perimeter strips (i.e., along the edges or headlands), or in-field strips.
- When planting the refuge in strips across the field or as a perimeter, refuges must be at least four rows wide.
- Please note: Use of a neighbor's field does not satisfy the refuge requirement.

#### INSECTICIDE USE

- Insecticides for the control of European corn borer, southwestern corn borer, corn earworm, black cutworm, fall armyworm, and western bean cutworm may be applied to the refuge only if economic thresholds are reached for one or more of these insects.
- Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants).
- For control of lepidopteran insects in the refuge, an insecticide may be applied based on local recommended pest thresholds. For specific use instructions for the insecticide, consult the product label.
- Microbial Bt insecticides must not be applied on the refuge.
- If the refuge is treated, the Bt corn must also be treated.

#### SALES AND PLANTING RESTRICTIONS

**CALIFORNIA RESTRICTION:** The planting of hybrids with the HX1 trait is prohibited in certain California counties. Contact your sales professional for additional details.

**PUERTO RICO RESTRICTION:** The sales, distribution, and planting of hybrids with the HX1 trait are prohibited in Puerto Rico.

**PRODUCT USE STATEMENT:** PRODUCT USE STATEMENT: This seed contains the Herculex® I Insect Protection gene that produces a *Bacillus thuringiensis (Bt) Cry1F* protein that provides protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, sugarcane borer, and corn earworm. Product responses may vary by location, pest population, environmental conditions, and agricultural practices. This protein and the genetic material necessary for its production in corn are approved under EPA Reg. No. 029964-3.

**YOU MUST SIGN A TECHNOLOGY AGREEMENT, READ THE PRODUCT USE GUIDE PRIOR TO PLANTING AND FOLLOW INSECT RESISTANCE MANAGEMENT (IRM) REQUIREMENTS.**

**PATENT STATEMENT:** The Herculex I Insect Resistance technology incorporated into these seeds is protected under one or more U.S. patents. The purchase of these seeds includes a limited license to produce a single corn crop in the United States (or other applicable country). The use of seed from such a crop or the progeny thereof for propagation or seed multiplication or for production or development of a hybrid or different variety of seed is strictly prohibited.

## Insect Resistance Management Grower Guide

# Herculex® XTRA (HXX) Insect Protection

(HXX/LL/RR2)

### Insect Resistance Management (IRM) Requirements

**IMPORTANT: READ PRIOR TO PLANTING**



**WHAT IS HERCULEX® XTRA INSECT PROTECTION TECHNOLOGY?** Hybrids that contain Herculex® XTRA (HXX) have two insect protection traits: the Herculex I (HX1) trait and the Herculex RW (HXRW) trait. Hybrids that contain HXX traits provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, sugarcane borer, and corn earworm; and also provide protection from larval injury caused by susceptible western corn rootworm, northern corn rootworm, and Mexican corn rootworm. Please contact your sales professional for more information regarding insect resistance management guidelines, best management practices and corn products for your area and to understand whether there has been a shift in susceptibility or insect resistance documented in your area.

#### REFUGE OPTIONS

##### ■ Common Refuge for Herculex Xtra Insect Protection

A common refuge is designed to address both corn borers and corn rootworms. The HX1 and HXRW traits in HXX are managed as one component for refuge purposes. The common refuge must be planted with corn hybrids that do not contain Bt genes for the control of corn borers or corn rootworms. This option is the simplest and easiest to implement.

##### ■ Separate Refuge for Herculex Xtra Insect Protection

A separate refuge is designed to work independently for each insect (i.e., corn borers and corn rootworms). The HX1 and HXRW components in HXX are managed separately for refuge purposes. This option offers more flexibility than the common refuge.

## COMMON REFUGE

## SEPARATE REFUGE

### REFUGE PERCENTAGE – Non-Cotton Growing Areas

On each farm, plant up to 80% of your corn acres with hybrids that contain the HXX traits. Plant a minimum of 20% of your corn acres to a common refuge with hybrids that do not contain Bt traits for control of corn borer and corn rootworm.

**For corn borers** — Plant a minimum of 20% of your corn acres to a corn borer refuge that does not contain a Bt trait for control of corn borer.

**For corn rootworms** — Plant at least 20% of your corn acres to a corn rootworm refuge that does not contain a Bt trait for control of corn rootworm.

### REFUGE PERCENTAGE – Southern Corn/Cotton Growing Areas

On each farm, plant up to 50% of your corn acres with hybrids that contain the HXX traits. Plant a minimum of 50% of your corn acres to a common refuge with hybrids that do not contain Bt traits for control of corn borer and corn rootworm.

**For corn borers** — Plant a minimum of 50% of your corn acres to a corn borer refuge that does not contain a Bt trait for control of corn borer.

**For corn rootworms** — Plant at least 20% of your corn acres to a corn rootworm refuge that does not contain a Bt trait for control of corn rootworm.

### DISTANCE REQUIREMENT

Plant the refuge within or adjacent to fields containing hybrids with HXX traits. The common refuge can be separated by a ditch or a road but not by another field. The refuge must be owned or managed by the same grower. A neighbor's field cannot be used as the refuge.

**For corn borers** — Plant the corn borer refuge within, adjacent to, or near the fields that contain hybrids with Bt corn borer protection such as the HXX traits. The corn borer refuge must be placed within 1/2 mile of these fields. The refuge must be owned or managed by the same grower. A neighbor's field cannot be used as the refuge.

**For corn rootworms** — Plant the corn rootworm refuge within or adjacent to fields that contain hybrids with Bt corn rootworm protection such as the HXX traits. The corn rootworm refuge can be separated by a ditch or a road but not by another field. The refuge must be owned or managed by the same grower. A neighbor's field cannot be used as the refuge.

## COMMON REFUGE

## SEPARATE REFUGE

### INSECTICIDE USE

The common refuge can be treated for corn rootworm larvae and other soil pests with soil-applied, seed-applied or foliar-applied insecticides. The refuge can also be treated with a non-Bt foliar insecticide to control pests (such as corn borer) if pest pressure reaches an economic threshold for damage. Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants). Pests other than adult corn rootworms can be treated on the combined refuge acres, without treating the HXX acres, only if treatment occurs when adult corn rootworms are not present or if a pesticide without activity against adult corn rootworms is used. If aerial insecticides are applied to the combined refuge for control of corn rootworm adults, the same treatment must also be applied in the same timeframe to HXX acres. Pests on the HXX acres can be treated as needed without having to treat the common refuge.

**For corn borers** — The corn borer refuge can be treated with a soil-applied, seed-applied, or foliar-applied insecticide for corn rootworm larval control. The corn borer refuge can be protected from corn rootworm damage by planting a hybrid with corn rootworm protection technology. The refuge can also be treated with a non-Bt foliar insecticide to control pests such as corn borer, if pest pressure reaches an economic threshold for damage. Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants). Under this option, the HXX area of the field does not have to be treated in a similar manner.

**For corn rootworms** — The corn rootworm refuge can be treated with a soil-applied, seed-applied, or foliar-applied insecticide for corn rootworm larval control. The corn rootworm refuge can be protected from corn borer damage by planting a hybrid with corn borer protection technology. Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants). Pests other than adult corn rootworms can be treated on the rootworm refuge acres, without treating the HXX acres, only if treatment occurs when adult corn rootworms are not present or if a pesticide without activity against adult corn rootworms is used. If aerial insecticides are applied to the rootworm refuge for control of CRW adults, the same treatment must also be applied in the same timeframe to HXX acres. Pests on the HXX acres can be treated as needed without having to treat the rootworm refuge.

