

The Handy Bt Trait Table

for U.S. Corn Production

Updated February 2020

The newest version of the table is posted at <https://www.texasinsects.org/bt-corn-trait-table.html>
 Editor: Chris DiFonzo, Michigan State University, difonzo@msu.edu Web host: Pat Porter, Texas A&M University

The Handy Bt Trait Table provides a helpful list of trait names (below) and details of trait packages (over) to make it easier to understand company seed guides, sales materials, and bag tags.

At the end of 2018, European corn borer (ECB) damage to Cry1F Bt corn was reported in Nova Scotia, Canada. ECB populations were collected and bio-assayed. The results, published in fall 2019, confirm the first case of practical, field-evolved resistance by corn borer to any Bt trait. In their paper, entomologists from the University of Guelph highlight “preventable causal factors” contributing to ECB resistance in Nova Scotia. A key factor was the continued planting of single-trait Cry1F hybrids. To sell seed with reduced 5% or 10% refuge in the bag, seed companies were supposed to phase out single-trait hybrids and replace them with pyramided multiple-Bt hybrids to slow the development of resistance. This transition apparently did not happen in some places.

Unfortunately, single-trait hybrids are just part of the story. As insects become resistant to individual Cry proteins, *pyramided hybrids effectively become single-trait hybrids*. For example, because ECB is resistant to Cry1F in Nova Scotia, Cry1Ab + Cry1F hybrids are functionally single-trait for Cry1Ab in that province. Entomologists recommend that such pyramids not be used in that region to reduce the chance of ECB resistance to Cry1Ab. Similarly, because western bean cutworm developed resistance to Cry1F, Vip 3A is the only effective toxin to control it. All Vip hybrids, regardless of the number of other Bts in plant, are single-trait for this key pest. Finally, in the southern US, corn earworm (AKA cotton bollworm) is overcoming multiple Bt toxins and Vip3A increasingly functions alone in pyramided corn and cotton. Although you can’t control how traits are packaged or marketed, it is important to realize which hybrids you plant are not really pyramids, to scout fields for unusual pest pressure, and to report problems promptly so that resistance can be dealt with quickly, as in Nova Scotia.

Field corn ‘events’ (transformations of one or more genes) and their Trade Names

Trade name for trait	Event	Protein(s) expressed	Primary Insect Targets + <i>Herbicide tolerance</i>
Agrisure CB/LL	Bt11	Cry1Ab + PAT	corn borer + <i>glufosinate</i>
Agrisure Duracade	5307	eCry3.1Ab	rootworm
Agrisure GT	GA21	EPSPS	<i>glyphosate</i>
Agrisure RW	MIR604	mCry3A	rootworm
Agrisure Viptera	MIR162	Vip3Aa20	broad caterpillar control, except for corn borer
Enlist	DAS40278	<i>aad-1</i>	2,4-D & ‘FOPs’
Herculex I (HXI) or CB	TC1507	Cry1Fa2 + PAT	corn borer + <i>glufosinate</i>
Herculex CRW	DAS-59122-7	Cry34Ab1/Cry35Ab1 + PAT	rootworm + <i>glufosinate</i>
(None – part of Qrome)	DP-4114	Cry1F + Cry34Ab1/Cry35Ab1 + PAT	corn borer + rootworm + <i>glufosinate</i>
Roundup Ready 2	NK603	EPSPS	<i>glyphosate</i>
Yieldgard Corn Borer	MON810	Cry1Ab	corn borer
Yieldgard Rootworm	MON863	Cry3Bb1	rootworm
Yieldgard VT Pro	MON89034	Cry1A.105 + Cry2Ab2	corn borer & several caterpillar species
Yieldgard VT Rootworm	MON88017	Cry3Bb1 + EPSPS	rootworm + <i>glyphosate</i>

Abbreviations used in the Trait Table

Herbicide tolerance

- E Enlist - 2,4-D and ‘FOPs’
- G *glyphosate*
- R Roundup Ready 2 - *glyphosate*
- LL Liberty Link - *glufosinate*

Insect targets

- | | |
|--|-----------------------------|
| BCW black cutworm | SB stalk borer |
| CEW corn earworm | SCB sugarcane borer |
| ECB European corn borer | SWB southwestern corn borer |
| FAW fall armyworm | TAW true armyworm |
| CR corn rootworm (NCR = Northern CR, WCR = Western CR) | WBC western bean cutworm |

