

The Handy Bt Trait Table

for U.S. Corn Production

Updated March 2022

An up-to-date version of the table is posted at <https://www.texasinsects.org/bt-corn-trait-table.html>

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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.

EPA proposes new rules: As Bt toxins continue to lose efficacy against various pest caterpillars, EPA has been gathering feedback for several years to update rules for reducing the risk of Lepidopteran resistance in Bt corn and cotton. The Agency is now negotiating with the seed industry on the changes that are proposed. Any that are adopted will be phased in gradually as new trait packages get released or current packages are re-registered. A few highlights of EPA's proposal are:

** An increase in the refuge in the bag from the current minimum of 5% to 10% nationwide. My coauthor Dr. Porter points out that an increase in refuge may be problematic in production areas with southwestern corn borer (this insect girdles and breaks stalks before harvest) or where mycotoxins are a concern (the southern US and Great Lakes region)

** Cases of unexpected damage to Bt corn by rootworm and European corn borer were always required to be reported by companies to EPA. Now, unexpected injury from earworm, fall armyworm, & western bean cutworm would also be reported.

** Growers who are out of compliance with refuge requirements will be monitored for TWO years, instead of one.

Shout-outs for resources related to trapping corn insects:

- Great Lakes & Maritimes Pest Management Network (GLMPMN), <https://arcg.is/0Lry5a>. With the increase in non-Bt corn and potentially earlier flight of southern species north, pheromone trapping is becoming more important. Volunteers enter pheromone trap catches of black cutworm, earworm, European corn borer, fall & true armyworm, and western bean cutworm. The site generates weekly maps. In 2021, there were 1560 locations across six Canadian provinces and four northern states.
- Corn rootworm IPM website, rootwormipm.org. This web site is a one-stop shop for info on rootworm biology, efficacy trials, management recommendations, and new findings. It also hosts the CRW Adult Monitoring Network, a multistate project monitoring beetle populations in US and Canadian fields using sticky cards. See the website for how to volunteer in 2022.

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

Trade name for trait	Event	Bt toxin or other trait expressed	Primary Insect Targets + Herbicide tolerance
Agrisure CB/LL	Bt11	Cry1Ab + PAT	corn borer + <i>glufosinate tolerance</i>
Agrisure Duracade	5307	eCry3.1Ab	rootworm
Agrisure GT	GA21	EPSPS	<i>glyphosate tolerance</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 tolerance</i>
Herculex RW	DAS-59122-7	Cry34Ab1/Cry35Ab1 + PAT	rootworm + <i>glufosinate tolerance</i>
Roundup Ready 2	NK603	EPSPS	<i>glyphosate tolerance</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 tolerance</i>
(None – in Qrome)	DP-4114	Cry1F + Cry34Ab1/Cry35Ab1 + PAT	corn borer + rootworm + <i>glufosinate tolerance</i>
(None – in SmartStax Pro)	MON87411	Cry3Bb1 + DvSnf7 dsRNA + EPSPS	rootworm + <i>glyphosate tolerance</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
 CEW corn earworm
 CR corn rootworm
 (N- Northern, W- Western)
 ECB European corn borer

FAW fall armyworm
 SB stalk borer
 SCB sugarcane borer
 SWCB southwestern corn borer
 TAW true armyworm
 WBC western bean cutworm

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Trait packages in alphabetical order (acronym that may be used)	Bt protein(s) (or other trait) in 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	E	F	S	S	T	W					G	L	E	
		C	E	C	A	S	C	W	A	B	C	R		R	L	E	
AcreMax (AM)	Cry1Ab Cry1F	x	x	x	x	x	x	x					CEW FAW WBC	x	x		5% in bag
AcreMax CRW (AMRW)	Cry34/35Ab1												NCR WCR	x	x		10% in bag
AcreMax1 (AM1)	Cry1F Cry34/35Ab1	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		5% in bag
AcreMax TRIsect (AMT)	Cry1Ab Cry1F mCry3A	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					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					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				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					CEW FAW WBC	x	See bag tag. E-Z=no E-Z1=yes		5% in bag
Agrisure 3122 E-Z Refuge	Cry1Ab Cry1F mCry3A Cry34/35Ab1	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					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		WCR	x			5% in bag
Agrisure Duracade 5332-E-Z	Cry1A.105/Cry2Ab2 Cry1Ab Vip3A mCry3A eCry3.1Ab	x	x	x	x	x	x	x	x	x	x		WCR	x	x		5% in bag
Herculex I (HXI)	Cry1F	x		x	x	x	x	x					ECB FAW SWB WBC	x	x		20%
Herculex RW (HXRW)	Cry34/35Ab1												NCR WCR	x	x		20%
Herculex XTRA (HXX)	Cry1F Cry34/35Ab1	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					CEW FAW WBC	x	x		5%
Intrasect TRIsect (CYHR)	Cry1Ab Cry1F mCry3A	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					CEW FAW WBC NCR WCR	x	x		20%
Intrasect Xtreme (CYXR)	Cry1Ab Cry1F mCry3A Cry34/35Ab1	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					CEW WBC	x	x		^a 5% in bag
PW Refuge Advanced ^b (PWRA)	Cry1F																^b 5% in bag
Powercore Enlist (PWE)	Same as Powercore	x	x	x	x	x	x	x					CEW WBC	x	x	x	5% in bag
QROME (Q)	Cry1Ab Cry1F mCry3A Cry34/35Ab1	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					CEW WBC	x	x		^a 5%
STX Refuge Advanced ^b (SXRA)	Cry1F Cry3Bb1												NCR WCR				^b 5% in bag
STX RIB Complete ^b (SSRIB)	Cry34/35Ab1																
SmartStax Enlist (SXE)	Same as SmartStax	x	x	x	x	x	x	x					Same as SmartStax	x	x	x	5% in bag
SmartStax Pro w/ RNAi Technology (SSPRORIB)	Same as SmartStax + DvSnf7 dsRNA	x	x	x	x	x	x	x					CEW WBC	x	x		5% in bag
Trecepta ^a (TRE)	Cry1A.105/Cry2Ab2 Vip3A	x	x	x	x	x	x	x	x	x				x			^a 5%
Trecepta RIB Complete ^b (TRERIB)																	^b 5% in bag
TRIssect (CHR)	Cry1F mCry3A	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					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					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												NCR WCR	x			20%
Yieldgard VT Triple (VT3)	Cry1Ab Cry3Bb1		x	x				x	x				CEW NCR WCR	x			20%