### REFUGE DESIGN – Refuge Configuration Options

The refuge on each farm may be arranged in a number of different configurations that allow growers to easily incorporate an effective common refuge into their farm operations. The refuge should be sown on the same day, or with the shortest window possible between planting dates. Options include:

- The refuge may be planted in-field or adjacent to (e.g., across the road) the HXX trait field.
- In-field refuge options include: blocks, perimeter strips (i.e., along the edges or headlands), or in-field strips.
- When planting the refuge in strips across the field or as a perimeter, refuges must be at least four rows wide.

**For corn borers** — The corn borer refuge on each farm may be arranged in a number of configurations that allow the grower to easily incorporate an effective corn refuge into farm operations. The refuge should be sown on the same day, or with the shortest window possible between planting dates. Options include:

- The refuge may be planted in-field, adjacent to (e.g., across the road), or as a separate block within 1/2 mile of the HXX trait field.
- In-field refuge options include: blocks, perimeter strips (i.e., along the edges or headlands), or in-field strips.
- When planting the refuge in strips across the field or as a perimeter, refuges must be at least four rows wide.

**For corn rootworms** — The corn rootworm refuge on each farm may be arranged in a number of configurations that allow the grower to easily incorporate an effective corn rootworm refuge into farm operations. The refuge should be sown on the same day, or with the shortest window possible between planting dates. Options include:

- The refuge may be planted in-field or adjacent to (e.g., across the road) the HXX trait field.
- In-field refuge options include: blocks, perimeter strips (i.e., along the edges or headlands), or in-field strips.
- When planting the refuge in strips across the field or as a perimeter, refuges must be at least four rows wide.

#### SALES AND PLANTING RESTRICTIONS

**CALIFORNIA RESTRICTION:** The planting of hybrids with the HXX traits is prohibited in certain California counties. Contact your sales professional for additional details.

**PUERTO RICO RESTRICTION:** The sales, distribution, and planting of hybrids with the HXX trait are prohibited in Puerto Rico.

**PRODUCT USE STATEMENT:** This seed contains the Herculex® XTRA Insect Protection genes that produce a *Bacillus thuringiensis* (Bt) Cry1F protein and the Bt Cry34Ab1 and Cry35Ab1 proteins that provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, sugarcane borer, and corn earworm; and also provide protection from larval injury caused by susceptible western corn rootworm, northern corn rootworm, and Mexican corn rootworm. Product responses may vary by location, pest population, environmental conditions, and agricultural practices. These proteins and the genetic material necessary for their production in corn are approved under EPA Reg. No. 29964-5.

#### YOU MUST SIGN A TECHNOLOGY AGREEMENT, READ THE PRODUCT USE GUIDE PRIOR TO PLANTING AND FOLLOW INSECT RESISTANCE MANAGEMENT (IRM) REQUIREMENTS.

**PATENT STATEMENT:** The Herculex I and Herculex RW Insect Resistance technologies incorporated into these seeds are protected under one or more U.S. patents. The purchase of these seeds includes a limited license to produce a single corn crop in the United States (or other applicable country). The use of seed from such a crop or the progeny thereof for propagation or seed multiplication or for production or development of a hybrid or different variety of seed is strictly prohibited.

## Insect Resistance Management Grower Guide

# Optimum® TRIsect® Insect Protection

(RW/HX1/LL/RR2)

### Insect Resistance Management (IRM) Requirements

**IMPORTANT: READ PRIOR TO PLANTING**



**WHAT IS OPTIMUM® TRISECT® INSECT PROTECTION TECHNOLOGY?** Hybrids that contain Optimum® TRIsect® Insect Protection have two insect protection traits: the Herculex® I (HX1) trait and the Agrisure® RW trait. Hybrids that contain Optimum TRIsect Insect Protection traits provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, sugarcane borer, and corn earworm; and also provide protection from larval injury caused by susceptible western corn rootworm, northern corn rootworm, and Mexican corn rootworm. Please contact your sales professional for more information regarding insect resistance management guidelines, best management practices and corn products for your area and to understand whether there has been a shift in susceptibility or insect resistance documented in your area.

#### REFUGE OPTIONS

##### ■ Common Refuge for Optimum TRIsect Insect Protection

A common refuge is designed to address both corn borers and corn rootworms. The HX1 and Agrisure® RW traits in Optimum TRIsect Insect Protection are managed as one component for refuge purposes. The common refuge must be planted with corn hybrids that do not contain Bt genes for the control of corn borers or corn rootworms. This option is the simplest and easiest to implement.

##### ■ Separate Refuge for Optimum TRIsect Insect Protection

A separate refuge is designed to work independently for each insect (i.e., corn borers and corn rootworms). The HX1 and Agrisure RW components in Optimum TRIsect Insect Protection are managed separately for refuge purposes. This option offers more flexibility than the common refuge.

## COMMON REFUGE

## SEPARATE REFUGE

### REFUGE PERCENTAGE – Non-Cotton Growing Areas

On each farm, plant up to 80% of your corn acres with hybrids that contain the Optimum TRIsect Insect Protection traits. Plant a minimum of 20% of your corn acres to a common refuge with hybrids that do not contain Bt traits for control of corn borer and corn rootworm.

**For corn borers** — Plant a minimum of 20% of your corn acres to a corn borer refuge that does not contain a Bt trait for control of corn borer.

**For corn rootworms** — Plant at least 20% of your corn acres to a corn rootworm refuge that does not contain a Bt trait for control of corn rootworm.

### REFUGE PERCENTAGE – Southern Corn/Cotton Growing Areas

On each farm, plant up to 50% of your corn acres with hybrids that contain the Optimum TRIsect Insect Protection traits. Plant a minimum of 50% of your corn acres to a common refuge with hybrids that do not contain Bt traits for control of corn borer and corn rootworm.

**For corn borers** — Plant a minimum of 50% of your corn acres to a corn borer refuge that does not contain a Bt trait for control of corn borer.

**For corn rootworms** — Plant at least 20% of your corn acres to a corn rootworm refuge that does not contain a Bt trait for control of corn rootworm.

### DISTANCE REQUIREMENT

Plant the refuge within or adjacent to fields containing hybrids with Optimum TRIsect Insect Protection traits. The common refuge can be separated by a ditch or a road but not by another field. The refuge must be owned or managed by the same grower. A neighbor's field cannot be used as the refuge.

**For corn borers** — Plant the corn borer refuge within, adjacent to, or near the fields that contain hybrids with Bt corn borer protection such as the Optimum TRIsect Insect Protection traits. The corn borer refuge must be placed within 1/2 mile of these fields. The refuge must be owned or managed by the same grower. A neighbor's field cannot be used as the refuge.

**For corn rootworms** — Plant the corn rootworm refuge within or adjacent to fields that contain hybrids with Bt corn rootworm protection such as the Optimum TRIsect Insect Protection traits. The corn refuge can be separated by a ditch or a road but not by another field. The refuge must be owned or managed by the same grower. A neighbor's field cannot be used as the refuge.

## COMMON REFUGE

## SEPARATE REFUGE

### INSECTICIDE USE

The common refuge can be treated for corn rootworm larvae and other soil pests with soil-applied, seed-applied or foliar-applied insecticides. The refuge can also be treated with a non-Bt foliar insecticide to control pests (such as corn borer) if pest pressure reaches an economic threshold for damage. Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants). Pests other than adult corn rootworms can be treated on the combined refuge acres, without treating the Optimum® TRIssect® Insect Protection acres, only if treatment occurs when adult corn rootworms are not present or if a pesticide without activity against adult corn rootworms is used. If aerial insecticides are applied to the combined refuge for control of corn rootworm adults, the same treatment must also be applied in the same timeframe to Optimum TRIssect Insect Protection acres. Pests on the Optimum TRIssect Insect Protection acres can be treated as needed without having to treat the common refuge.