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Trait packages in alphabetical order (acronym that may be used)	Bt protein(s) in the trait package	Marketed for control of:											Resistance confirmed to the combination of Bts in package (check local situation)	Herbicide trait			Non-Bt Refuge % (cornbelt)	
		B C W	C E W	E C B	F A W	S B B	S C B	S W B	T A W	W B C	W C R	R		G R	L L	E		
AcreMax (AM)	Cry1Ab Cry1F	x	x	x	x	x	x	x	x					CEW FAW WBC	x	x		5% in bag
AcreMax CRW (AMRW)	Cry34/35Ab1												x	NCR WCR	x	x		10% in bag
AcreMax1 (AM1)	Cry1F Cry34/35Ab1	x		x	x	x	x	x	x				x	ECB FAW SWB WBC NCR WCR	x	x		10% in bag 20% ECB
AcreMax Leptra (AML)	Cry1Ab Cry1F Vip3A	x	x	x	x	x	x	x	x	x	x				x	x		5% in bag
AcreMax TRIssect (AMT)	Cry1Ab Cry1F mCry3A	x	x	x	x	x	x	x	x				x	CEW FAW WBC WCR	x	x		10% in bag
AcreMax Xtra (AMX)	Cry1Ab Cry1F Cry34/35Ab1	x	x	x	x	x	x	x	x				x	CEW FAW WBC NCR WCR	x	x		10% in bag
AcreMax Xtreme (AMXT)	Cry1Ab Cry1F mCry3A Cry34/35Ab1	x	x	x	x	x	x	x	x				x	CEW FAW WBC WCR	x	x		5% in bag
Agrisure 3010 (BR)	Cry1Ab		x	x				x	x					CEW	x	x		20%
Agrisure 3000GT & 3011A	Cry1Ab mCry3A		x	x				x	x				x	CEW WCR	x	x		20%
Agrisure Viptera 3110 (VR)	Cry1Ab Vip3A	x	x	x	x	x	x	x	x	x					x	x		20%
Agrisure Viptera 3111 (A4)	Cry1Ab Vip3A mCry3A	x	x	x	x	x	x	x	x	x	x			WCR	x	x		20%
Agrisure 3120 E-Z Refuge (BZ)	Cry1Ab Cry1F	x	x	x	x	x	x	x	x					CEW FAW WBC	x	See bag tag: EZ0 = no EZ1 = yes		5% in bag
Agrisure 3122 E-Z Refuge	Cry1Ab Cry1F mCry3A Cry34/35Ab1	x	x	x	x	x	x	x	x				x	CEW FAW WBC WCR	x			5% in bag
Agrisure Viptera 3220 E-Z (VZ)	Cry1Ab Cry1F Vip3A	x	x	x	x	x	x	x	x	x					x			5% in bag
Agrisure Viptera 3330 E-Z	Cry1Ab Vip3A Cry1A.105/Cry2Ab2	x	x	x	x	x	x	x	x	x					x			5% in bag
Agrisure Duracade 5122 E-Z (D1)	Cry1Ab Cry1F mCry3A eCry3.1Ab	x	x	x	x	x	x	x	x				x	CEW FAW WBC WCR	x			5% in bag
Agrisure Duracade 5222 E-Z (D2)	Cry1Ab Cry1F Vip3A mCry3A eCry3.1Ab	x	x	x	x	x	x	x	x	x	x		x	WCR	x		5% in bag	
Herculex I (HXI)	Cry1F	x		x	x	x	x	x	x					ECB FAW SWB WBC	x	x		20%
Herculex RW (HXRW)	Cry34/35Ab1												x	NCR WCR	x	x		20%
Herculex XTRA (HXX)	Cry1F Cry34/35Ab1	x		x	x	x	x	x	x				x	ECB FAW SWB WBC NCR WCR	x	x		20%
Intrasect (YHR)	Cry1Ab Cry1F	x	x	x	x	x	x	x	x					CEW FAW WBC	x	x		5%
Intrasect TRIssect (CYHR)	Cry1Ab Cry1F mCry3A	x	x	x	x	x	x	x	x				x	CEW FAW WBC WCR	x	x		20%
Intrasect Xtra (YXR)	Cry1Ab Cry1F Cry34/35Ab1	x	x	x	x	x	x	x	x				x	CEW FAW WBC NCR WCR	x	x		20%
Intrasect Xtreme (CYXR)	Cry1Ab Cry1F mCry3A Cry34/35Ab1	x	x	x	x	x	x	x	x				x	CEW FAW WBC WCR	x	x		5%
Leptra (VYHR)	Cry1Ab Cry1F Vip3A	x	x	x	x	x	x	x	x	x					x	x		5%
Powercore ^a (PW)	Cry1A.105/Cry2Ab2	x	x	x	x	x	x	x	x					CEW WBC	x	x		^a 5%
PW Refuge Advanced ^b (PWRA)	Cry1F																	^b 5% in bag
Powercore Enlist (PWE)	Same as Powercore	x	x	x	x	x	x	x	x					Same as Powercore	x	x	x	5% in bag
QROME (Q)	Cry1Ab Cry1F mCry3A Cry34/35Ab1	x	x	x	x	x	x	x	x				x	CEW FAW WBC WCR	x	x		5% in bag
SmartStax ^a (SX,STX or SS)	Cry1A.105/Cry2Ab2	x	x	x	x	x	x	x	x				x	CEW WBC NCR WCR	x	x		^a 5%
STX Refuge Advanced ^b (SXRA)	Cry1F Cry3Bb1																	^b 5% in bag
STX RIB Complete ^b (STXRIB)	Cry34/35Ab1																	^b 5% in bag
SmartStax Enlist (SXE)	Same as SmartStax	x	x	x	x	x	x	x	x				x	Same as SmartStax	x	x	x	5% in bag
Trecepta ^a (TRE)	Cry1A.105/Cry2Ab2	x	x	x	x	x	x	x	x	x					x			^a 5%
Trecepta RIB Complete ^b (TRERIB)	Vip3A																	^b 5% in bag
TRIssect (CHR)	Cry1F mCry3A	x		x	x	x	x	x	x				x	ECB FAW SWB WBC WCR	x	x		20%
VT DoublePRO ^a (VT2P)	Cry1A.105/Cry2Ab2		x	x	x	x	x	x	x					CEW	x			^a 5%
VT2P RIB Complete ^b (VT2PRIB)																		^b 5% in bag
VT TriplePRO ^c (VT3P)	Cry1A.105/Cry2Ab2		x	x	x	x	x	x	x				x	CEW	x			^c 20%
VT3P RIB Complete ^d (VT3PRIB)	Cry3Bb1													NCR WCR				^d 10% in bag
Yieldgard Corn Borer (YGCB)	Cry1Ab		x	x				x	x					CEW	x			20%
Yieldgard Rootworm (YGRW)	Cry3Bb1												x	NCR WCR	x			20%
Yieldgard VT Triple (VT3)	Cry1Ab Cry3Bb1		x	x				x	x				x	CEW NCR WCR	x			20%