

## Bt Corn Products Available as of April 2021

| Trade Name                             | Bt Protein(s)<br>1st Line = Above Ground<br>2nd Line = Below Ground | # of Bt Proteins Providing Protection |     |     |     |     |     |              | Herbicide Tolerance |    |     |        | Refuge %<br>& Location |
|--|---|---------------------------------------|-----|-----|-----|-----|-----|--------------|---------------------|----|-----|--------|------------------------|
|  |   | Above Ground                          |     |     |     |     |     | Below Ground | LL                  | GT | RR2 | Enlist |                        |
|  |   | BCW                                   | CEW | ECB | FAW | TAW | WBC | CRW          |                     |    |     |        |                        |
| Agrisure® CB/LL                        | Cry1Ab  | 0                                     | 0-1 | 1   | 0   | 0   | 0   | 0            | X                   |    |     |        | 20% - 400 m            |
| Agrisure® GT/CB/LL<br>Agrisure® 3010   | Cry1Ab  | 0                                     | 0-1 | 1   | 0   | 0   | 0   | 0            | X                   | X  |     |        | 20% - 400 m            |
| Agrisure® 3000GT                       | Cry1Ab<br>mCry3A  | 0                                     | 0-1 | 1   | 0   | 0   | 0   | 0-1          | X                   | X  |     |        | 20% - adjacent         |
| Agrisure® 3120<br>E-Z Refuge®          | Cry1Ab, Cry1F   | 1                                     | 0-1 | 1-2 | 0-1 | 0   | 0   | 0            | X                   | X  |     |        | 5% IR                  |
| Agrisure® 3122<br>E-Z Refuge®          | Cry1Ab, Cry1F<br>mCry3A, Cry34/35Ab1                                | 1                                     | 0-1 | 1-2 | 0-1 | 0   | 0   | 0-2          | X                   | X  |     |        | 5% IR                  |
| Agrisure 3110<br>Viptera®              | Cry1Ab, Vip3A   | 1                                     | 1-2 | 1   | 1   | 1   | 1   | 0            | X                   | X  |     |        | 20% - 400 m            |
| Agrisure 3111<br>Viptera®              | Cry1Ab, Vip3A<br>mCry3A   | 1                                     | 1-2 | 1   | 1   | 1   | 1   | 0-1          | X                   | X  |     |        | 20% - adjacent         |
| Agrisure Viptera®<br>3220 E-Z Refuge®  | Cry1Ab, Cry1F, Vip3A  | 2                                     | 1-2 | 1-2 | 1-2 | 1   | 1   | 0            | X                   | X  |     |        | 5% IR                  |
| Agrisure Viptera®<br>3330 E-Z Refuge®  | Cry1Ab, Vip3A,<br>Cry1A.105/ Cry2Ab2                                | 1                                     | 1-4 | 3   | 3   | 1   | 1   | 0            | X                   | X  |     |        | 5% IR                  |
| Agrisure Duracade®<br>5122 E-Z Refuge® | Cry1Ab, Cry1F<br>mCry3A, eCry3.1Ab                                  | 1                                     | 1-2 | 1-2 | 1-2 | 0   | 0   | 0-2          | X                   | X  |     |        | 5% IR                  |
| Agrisure Duracade®<br>5222 E-Z Refuge® | Cry1Ab, Cry1F, Vip3A<br>mCry3A, eCry3.1Ab                           | 2                                     | 1-3 | 1-2 | 1-3 | 1   | 1   | 0-2          | X                   | X  |     |        | 5% IR                  |
| Optimum®<br>AcreMax®                   | Cry1Ab Cry1F  | 1                                     | 0-1 | 1-2 | 0-1 | 0   | 0   | 0            | X                   |    | X   |        | 5% IR                  |
| Optimum®<br>AcreMax® Leptra®           | Cry1Ab, Cry1F, Vip3A  | 2                                     | 1-2 | 1-2 | 1-2 | 1   | 1   | 0            | X                   |    | X   |        | 5% IR                  |
| Optimum®<br>AcreMax® XTreme            | Cry1Ab, Cry1F<br>Cry34/35Ab1, mCry3A                                | 1                                     | 0-1 | 1-2 | 0-1 | 0   | 0   | 0-2          | X                   |    | X   |        | 5% IR                  |
| Optimum®<br>Intrasect®                 | Cry1Ab, Cry1F   | 1                                     | 0-1 | 1-2 | 0-1 | 0   | 0   | 0            | X                   |    | X   |        | 5% - 400 m             |
| PowerCore™                             | Cry1F,<br>Cry1A.105/Cry2Ab2   | 1                                     | 0-2 | 2-3 | 2-3 | 0   | 0   | 0            | X                   |    | X   |        | 5% - 400 m             |
| PowerCore<br>Enlist™                   | Cry1F,<br>Cry1A.105/Cry2Ab2   | 1                                     | 0-2 | 2-3 | 2-3 | 0   | 0   | 0            | X                   |    | X   | X      | 5% - 400 m             |
| Qrome                                  | Cry1Ab, Cry1F<br>Cry34/35Ab1, mCry3A                                | 1                                     | 0-1 | 1-2 | 0-1 | 0   | 0   | 0-2          | X                   |    | X   |        | 5% IR                  |