**For corn borers** — The corn borer refuge can be treated with a soil-applied, seed-applied, or foliar-applied insecticide for corn rootworm larval control. The corn borer refuge can be protected from corn rootworm damage by planting a hybrid with corn rootworm protection technology. The refuge can also be treated with a non-Bt foliar insecticide to control pests such as corn borer, if pest pressure reaches an economic threshold for damage. Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants). Under this option, the Optimum TRIssect Insect Protection area of the field does not have to be treated in a similar manner.

**For corn rootworms** — The corn rootworm refuge can be treated with a soil-applied, seed-applied, or foliar-applied insecticide for corn rootworm larval control. The corn rootworm refuge can be protected from corn borer damage by planting a hybrid with corn borer protection technology. Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants). Pests other than adult corn rootworms can be treated on the rootworm refuge acres, without treating the Optimum TRIssect Insect Protection acres, only if treatment occurs when adult corn rootworms are not present or if a pesticide without activity against adult corn rootworms is used. If aerial insecticides are applied to the rootworm refuge for control of CRW adults, the same treatment must also be applied in the same timeframe to Optimum TRIssect Insect Protection acres. Pests on the Optimum TRIssect Insect Protection acres can be treated as needed without having to treat the rootworm refuge.

### REFUGE DESIGN – Refuge Configuration Options

The refuge on each farm may be arranged in a number of different configurations that allow growers to easily incorporate an effective common refuge into their farm operations. The refuge should be sown on the same day, or with the shortest window possible between planting dates. Options include:

- The refuge may be planted in-field or adjacent to (e.g., across the road) the Optimum TRIssect Insect Protection hybrids.
- In-field refuge options include: blocks, perimeter strips (i.e., along the edges or headlands), or in-field strips.
- When planting the refuge in strips across the field or as a perimeter, refuges must be at least four rows wide.

**For corn borers** — The corn borer refuge on each farm may be arranged in a number of configurations that allow the grower to easily incorporate an effective corn refuge into farm operations. The refuge should be sown on the same day, or with the shortest window possible between planting dates. Options include:

- The refuge may be planted in-field, adjacent to (e.g., across the road), or as a separate block within 1/2 mile of the Optimum TRIssect Insect Protection hybrids.
- In-field refuge options include: blocks, perimeter strips (i.e., along the edges or headlands), or in-field strips.
- When planting the refuge in strips across the field or as a perimeter, refuges must be at least four rows wide.

**For corn rootworms** — The corn rootworm refuge on each farm may be arranged in a number of configurations that allow the grower to easily incorporate an effective corn rootworm refuge into farm operations. The refuge should be sown on the same day, or with the shortest window possible between planting dates. Options include:

- The refuge may be planted in-field or adjacent to (e.g., across the road) the Optimum TRIssect Insect Protection hybrids.
- In-field refuge options include: blocks, perimeter strips (i.e., along the edges or headlands), or in-field strips.
- When planting the refuge in strips across the field or as a perimeter, refuges must be at least four rows wide.

#### SALES AND PLANTING RESTRICTIONS

**CALIFORNIA RESTRICTION:** The planting of hybrids with the Optimum TRIssect Insect Protection traits is prohibited in certain California counties. Contact your sales professional for additional details.

**PUERTO RICO RESTRICTION:** The sales, distribution, and planting of hybrids with the Optimum TRIssect Insect Protection trait are prohibited in Puerto Rico.

**PRODUCT USE STATEMENT:** This seed contains the Herculex® I Insect Protection gene that produces a *Bacillus thuringiensis (Bt)* Cry1F protein and the Agrisure® RW gene that produces a *Bt* mCry3A protein that provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, sugarcane borer, and corn earworm; and also provide protection from larval injury caused by susceptible western corn rootworm, northern corn rootworm and Mexican corn rootworm. Product responses may vary by location, pest population, environmental conditions, and agricultural practices. These proteins and the genetic material necessary for their production in corn are registered under EPA Reg. No. 29964-13.

#### YOU MUST SIGN A TECHNOLOGY AGREEMENT, READ THE PRODUCT USE GUIDE PRIOR TO PLANTING AND FOLLOW INSECT RESISTANCE MANAGEMENT (IRM) REQUIREMENTS.

**PATENT STATEMENT:** The Herculex I Insect Resistance technology incorporated into these seeds is protected under one or more U.S. patents. The purchase of these seeds includes a limited license to produce a single corn crop in the United States (or other applicable production country). The use of seed from such a crop or the progeny thereof for propagation or seed multiplication or for production or development of a hybrid or different variety of seed is strictly prohibited.

Agrisure RW technology incorporated into these seeds is commercialized under a license from Syngenta Crop Protection AG, under one or more U.S. patent numbers. This license does not extend to the use of seed from such crop or the progeny thereof for propagation or seed multiplication. Furthermore, the use of such seed or the progeny thereof for propagation, seed multiplication, production or development of a hybrid or different variety of seed, research, breeding or crossing is strictly prohibited. Resale or transfer of this seed is strictly prohibited.

## Insect Resistance Management Grower Guide

# Optimum® Intrasect® Insect Protection

(YGCB/HX1/LL/RR2)

### Insect Resistance Management (IRM) Requirements

**IMPORTANT: READ PRIOR TO PLANTING**



**WHAT IS OPTIMUM® INTRASECT® INSECT PROTECTION TECHNOLOGY?** Hybrids containing Optimum® Intrasect® Insect Protection provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, sugarcane borer, stalk borer, and corn earworm. Please contact your sales professional for more information regarding insect resistance management guidelines, best management practices and corn products for your area and to understand whether there has been a shift in susceptibility or insect resistance documented in your area.

#### REFUGE PERCENTAGE

**NON-COTTON GROWING AREAS:** On each farm, plant up to 95% of the corn acres with Optimum Intrasect Insect Protection hybrids. Plant at least 5% of the corn acres to a corn borer refuge.

**SOUTHERN CORN/COTTON GROWING AREAS:** On each farm, plant up to 80% of the corn acres with Optimum Intrasect Insect Protection hybrids. Plant at least 20% of the corn acres to a corn borer refuge.

**REFUGE DESIGN:** The corn borer refuge for each field may be arranged in a number of configurations that allow the grower to easily incorporate an effective refuge into a farming operation. The refuge should be sown on the same day, or with the shortest window possible between planting dates. Options include:

- The refuge may be planted in-field, adjacent to (e.g., across the road), or as a separate block within 1/2 mile of the Optimum Intrasect Insect Protection hybrids.
- In-field refuge options include: blocks, perimeter strips (i.e., along the edges or headlands), or in-field strips.
- When planting the refuge in strips across the field or as a perimeter, refuges must be at least four rows wide.
- Please note: Use of a neighbor's field does not satisfy the refuge requirement.

#### INSECTICIDE USE

- Insecticides for the control of European corn borer, southwestern corn borer, corn earworm, black cutworm, fall armyworm, and western bean cutworm may be applied to the refuge only if economic thresholds are reached for one or more of these insects.
- Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants).
- For control of lepidopteran insects in the refuge, an insecticide may be applied based on local recommended pest thresholds. For specific use instructions for the insecticide, consult the product label.
- Microbial Bt insecticides must not be applied on the refuge.
- If the refuge is treated, the Bt corn must also be treated.

