

TALK WITH YOUR FARMERS ABOUT MITIGATING RISK WITH SMARTSTAX[®] TECHNOLOGY.

SmartStax[®]

Minimizing corn crop damage is key to reducing yield loss and increasing profits. This guide provides deeper insights into SmartStax[®] technology and how the built-in multiple modes of action limit the damage from insects and weed competition, helping farmers reach their profit goals.

DO YOU KNOW THE DIFFERENCE BETWEEN TRAITS AND PROTEINS?

SmartStax technology comprises six existing traits. A single trait can include one or more proteins.

- Proven to be successful across all geographies, SmartStax technology was the first of its kind to be stacked with such a large number of traits.
- The six core traits found in SmartStax technology provide seven total modes of action through eight specific proteins.

WHY ARE MODES OF ACTION IMPORTANT?

A mode of action is a specific manner by which something can be affected. Targeting a specific insect with two unique modes of action means that you are attacking that insect in two different ways.

- Multiple modes of action against insects help prevent pests from adapting to a specific *B.t.* protein.
- SmartStax technology contains multiple *B.t.* proteins that control specific pests in different ways (through different modes of action).
- SmartStax technology includes three modes of action against pests above ground, two modes below ground and two modes that enable herbicide applications.

ABOVE-GROUND CONTROL

HOW DOES THE PLANT ACHIEVE ABOVE-GROUND PEST PROTECTION?

Three modes of action in SmartStax technology protect the plant from corn-feeding pests above soil level, including corn earworm, corn borer, fall armyworm and black cutworm.

- Multiple modes of action work in different portions of the plant, helping to reduce the chance of immunity to one specific protein, minimizing the risk of resistance.
- Once ingested, the *B.t.* protein is activated, killing the pest.

HOW DOES *B.T.* AFFECT INSECTS?

B.t. stands for *Bacillus thuringiensis*, a bacteria found in certain soils and plants. Some forms of *B.t.* are exceptionally effective at controlling insects. When the protoxin reaches the pest's midgut, it is activated, eliminating the pest.

MODES OF ACTION

PROTEIN CRY1A.105

FIRST MODE OF ACTION

Function: Pest Control

Action: Controls lepidopteran insects

7

PROTEIN CRY2AB2

SECOND MODE OF ACTION

Function: Pest Control

Action: Controls lepidopteran insects

6

PROTEIN CRY1F

ONE MODE OF ACTION

Function: Pest Control

Action: Controls lepidopteran insects

5

CONTROLS INSECTS INCLUDING:



SOUTHWESTERN
CORN BORER



EUROPEAN
CORN BORER



FALL
ARMYWORM



CORN EARWORM



BLACK CUTWORM

See how our yield and profit potential stacks up against other trait options at Genuity.com/Compare

WEED CONTROL

HOW DOES SMARTSTAX TECHNOLOGY PROTECT AGAINST WEEDS?

SmartStax technology includes two herbicide-tolerant traits. These traits protect the plant from two different modes of action found in select broad-spectrum herbicides.

- A corn plant with SmartStax technology can withstand applications of glyphosate and glufosinate.
- By eliminating surrounding weeds and grasses, corn plants do not have to compete for available nutrients and water.

BELOW-GROUND CONTROL

HOW DOES SMARTSTAX® TECHNOLOGY FIGHT CORN ROOTWORM?

SmartStax technology contains three different proteins for below-ground protection.

- Multiple modes of action are fighting off corn rootworm in two different ways to prevent the chance of building an immunity to a specific mode of action.
- Once ingested, the *B.t.* protoxin is activated and the insect dies.
- SmartStax technology was the first to offer built-in multiple modes of action (without a soil-applied insecticide requirement) to control corn rootworm, making it the most proven trait technology to effectively control the pest.

CONTROLS COLEOPTERAN INSECTS LIKE:



CORN ROOTWORM

MODES OF ACTION

ROUNDUP READY 2® TECHNOLOGY – ONE MODE OF ACTION

4

Function: Glyphosate tolerance
Action: Helps plant withstand glyphosate applications like Roundup Ready technology

LIBERTYLINK® – ONE MODE OF ACTION

3

Function: Glyphosate tolerance
Action: Helps plant withstand glufosinate applications

2 PROTEINS CRY34 AND CRY35

2

ONE MODE OF ACTION

Function: Pest Control
Action: Controls coleopteran insects like larval corn rootworm

PROTEIN CRY3BB1

1

SECOND MODE OF ACTION

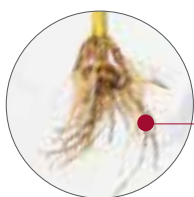
Function: Pest Control
Action: Controls coleopteran insects like corn rootworm

QUANTIFYING THE DAMAGE

Root damage is primarily caused by CRW larval feeding. Every root node nibbled by larvae results in a yield loss of approximately 15%.¹ In addition, root lodging can impede harvesting, further reducing grain yield by 15%-34%.²

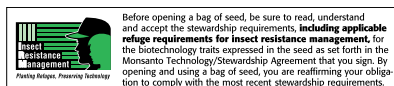


HEALTHY ROOT



DAMAGED ROOT
15%-34% Yield Loss
Root Damage by CRW

¹Journal of Applied Entomology 137 [2103]: Validation of a nested error component model to estimate damage cause by corn rootworm larvae. N.A.Tinsley, R.E.Estes & M.E.Gray.
²Spike BP, Tolleson JJ, 1991. Yield response of corn subjected to western corn rootworm [Coleoptera:Chrysomelidae] infestation and lodging. J. con. Entomol. 84, 1585-1590.
³Commodity Price \$3.25/ac.



Monsanto Company is a member of Excellence Through Stewardship® (ETS). Monsanto products are commercialized in accordance with ETS Product Launch Stewardship Guidance, and in compliance with Monsanto's Policy for Commercialization of Biotechnology-Derived Plant Products in Commodity Crops. This product has been approved for import into key export markets with functioning regulatory systems. Any crop or material produced from this product can only be exported to, or used, processed or sold in countries where all necessary regulatory approvals have been granted. It is a violation of national and international law to move material containing biotech traits across boundaries into nations where import is not permitted. Growers should talk to their grain handler or product purchaser to confirm their buying position for this product. Excellence Through Stewardship® is a registered trademark of Excellence Through Stewardship.

B.t. products may not yet be registered in all states. Check with your Monsanto representative for the registration status in your state.

IMPORTANT IRM INFORMATION: RIB Complete® corn blend products do not require the planting of a structured refuge **except** in the Cotton-Growing Area where corn earworm is a significant pest. SmartStax® RIB Complete® corn blend is not allowed to be sold for planting in the Cotton-Growing Area. See the IRM/Grower Guide for additional information. Always read and follow IRM requirements.

Performance may vary from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields.

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Roundup Ready technology contains genes that confer tolerance to glyphosate, an active ingredient in Roundup® brand agricultural herbicides. Agricultural herbicides containing glyphosate will kill crops that are not tolerant to glyphosate. RIB Complete and Design®, RIB Complete®, Roundup and Design®, Roundup Ready®, Roundup®, SmartStax® are trademarks of the Bayer Group. LibertyLink® and the Water Droplet Design® is a registered trademark of BASF. Respect the Refuge and Corn Design® is a registered trademark of National Corn Growers Association. All other trademarks are the property of their respective owners.

©2018 Bayer Group. All Rights Reserved. 10707-01 3N4T175731