| Trade Name                            | Bt Protein(s)<br>1st Line = Above Ground<br>2nd Line = Below Ground | # of Bt Proteins Providing Protection<br>(See Resistance Table Provided Below) |       |       |       |     |     |              | Herbicide Tolerance |    |     |        | Refuge %<br>& Location                                  |
|---------------------------------------|---|--|-------|-------|-------|-----|-----|--------------|---------------------|----|-----|--------|---|
|                                       |   | Above Ground   |       |       |       |     |     | Below Ground | LL                  | GT | RR2 | Enlist |   |
|                                       |   | BCW  | CEW   | ECB   | FAW   | TAW | WBC | CRW          |                     |    |     |        |   |
| SmartStax® RIB Complete® (Bayer)      | Cry1F,<br>Cry1A.105/Cry2Ab2<br>Cry3Bb1, Cry34/35Ab1                 | 1  | 0 - 2 | 2 - 3 | 2 - 3 | 0   | 0   | 0 - 2        | X                   |    | X   |        | 5% adjacent<br>(2 row min)<br>or 5% IR                  |
| SmartStax® Enlist™                    | Cry1F,<br>Cry1A.105/Cry2Ab2<br>Cry3Bb1, Cry34/35Ab1                 | 1  | 0 - 2 | 2 - 3 | 2 - 3 | 0   | 0   | 0 - 2        | X                   |    | X   | X      | 5% - 400m   |
| SmartStax® Refuge Advanced (Corteva™) | Cry1F,<br>Cry1A.105/Cry2Ab2<br>Cry3Bb1, Cry34/35Ab1                 | 1  | 0 - 2 | 2 - 3 | 2 - 3 | 0   | 0   | 0 - 2        | X                   |    | X   |        | 5% IR   |
| Trecepta® RIB Complete®               | Vip3A Cry1A.105/Cry2Ab2   | 1  | 1 - 3 | 2     | 3     | 1   | 1   | 0            |                     |    | X   |        | 5% IR   |
| VT Double PRO® RIB Complete®          | Cry1A.105/Cry2Ab2   | 0  | 0 - 2 | 2     | 2     | 0   | 0   | 0            |                     |    | X   |        | 5% IR   |
| <b>SWEET CORN PRODUCTS</b>            |   |  |       |       |       |     |     |              |                     |    |     |        |   |
| Attribute II Series (Syngenta)        | Cry1Ab, Vip3A   | 1  | 0 - 1 | 1     | 1     | 1   | 1   | 0            | X                   |    |     |        | No refuge needed if stubble is destroyed within 30 days |
| Performance Series                    | Cry1A.105/Cry2Ab2<br>Cry3Bb1  | 0  | 0 - 2 | 2     | 2     | 0   | 0   | 0 - 1        |                     |    | X   |        |   |

**# of Bt Proteins:** Where ranges are given under each pest, the protein may no longer be effective or have reduced effectiveness for the pest listed. See table titled “Resistance Status of Bt Proteins for Each Target Pest” for known resistance cases. Always try to select hybrids with more than one effective Bt protein against your target pest.

**IR** = refers to Integrated Refuge, where refuge hybrid seed has been pre-mixed with Bt hybrid seed in the bag.

**Note:** Herbicide tolerances listed are for the non-Integrated Refuge products. IR products may have different herbicide tolerances and herbicide selection should be based on the properties of the refuge hybrid.