#### SALES AND PLANTING RESTRICTIONS

**CALIFORNIA RESTRICTION:** The planting of Optimum Intrasect Insect Protection hybrids is prohibited in certain California counties. Contact your sales professional for additional details.

**PUERTO RICO RESTRICTION:** The sales, distribution, and planting of Optimum Intrasect Insect Protection hybrids are prohibited in Puerto Rico.

**PRODUCT USE STATEMENT:** This seed contains the Herculex® I Insect Protection gene that produces a *Bacillus thuringiensis (Bt)* Cry1F protein and also contains the YIELDGARD® Corn Borer gene that produces a *Bt* Cry1Ab protein that provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, sugarcane borer, stalk borer and corn earworm. Product responses may vary by location, pest population, environmental conditions, and agricultural practices. These proteins and the genetic material necessary for their production in corn are registered under EPA Reg. No. 29964-7.

#### YOU MUST SIGN A TECHNOLOGY AGREEMENT, READ THE PRODUCT USE GUIDE PRIOR TO PLANTING AND FOLLOW INSECT RESISTANCE MANAGEMENT (IRM) REQUIREMENTS.

**PATENT STATEMENT:** The Herculex I Insect Resistance technology incorporated into these seeds is protected under one or more U.S. patents. The purchase of these seeds includes a limited license to produce a single corn crop in the United States (or other applicable country). The use of seed from such a crop or the progeny thereof for propagation or seed multiplication or for production or development of a hybrid or different variety of seed is strictly prohibited.

This license does not extend to the use of seed from such crop or the progeny thereof for propagation or seed multiplication. Furthermore, the use of such seed or the progeny thereof for propagation or seed multiplication or for production or development of a hybrid or different variety of seed is strictly prohibited.

## Insect Resistance Management Grower Guide

# Optimum® Leptra® Insect Protection

(AVBL/YGCB/HX1/LL/RR2)

### Insect Resistance Management (IRM) Requirements

**IMPORTANT: READ PRIOR TO PLANTING**



**WHAT IS OPTIMUM® LEPTRA® TECHNOLOGY?** Hybrids containing Optimum® Leptra® Insect Protection provide protection or suppression against susceptible corn earworm, European corn borer, southwestern corn borer, black cutworm, fall armyworm, western bean cutworm, lesser corn stalk borer, southern corn stalk borer, stalk borer, and sugarcane borer. Please contact your sales professional for more information regarding insect resistance management guidelines, best management practices and corn products for your area and to understand whether there has been a shift in susceptibility or insect resistance documented in your area.

#### REFUGE PERCENTAGE

**NON-COTTON GROWING AREAS:** On each farm, plant up to 95% of the corn acres with Optimum Leptra Insect Protection hybrids. Plant at least 5% of the corn acres to a refuge.

**SOUTHERN CORN/COTTON GROWING AREAS:** On each farm, plant up to 80% of the corn acres with Optimum Leptra Insect Protection hybrids. Plant at least 20% of the corn acres to a refuge.

**REFUGE DESIGN:** The corn borer refuge for each field may be arranged in a number of configurations that allow the grower to easily incorporate an effective refuge into a farming operation. The refuge should be sown on the same day, or with the shortest window possible between planting dates. Options include:

- The refuge may be planted in-field, adjacent to (e.g., across the road), or as a separate block within 1/2 mile of the Optimum Leptra Insect Protection hybrids.
- In-field refuge options include: blocks, perimeter strips (i.e., along the edges or headlands), or in-field strips.
- When planting the refuge in strips across the field or as a perimeter, refuges must be at least four rows wide.
- Please note: Use of a neighbor's field does not satisfy the refuge requirement.

#### INSECTICIDE USE

- Insecticides for the control of European corn borer, southwestern corn borer, corn earworm, black cutworm, fall armyworm, and western bean cutworm may be applied to the refuge only if economic thresholds are reached for one or more of these insects.
- Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants).
- Microbial Bt insecticides must not be applied on the refuge.
- If the refuge is treated, the Bt corn must also be treated.

#### SALES AND PLANTING RESTRICTIONS

**CALIFORNIA RESTRICTION:** The planting of Optimum Leptra Insect Protection hybrids is prohibited in certain California counties. Contact your sales professional for additional details.

**MAINE RESTRICTION:** The sales, distribution, and planting of Optimum Leptra Insect Protection hybrids are prohibited in Maine.

**PRODUCT USE STATEMENT:** This seed contains the Herculex® I Insect Protection gene that produces a *Bacillus thuringiensis* (Bt) Cry1F protein, the YIELDGARD® Corn Borer gene that produces a Bt Cry1Ab protein, and the Agrisure Viptera® gene that produces a Vip3Aa20 protein that provide protection or suppression against susceptible corn earworm, European corn borer, southwestern corn borer, black cutworm, fall armyworm, western bean cutworm, lesser corn stalk borer, southern corn stalk borer, stalk borer, and sugarcane borer. Product responses may vary by location, pest population, environmental conditions, and agricultural practices. These proteins and the genetic material necessary for their production in corn are registered under EPA Reg. No. 29964-19.

**YOU MUST SIGN A TECHNOLOGY AGREEMENT, READ THE PRODUCT USE GUIDE PRIOR TO PLANTING AND FOLLOW INSECT RESISTANCE MANAGEMENT (IRM) REQUIREMENTS.**

**PATENT STATEMENT:** The Herculex I Insect Resistance technology incorporated into these seeds is protected under one or more U.S. patents. The purchase of these seeds includes a limited license to produce a single corn crop in the United States (or other applicable country). The use of seed from such a crop or the progeny thereof for propagation or seed multiplication or for production or development of a hybrid or different variety of seed is strictly prohibited. This license does not extend to the use of seed from such crop or the progeny thereof for propagation or seed multiplication. Furthermore, the use of such seed or the progeny thereof for propagation or seed multiplication or for production or development of a hybrid or different variety of seed is strictly prohibited.

Agrisure technology incorporated into these seeds is commercialized under a license from Syngenta Crop Protection AG under one or more U.S. patent numbers. This license does not extend to the use of seed from such crop or the progeny thereof for propagation or seed multiplication. Furthermore, the use of such seed or the progeny thereof for propagation, seed multiplication, production or development of a hybrid or different variety of seed, research, breeding or crossing, is strictly prohibited. Resale or transfer of this seed is strictly prohibited.

® YIELDGARD is a registered trademark used under license from Monsanto Co. Herculex® I Insect Protection technology by Dow AgroSciences and Pioneer Hi-Bred.

® Herculex and the HX logo are registered trademarks of Dow AgroSciences LLC. Agrisure Viptera® is a registered trademark of, and used under license from, a Syngenta Group Company. Agrisure® technology incorporated into these seeds is commercialized under a license from Syngenta Crop Protection AG.

## Insect Resistance Management Grower Guide

# Optimum® Intrasect® XTreme Insect Protection

(RW/YGCB/HXX/LL/RR2)

### Insect Resistance Management (IRM) Requirements

**IMPORTANT: READ PRIOR TO PLANTING**



**WHAT IS OPTIMUM® INTRASECT® XTREME INSECT PROTECTION TECHNOLOGY?** Hybrids containing Optimum® Intrasect® XTreme Insect Protection provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, sugarcane borer, stalk borer, and corn earworm; and also provide protection from larval injury caused by susceptible western corn rootworm, northern corn rootworm, and Mexican corn rootworm. Please contact your sales professional for more information regarding insect resistance management guidelines, best management practices and corn products for your area and to understand whether there has been a shift in susceptibility or insect resistance documented in your area.

#### REFUGE PERCENTAGE

**NON-COTTON GROWING AREAS:** On each farm, plant up to 95% of the corn acres with Optimum Intrasect XTreme Insect Protection hybrids. Plant a minimum of 5% of the corn acres to a refuge.

**SOUTHERN CORN/COTTON GROWING AREAS:** On each farm, plant up to 80% of the corn acres with Optimum Intrasect XTreme Insect Protection hybrids. Plant a minimum of 20% of the corn acres to a refuge.

**REFUGE DESIGN:** The refuge on each farm may be arranged in a number of different configurations that allow growers to easily incorporate an effective refuge into a farming operation. The refuge should be sown on the same day, or with the shortest window possible between planting dates. Options include:

- The refuge may be planted in-field or adjacent to (e.g., across the road) the Optimum Intrasect XTreme Insect Protection hybrids.
- In field refuge options include: blocks, perimeter strips (i.e., along the edges or headlands), or in-field strips.
- When planting the refuge in strips across the field, refuges must be four rows wide.
- Please note: A neighbor's field does not satisfy the refuge requirement.

#### INSECTICIDE USE

- Insecticides for the control of European corn borer, corn earworm, southwestern corn borer, fall armyworm, black cutworm, western bean cutworm, lesser corn stalk borer, southern corn stalk borer, stalk borer, and sugarcane borer may be applied only if economic thresholds are reached for one or more of these insects.
- Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants).
- The refuge can be treated with a soil-applied, foliar-applied or seed-applied insecticide for corn rootworm control. However, insecticides labeled for adult corn rootworm control must not be applied on the refuge when adult corn rootworms are present.
- Microbial Bt insecticides must not be applied on the refuge.

#### SALES AND PLANTING RESTRICTIONS

**CALIFORNIA RESTRICTION:** The planting of Optimum Intrasect XTreme products is prohibited in certain California counties. Contact your sales professional for additional details.

**PUERTO RICO RESTRICTION:** The sales, distribution, and planting of Optimum Intrasect XTreme products is prohibited in Puerto Rico.

**PRODUCT USE STATEMENT:** This seed contains the Herculex® XTRA Insect Protection genes that produce a *Bacillus thuringiensis* (Bt) Cry1F protein and the Bt Cry34Ab1 and Cry35Ab1 proteins; the Agrisure® RW trait that includes a gene that produces a Bt mCry3A protein, and the YIELDGARD® Corn Borer gene that produces a Bt Cry1Ab protein that provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, sugarcane borer, stalk borer, and corn earworm; and also provide protection from larval injury caused by susceptible western corn rootworm, northern corn rootworm and Mexican corn rootworm. Product responses may vary by location, pest population, environmental conditions, and agricultural practices. These proteins and the genetic material necessary for their production in corn are registered under EPA Reg. No. 29964-14.

**YOU MUST SIGN A TECHNOLOGY AGREEMENT, READ THE PRODUCT USE GUIDE PRIOR TO PLANTING AND FOLLOW INSECT RESISTANCE MANAGEMENT (IRM) REQUIREMENTS.**

**PATENT STATEMENT:** The Herculex I and Herculex RW Insect Resistance technologies incorporated into these seeds are protected under one or more U.S. patent numbers. The purchase of these seeds includes a limited license to produce a single corn crop in the United States (or other applicable country). The use of seed from such a crop or the progeny thereof for propagation or seed multiplication or for production or development of a hybrid or different variety of seed is strictly prohibited. Agrisure RW technology incorporated into these seeds is commercialized under a license from Syngenta Crop Protection AG, under one or more U.S. patent numbers. This license does not extend to the use of seed from such crop or the progeny thereof for propagation or seed multiplication. Furthermore, the use of such seed or the progeny thereof for propagation, seed multiplication, production or development of a hybrid or different variety of seed, research, breeding or crossing, is strictly prohibited. Resale or transfer of this seed is strictly prohibited.

## Insect Resistance Management Grower Guide

# Optimum® Intrasect® Xtra Insect Protection

(YGCB/HXX/LL/RR2)

### Insect Resistance Management (IRM) Requirements

**IMPORTANT: READ PRIOR TO PLANTING**



**WHAT IS OPTIMUM® INTRASECT® XTRA INSECT PROTECTION TECHNOLOGY?** Hybrids containing Optimum® Intrasect® Xtra Insect Protection provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, stalk borer, sugarcane borer, and corn earworm; and also provide protection from larval injury caused by susceptible western corn rootworm, northern corn rootworm, and Mexican corn rootworm. Please contact your sales professional for more information regarding insect resistance management guidelines, best management practices and corn products for your area and to understand whether there has been a shift in susceptibility or insect resistance documented in your area.

#### REFUGE OPTIONS

##### ■ Common Refuge for Optimum Intrasect Xtra Insect Protection

A common refuge is designed to address both corn borers and corn rootworms. The Optimum Intrasect Xtra Insect Protection traits are managed as one component for refuge purposes. The common refuge must be planted with corn hybrids that do not contain Bt genes for the control of corn borers or corn rootworms. This option is the simplest and easiest to implement.

##### ■ Separate Refuge for Optimum Intrasect Xtra Insect Protection

A separate refuge is designed to work independently for each insect (i.e., corn borers and corn rootworms). The Optimum Intrasect Xtra Insect Protection components are managed separately for refuge purposes. This option offers more flexibility than the common refuge.

COMMON REFUGE	SEPARATE REFUGE
REFUGE PERCENTAGE	
On each farm, plant up to 80% of your corn acres with Optimum Intrasect Xtra Insect Protection hybrids. Plant a minimum of 20% of your corn acres to a common refuge with hybrids that do not contain Bt traits for control of corn borer and corn rootworm.	<p><b>For corn borers</b> – Plant a minimum of 20% of your corn acres to a corn borer refuge that does not contain a Bt trait for control of corn borer.</p> <p><b>For corn rootworms</b> – Plant at least 20% of your corn acres to a corn rootworm refuge that does not contain a Bt trait for control of corn rootworm.</p>
DISTANCE REQUIREMENT	
Plant the refuge within or adjacent to fields containing Optimum Intrasect Xtra Insect Protection hybrids. The common refuge can be separated by a ditch or a road but not by another field. The refuge must be owned or managed by the same grower. A neighbor's field cannot be used as the refuge.	<p><b>For corn borers</b> – Plant the corn borer refuge within, adjacent to, or near the fields that contain Optimum Intrasect Xtra Insect Protection hybrids with Bt corn borer protection. The corn borer refuge must be placed within 1/2 mile of these fields. The refuge must be owned or managed by the same grower. A neighbor's field cannot be used as the refuge.</p> <p><b>For corn rootworms</b> – Plant the corn rootworm refuge within or adjacent to fields that contain Optimum Intrasect Xtra Insect Protection hybrids with Bt corn rootworm protection. The corn refuge can be separated by a ditch or a road but not by another field. The refuge must be owned or managed by the same grower. A neighbor's field cannot be used as the refuge.</p>

## COMMON REFUGE

## SEPARATE REFUGE

### INSECTICIDE USE

The common refuge can be treated for corn rootworm larvae and other soil pests with soil-applied, seed-applied or foliar-applied insecticides. The refuge can also be treated with a non-Bt foliar insecticide to control pests (such as corn borer) if pest pressure reaches an economic threshold for damage. Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants). Pests other than adult corn rootworms can be treated on the combined refuge acres, without treating the Optimum® Intrasect® Xtra Insect Protection acres, only if treatment occurs when adult corn rootworms are not present or if a pesticide without activity against adult corn rootworms is used. If aerial insecticides are applied to the combined refuge for control of corn rootworm adults, the same treatment must also be applied in the same timeframe to Optimum Intrasect Xtra Insect Protection acres. Pests on the Optimum Intrasect Xtra Insect Protection acres can be treated as needed without having to treat the common refuge.