**Field corn trade names and their ‘events’ (gene transformations)**

| Trade Name            | Event       | Bt Protein(s) expressed |
|-----------------------|-------------|-------------------------|
| Agrisure CB/LL        | Bt11        | Cry1Ab                  |
| Agrisure Duracade     | 5307        | eCry3.1Ab               |
| Agrisure RW           | MIR604      | mCry3A                  |
| Agrisure Viptera      | MIR162      | Vip3Aa20 (Vip3A)        |
| Herculex I (HXI)      | TC1507      | Cry1F                   |
| Herculex CRW          | DAS-59122-7 | Cry34/35Ab1             |
| None – part of Qrome  | DP-4114     | Cry1F + Cry34/35Ab1     |
| Yieldgard Corn Borer  | MON810      | Cry1Ab                  |
| Yieldgard Rootworm    | MON863      | Cry3Bb1                 |
| Yieldgard VT Pro      | MON89034    | Cry1A.105/Cry2Ab2       |
| Yieldgard VT Rootworm | MON88017    | Cry3Bb1                 |

**Abbreviations used in the table**

| Target Insect             |                                     |
|---------------------------|-------------------------------------|
| BCW                       | Black cutworm                       |
| CEW                       | Corn earworm                        |
| ECB                       | European corn borer                 |
| FAW                       | Fall armyworm                       |
| TAW                       | True armyworm                       |
| WBC                       | Western bean cutworm                |
| CRW                       | Corn rootworm                       |
| Herbicide Tolerance Trait |                                     |
| LL                        | Liberty Link / Glufosinate tolerant |
| GT                        | Glyphosate tolerant                 |
| RR2                       | Roundup Ready®/Glyphosate tolerant  |
| ENLIST                    | 2,4-D, FOPS                         |

## Resistance Status of Bt Proteins for Each Target Pest

| Target Pest                | Effective Bt Proteins<br>* = see next column                   | Bt Proteins of Known Resistance<br>(widespread or local)  | Bt Proteins that Never Worked on the Pest |
|----------------------------|--|---|---|
| Black cutworm (BCW)        | Cry1F<br>Vip3A   | None  | Cry1Ab<br>Cry1A.105 x Cry2Ab2             |
| Corn earworm (CEW)         | Vip3A  | <b>Cry1Ab</b> in US and Ontario<br><b>Cry1A.105 x Cry1Ab2</b> in US and Ontario   | Cry1F                                     |
| European corn borer (ECB)  | Cry1Ab<br>Cry1A.105 x Cry2Ab2<br>Cry1F (except the Maritimes)* | <b>Cry1F</b> (in Maritimes)   | Vip3A                                     |
| Fall armyworm (FAW)        | Cry1F*<br>Cry1A.105 x Cry2Ab2<br>Vip3A                         | <b>Cry1F</b> in southern US   | Cry1Ab                                    |
| True armyworm (TAW)        | Vip3A  | None  | Cry1Ab, Cry 1F<br>Cry1A.105 x Cry2Ab2     |
| Western bean cutworm (WBC) | Vip3A  | <b>Cry1F</b> widespread in US and Canada  | Cry1Ab<br>Cry1A.105 x Cry2Ab2             |
| Corn rootworm (CRW)        | Cry3Bb1*<br>Cry34/35Ab1*<br>mCry3A*<br>eCry3.1Ab*              | <b>Resistance to multiple proteins is suspected in some Ontario populations. Pyramid hybrids may experience injury. Use with best management practices, esp. rotate to non-host crop where high pest pressure is observed.</b><br><b>Cry3Bb1</b> in the US and Ontario<br><b>Cry34/35Ab1</b> in the US<br><b>mCry3A</b> in the US and Ontario<br><b>eCry3.1Ab</b> in the US |   |

\*References for reported resistance: [https://agrilife.org/lubbock/files/2020/02/BtTraitTable\\_Citations.pdf](https://agrilife.org/lubbock/files/2020/02/BtTraitTable_Citations.pdf)

### Key Points When Selecting Bt Corn Hybrids for Pest Control:

1. No one protein controls all corn pests. Know your primary pest of concern and select hybrids that contain proteins that provide effective control. Most hybrids contain multiple proteins to control ECB and/or CRW but may not target your primary pest of concern.
2. To reduce the risk of resistance, select hybrids that contain more than one protein against your primary pest concern.
3. If only one protein is available to control your primary pest concern, do not use that protein every year.
4. Growers should avoid repeated use of any management tool and implement recommended best management practices, especially crop rotation to a non-host crop, in situations where high corn rootworm populations are observed and/or a resistant population is suspected.
5. Note any potential resistance cases mentioned for each pest. Some resistance cases are local or regional while others are widespread. Resistant pest populations that migrate from the southern US can influence the effectiveness of Bt proteins in Canada, as is the case with corn earworm.
6. Scout and report any injury found by pests that should be controlled by the Bt hybrid being used. If injury has been found, contact your seed agronomist, provincial entomologist and/or Tracey Baute, OMAFRA, Chair of the Canadian Corn Pest Coalition.