**For corn borers** – The corn borer refuge can be treated with a soil-applied, seed-applied, or foliar-applied insecticide for corn rootworm larval control. The corn borer refuge can be protected from corn rootworm damage by planting a hybrid with corn rootworm protection technology (such as Herculex® RW). The refuge can also be treated with a non-Bt foliar insecticide to control pests such as corn borer, if pest pressure reaches an economic threshold for damage. Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants). Under this option, the Optimum Intrasect Xtra Insect Protection area of the field does not have to be treated in a similar manner.

**For corn rootworms** – The corn rootworm refuge can be treated with a soil-applied, seed-applied, or foliar-applied insecticide for corn rootworm larval control. The corn rootworm refuge can be protected from corn borer damage by planting a hybrid with corn borer protection technology (such as HX1). Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants). Pests other than adult corn rootworms can be treated on the rootworm refuge acres, without treating the Optimum Intrasect Xtra Insect Protection acres, only if treatment occurs when adult corn rootworms are not present or if a pesticide without activity against adult corn rootworms is used. If aerial insecticides are applied to the rootworm refuge for control of CRW adults, the same treatment must also be applied in the same timeframe to Optimum Intrasect Xtra Insect Protection acres. Pests on the Optimum Intrasect Xtra Insect Protection acres can be treated as needed without having to treat the rootworm refuge.

### REFUGE DESIGN – Refuge Configuration Options

The refuge on each farm may be arranged in a number of different configurations that allow growers to easily incorporate an effective common refuge into their farm operations. The refuge should be sown on the same day, or with the shortest window possible between planting dates. Options include:

- The refuge may be planted in-field or adjacent to (e.g., across the road) the Optimum Intrasect Xtra Insect Protection hybrids.
- In-field refuge options include: blocks, perimeter strips (i.e., along the edges or headlands), or in-field strips.
- When planting the refuge in strips across the field or as a perimeter, refuges must be at least four rows wide.

**For corn borers** – The corn borer refuge on each farm may be arranged in a number of configurations that allow the grower to easily incorporate an effective corn refuge into farm operations. The refuge should be sown on the same day, or with the shortest window possible between planting dates. Options include:

- The refuge may be planted in-field, adjacent to (e.g., across the road), or as a separate block within 1/2 mile of the Optimum Intrasect Xtra Insect Protection hybrids.
- In-field refuge options include: blocks, perimeter strips (i.e., along the edges or headlands), or in-field strips.
- When planting the refuge in strips across the field or as a perimeter, refuges must be at least four rows wide.

**For corn rootworms** – The corn rootworm refuge on each farm may be arranged in a number of configurations that allow the grower to easily incorporate an effective corn rootworm refuge into farm operations. The refuge should be sown on the same day, or with the shortest window possible between planting dates. Options include:

- The refuge may be planted in-field or adjacent to (e.g., across the road) the Optimum Intrasect Xtra Insect Protection hybrids.
- In-field refuge options include: blocks, perimeter strips (i.e., along the edges or headlands), or in-field strips.
- When planting the refuge in strips across the field or as a perimeter, refuges must be at least four rows wide.

#### SALES AND PLANTING RESTRICTIONS

**CALIFORNIA RESTRICTION:** The planting of Optimum Intrasect Xtra Insect Protection hybrids is prohibited in certain California counties. Contact your sales professional for additional details.

**PUERTO RICO RESTRICTION:** The sales, distribution, and planting of Optimum Intrasect Xtra Insect Protection hybrids are prohibited in Puerto Rico.

**PRODUCT USE STATEMENT:** This seed contains the Herculex® XTRA Insect Protection gene that produce a *Bacillus thuringiensis* (Bt) Cry1F protein and the Bt Cry34Ab1 and Cry35Ab1 proteins and also contains the YIELDGARD® Corn Borer gene that produces a Bt Cry1Ab protein that provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, stalk borer, sugarcane borer, and corn earworm; and also provide protection from larval injury caused by susceptible western corn rootworm, northern corn rootworm and Mexican corn rootworm. Product responses may vary by location, pest population, environmental conditions, and agricultural practices. These proteins and the genetic material necessary for their production in corn are registered under EPA Reg. No. 29964-8.

#### YOU MUST SIGN A TECHNOLOGY AGREEMENT, READ THE PRODUCT USE GUIDE PRIOR TO PLANTING AND FOLLOW INSECT RESISTANCE MANAGEMENT (IRM) REQUIREMENTS.

**PATENT STATEMENT:** The Herculex I and Herculex RW Insect Resistance technologies incorporated into these seeds are protected under one or more U.S. patents. The purchase of these seeds includes a limited license to produce a single corn crop in the United States (or other applicable country). The use of seed from such a crop or the progeny thereof for propagation or seed multiplication or for production or development of a hybrid or different variety of seed is strictly prohibited.

This license does not extend to the use of seed from such crop or the progeny thereof for propagation or seed multiplication. Furthermore, the use of such seed or the progeny thereof for propagation or seed multiplication or for production or development of a hybrid or different variety of seed is strictly prohibited.

## Insect Resistance Management Grower Guide

# Optimum® Intrasect® TRIsect® Insect Protection

(RW/YGCB/HX1/LL/RR2)

### Insect Resistance Management (IRM) Requirements

**IMPORTANT: READ PRIOR TO PLANTING**



**WHAT IS OPTIMUM® INTRASECT® TRISECT® INSECT PROTECTION TECHNOLOGY?** Hybrids containing Optimum® Intrasect® TRIsect® Insect Protection provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, stalk borer, sugarcane borer, and corn earworm; and also provide protection from larval injury caused by susceptible western corn rootworm, northern corn rootworm, and Mexican corn rootworm. Please contact your sales professional for more information regarding insect resistance management guidelines, best management practices and corn products for your area and to understand whether there has been a shift in susceptibility or insect resistance documented in your area.

#### REFUGE PERCENTAGE

##### ■ Common Refuge for Optimum Intrasect TRIsect Insect Protection

A common refuge is designed to address both corn borers and corn rootworms. The Optimum Intrasect TRIsect Insect Protection traits are managed as one component for refuge purposes. The common refuge must be planted with corn hybrids that do not contain Bt genes for the control of corn borers or corn rootworms. This option is the simplest and easiest to implement.

##### ■ Separate Refuge for Optimum Intrasect TRIsect Insect Protection

A separate refuge is designed to work independently for each insect (i.e., corn borers and corn rootworms). The Optimum Intrasect TRIsect Insect Protection components are managed separately for refuge purposes. This option offers more flexibility than the common refuge.

COMMON REFUGE	SEPARATE REFUGE
REFUGE PERCENTAGE	
On each farm, plant up to 80% of your corn acres with Optimum Intrasect TRIsect Insect Protection hybrids. Plant a minimum of 20% of your corn acres to a common refuge with hybrids that do not contain Bt traits for control of corn borer and corn rootworm.	<p><b>For corn borers</b> – Plant a minimum of 20% of your corn acres to a corn borer refuge that does not contain a Bt trait for control of corn borer.</p> <p><b>For corn rootworms</b> – Plant at least 20% of your corn acres to a corn rootworm refuge that does not contain a Bt trait for control of corn rootworm.</p>
DISTANCE REQUIREMENT	
Plant the refuge within or adjacent to fields containing Optimum Intrasect TRIsect Insect Protection hybrids. The common refuge can be separated by a ditch or a road but not by another field. The refuge must be owned or managed by the same grower. A neighbor's field cannot be used as the refuge.	<p><b>For corn borers</b> – Plant the corn borer refuge within, adjacent to, or near the fields that contain Optimum Intrasect TRIsect Insect Protection hybrids with Bt corn borer protection. The corn borer refuge must be placed within 1/2 mile of these fields. The refuge must be owned or managed by the same grower. A neighbor's field cannot be used as the refuge.</p> <p><b>For corn rootworms</b> – Plant the corn rootworm refuge within or adjacent to fields that contain Optimum Intrasect TRIsect Insect Protection hybrids with Bt corn rootworm protection. The corn refuge can be separated by a ditch or a road but not by another field. The refuge must be owned or managed by the same grower. A neighbor's field cannot be used as the refuge.</p>

## COMMON REFUGE

## SEPARATE REFUGE

### INSECTICIDE USE

The common refuge can be treated for corn rootworm larvae and other soil pests with soil-applied, seed-applied or foliar-applied insecticides. The refuge can also be treated with a non-Bt foliar insecticide to control pests (such as corn borer) if pest pressure reaches an economic threshold for damage. Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants). Pests other than adult corn rootworms can be treated on the combined refuge acres, without treating the Optimum® Intrasect® TRIsect® Insect Protection acres, only if treatment occurs when adult corn rootworms are not present or if a pesticide without activity against adult corn rootworms is used. If aerial insecticides are applied to the combined refuge for control of corn rootworm adults, the same treatment must also be applied in the same timeframe to Optimum Intrasect TRIsect Insect Protection acres. Pests on the Optimum Intrasect TRIsect Insect Protection acres can be treated as needed without having to treat the common refuge.

**For corn borers** – The corn borer refuge can be treated with a soil-applied, seed-applied, or foliar-applied insecticide for corn rootworm larval control. The corn borer refuge can be protected from corn rootworm damage by planting a hybrid with corn rootworm protection technology (such as Herculex® RW). The refuge can also be treated with a non-Bt foliar insecticide to control pests such as corn borer, if pest pressure reaches an economic threshold for damage. Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants). Under this option, the Optimum Intrasect TRIsect Insect Protection area of the field does not have to be treated in a similar manner.

**For corn rootworms** – The corn rootworm refuge can be treated with a soil-applied, seed-applied, or foliar-applied insecticide for corn rootworm larval control. The corn rootworm refuge can be protected from corn borer damage by planting a hybrid with corn borer protection technology (such as HX1). Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants). Pests other than adult corn rootworms can be treated on the rootworm refuge acres, without treating the Optimum Intrasect TRIsect Insect Protection acres, only if treatment occurs when adult corn rootworms are not present or if a pesticide without activity against adult corn rootworms is used. If aerial insecticides are applied to the rootworm refuge for control of CRW adults, the same treatment must also be applied in the same timeframe to Optimum Intrasect TRIsect Insect Protection acres. Pests on the Optimum Intrasect TRIsect Insect Protection acres can be treated as needed without having to treat the rootworm refuge.

### REFUGE DESIGN – Refuge Configuration Options

The refuge on each farm may be arranged in a number of different configurations that allow growers to easily incorporate an effective common refuge into their farm operations. The refuge should be sown on the same day, or with the shortest window possible between planting dates. Options include:

- The refuge may be planted in-field or adjacent to (e.g., across the road) the Optimum Intrasect TRIsect Insect Protection hybrids.
- In-field refuge options include: blocks, perimeter strips (i.e., along the edges or headlands), or in-field strips.
- When planting the refuge in strips across the field or as a perimeter, refuges must be at least four rows wide.

**For corn borers** – The corn borer refuge on each farm may be arranged in a number of configurations that allow the grower to easily incorporate an effective corn refuge into farm operations. The refuge should be sown on the same day, or with the shortest window possible between planting dates. Options include:

- The refuge may be planted in-field, adjacent to (e.g., across the road), or as a separate block within 1/2 mile of the Optimum Intrasect TRIsect Insect Protection hybrids.
  - In-field refuge options include: blocks, perimeter strips (i.e., along the edges or headlands), or in-field strips.
  - When planting the refuge in strips across the field or as a perimeter, refuges must be at least four rows wide.
- For corn rootworms** – The corn rootworm refuge on each farm may be arranged in a number of configurations that allow the grower to easily incorporate an effective corn refuge into farm operations. The refuge should be sown on the same day, or with the shortest window possible between planting dates. Options include:
- The refuge may be planted in-field or adjacent to (e.g., across the road) the Optimum Intrasect TRIsect Insect Protection hybrids.
  - In-field refuge options include: blocks, perimeter strips (i.e., along the edges or headlands), or in-field strips.
  - When planting the refuge in strips across the field or as a perimeter, refuges must be at least four rows wide.

#### SALES AND PLANTING RESTRICTIONS

**CALIFORNIA RESTRICTION:** The planting of Optimum Intrasect TRIsect Insect Protection hybrids is prohibited in certain California counties. Contact your sales professional for additional details.

**PUERTO RICO RESTRICTION:** The sales, distribution, and planting of Optimum Intrasect TRIsect Insect Protection hybrids are prohibited in Puerto Rico.

**PRODUCT USE STATEMENT:** This seed contains the Herculex® I Insect Protection gene that produces a *Bacillus thuringiensis* (Bt) Cry1F protein; the YIELDGARD® Corn Borer gene which produces a Bt Cry1Ab protein; and the Agrisure® RW gene which produces a Bt mCry3A protein that provide protection or suppression against susceptible European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, stalk borer, sugarcane borer, and corn earworm; and also provide protection from larval injury caused by susceptible western corn rootworm, northern corn rootworm and Mexican corn rootworm. Product responses may vary by location, pest population, environmental conditions, and agricultural practices. These proteins and the genetic material necessary for their production in corn are registered under EPA Reg. No. 29964-24.

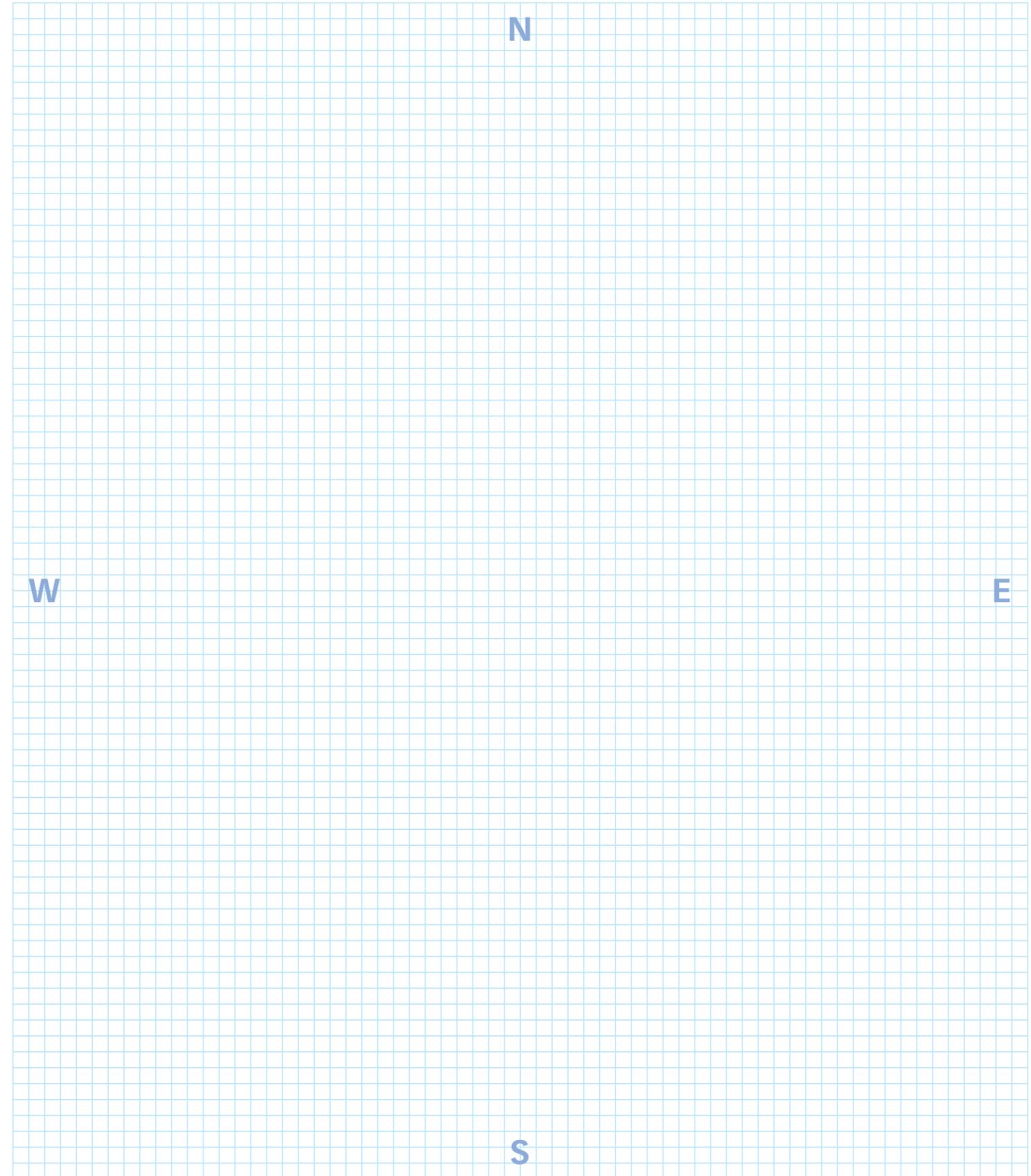
#### YOU MUST SIGN A TECHNOLOGY AGREEMENT, READ THE PRODUCT USE GUIDE PRIOR TO PLANTING AND FOLLOW INSECT RESISTANCE MANAGEMENT (IRM) REQUIREMENTS.

**PATENT STATEMENT:** The Herculex I Insect Resistance technology incorporated into these seeds is protected under one or more U.S. patent numbers. The purchase of these seeds includes a limited license to produce a single corn crop in the United States (or other applicable country). The use of seed from such a crop or the progeny thereof for propagation or seed multiplication or for production or development of a hybrid or different variety of seed is strictly prohibited. Agrisure RW technology incorporated into these seeds is commercialized under a license from Syngenta Crop Protection AG, under one or more U.S. patent numbers. This license does not extend to the use of seed from such crop or the progeny thereof for propagation or seed multiplication. Furthermore, the use of such seed or the progeny thereof for propagation seed multiplication, production or development of a hybrid or different variety of seed, research, breeding or crossing, is strictly prohibited. Resale or transfer of the seed is strictly prohibited.

Notes



Notes





Herculex® Insect Protection technology by Dow AgroSciences and Pioneer Hi-Bred. Herculex® and the HX logo are registered trademarks of Dow AgroSciences LLC.

Liberty®, LibertyLink® and the Water Droplet Design are trademarks of Bayer.

Agrisure® and Agrisure Viptera® are registered trademarks of, and used under license from, a Syngenta Group Company. Agrisure® technology incorporated into these seeds is commercialized under a license from Syngenta Crop Protection AG.

**\* QROME STEWARDSHIP GUIDANCE** Qrome products are approved for cultivation in the U.S. and Canada and have also received approval in a number of countries. Pioneer continues to pursue additional import approvals for Qrome, including in China, in accordance with Excellence Through Stewardship product launch guidance. Grain and certain by-products produced from Qrome cannot be marketed in unapproved locations, including China, until the applicable approval is granted. Growers can refer to <http://www.biotradestatus.com/> for updated information on import country approvals.

Until further notice, Qrome products can only be sold to and planted by growers who agree to use the grain as feed for livestock on their own farming operation or agree to only sell their grain directly to producers who agree to feed this grain to their livestock. No export of grain produced from Qrome products is currently permitted as part of stewardship requirements.

Always follow grain marketing, stewardship practices and pesticide label directions in accordance with the Product Use Guide (PUG) or other product-specific stewardship requirements including grain marketing and pesticide label directions. Varieties with the Glyphosate Tolerant trait (including those designated by the letter "R" in the product number) contain genes that confer tolerance to glyphosate herbicides. Glyphosate herbicides will kill crops that are not tolerant to glyphosate.

Roundup® brand agricultural herbicides will kill crops that are not tolerant to glyphosate. Genuity®, Roundup®, Roundup Ready 2 Yield®, YieldGard®, the YieldGard Corn Borer Design, Roundup Ready® and Roundup Ready 2 Xtend® are trademarks or registered trademarks of Monsanto Technology LLC used under license. Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

**Pioneer is a member of Excellence Through Stewardship® (ETS).** Products are commercialized in accordance with ETS Product Launch Stewardship Guidance and in compliance with the Pioneer policies regarding stewardship of those products. Crops and materials containing biotech traits may only be exported to or used, processed, or sold in jurisdictions where all necessary regulatory approvals have been granted for those crops and materials. It is a violation of national and international laws to move materials containing biotech traits across borders into jurisdictions where their import is not permitted. Growers should discuss these issues with their purchaser or grain handler to confirm the purchaser or handler's position on products being purchased. For further information on the approval status of biotech traits, please visit [www.biotradestatus.com](http://www.biotradestatus.com). Excellence Through Stewardship® is a registered trademark of the Excellence Through Stewardship.

Pioneer (or its chemical company partners) shall have no liability whatsoever for any losses or damages resulting from, or related to, or in connection with, (a) the use of incorrect herbicides applied to sunflower hybrids that contain the herbicide tolerant traits or (b) non-compliance with any of the other instructions set forth above, and all such liability is hereby expressly disclaimed by Pioneer and waived by you. If you have any questions on anything outlined in this document or would like additional information please contact your local representative.



To protect the usefulness and availability of these technologies for the future, growers must implement an Insect Resistance Management (IRM) program as specified in product use guides for the following traits available in corn hybrids: Herculex® I Insect Protection, Herculex® XTRA Insect Protection, Herculex® RW Insect Protection, Optimum® Leptra® Insect Protection, Optimum® AcreMax® 1 Insect Protection, Optimum® AcreMax® Insect Protection, Optimum® AcreMax® Xtra Insect Protection, Optimum® AcreMax® XTreme Insect Protection, Optimum® Intrasect® Insect Protection, Optimum® Intrasect® Xtra Insect Protection, Optimum® TRIsect® Insect Protection, Optimum® Intrasect® XTreme Insect Protection, Optimum® Intrasect® TRIsect® Insect Protection, Optimum® AcreMax® TRIsect® Insect Protection, Optimum® AcreMax® RW Insect Protection, and Optimum® AcreMax® Leptra® Insect Protection. For detailed IRM requirements for hybrids with in-plant insect resistance, refer to the appropriate product use guide, available from your sales professional or on the web.