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Handy Bt Trait Table

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Most corn hybrids planted in the U.S. now contain one or more transgenic traits for weed or insect management. These traits are meant to increase flexibility and profitability for producers, but sometimes cause confusion about their spectrum of control or refuge requirements. This bulletin is a handy one-stop-guide to make it easier to read company seed guides, sales materials, and bag tags. For the hybrids you purchase:

*Understand the **expected level of control** for each trait and refuge requirements for that hybrid;
***Confirm that the seed you ordered** in the fall is the same seed delivered in the spring;
*Keep good **planting records** and save a representative sample of **bags or bag tags;**
*Most important, if you see **unexpected damage or poor performance** of a trait (especially rootworm damage), contact your seed dealer and extension educator immediately so that the field can be visited while the problem is still fresh and samples can be taken. This is critical to **identify and manage rootworm resistance to Bt**.

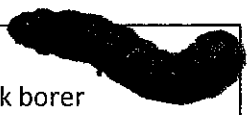
Table 1: Bt corn 'events' (transformations of one or more genes) and their Trade Names

Trade name for trait	Event	Protein(s) expressed	Insect Target or *Herbicide Activity*
Agrisure CB/LL	Bt11	Cry1Ab + *PAT*	corn borer + *glufosinate tolerance*
Agrisure Duracade	5307	eCry3.1Ab	rootworm
Agrisure GT	GA21	*EPSPS*	*glyphosate tolerance*
Agrisure RW	MIR604	mCry3A	rootworm
Agrisure Viptera	MIR162	Vip3A	broad lep control (but not corn borer)
Herculex 1 or CB	TC1507	Cry1Fa2 + *PAT*	corn borer + *glufosinate tolerance*
Herculex RW	DAS-59122-7	Cry34Ab1/Cry35Ab1 + *PAT*	rootworm + *glufosinate tolerance*
Roundup Ready 2	NK603	*EPSPS*	*glyphosate tolerance*
Yieldgard Corn Borer	MON810	Cry1Ab	corn borer
Yieldgard Rootworm	MON863	Cry3Bb1	rootworm
Yieldgard VT Pro	MON89034	Cry1A.105 + Cry2Ab2	broader lep control
Yieldgard VT Rootworm RR	MON88017	Cry3Bb1 + *EPSPS*	rootworm + *glyphosate tolerance*

Table 2 (next page) lists specific trait packages (combinations of events) sold by seed companies, their spectrum of control, and required refuge % + location. For many packages, pyramiding of Bt toxins allows for a reduction in refuge acres to 5%. Although some hybrids still require a structured refuge planted in rows or a block, an increasing proportion of Bt seed is sold as a refuge-in-the-bag (RIB).

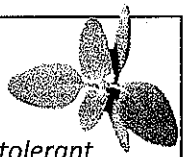
Note that the spectrum of control in Table 2 - excellent, poor (= suppression), or none - is based on seed company literature, reflecting how a product should perform. Actual field-level performance may differ. For example, rootworm populations in the western corn belt have developed resistance to several Bt toxins. In the Great Lakes region, western bean cutworm susceptibility to Cry1F appears to be decreasing over time. Unexpected, poor performance should be reported ASAP because it may be an early sign of insect resistance in a field or region.

Abbreviations used in Table 2



Insect targets

BCW	black cutworm	SB	stalk borer
CEW	corn earworm	SWCB	southern corn borer
ECB	European corn borer	TAW	true armyworm
FAW	fall armyworm	WBC	western bean cutworm
RW	corn rootworm		



Herbicide activity

DI	*dicamba tolerant*
GT	*glyphosate tolerant*
LL	Liberty Link, *glufosinate-tolerant*
RR2	Roundup Ready 2, *glyphosate-tolerant*

Refuge placement

RIB - Refuge In the Bag w/in - within adj - adjacent

Table 2. Bt corn trait packages, with spectrum of control and refuge requirements. Updated April 2016

Trait Family Product	Bt protein(s)	Insects controlled or *suppressed* Above-ground----------In soil		Herbicide tolerance	Refuge %, placement for the MIDWEST
AGRISURE					
Agrisure 3010, 3010A	Cry1Ab	ECB SWCB *CEW FAW SB*	---	GT LL	20% structured ½ mile
Agrisure 3000GT, 3011A	Cry1Ab mCry3A	ECB SWCB *CEW FAW SB*	RW	GT LL	20% structured w/in, adj
Agrisure Viptera 3110	Cry1Ab Vip3A	BCW CEW ECB FAW SB SWCB TAW WBC	---	GT LL	20% structured ½ mile
Agrisure Viptera 3111	Cry1Ab mCry3A Vip3A	BCW CEW ECB FAW SB SWCB TAW WBC	RW	GT LL	20% structured w/in, adj
Agrisure 3122 E-Z Refuge	Cry1Ab Cry1F mCry3A Cry34/35Ab1	BCW ECB FAW SB SWCB WBC *CEW*	RW	GT	5% RIB
Agrisure Viptera 3220 E-Z Refuge	Cry1Ab Cry1F Vip3A	BCW CEW ECB FAW SB SWCB TAW WBC	---	GT	5% RIB
Agrisure Duracade 5122 E-Z Refuge	Cry1Ab Cry1F mCry3A eCry3.1Ab	BCW ECB FAW SB SWCB WBC *CEW*	RW	GT	5% RIB
Agrisure Duracade 5222 E-Z Refuge	Cry1Ab Cry1F Vip3A mCry3A eCry3.1Ab	BCW CEW ECB FAW SB SWCB TAW WBC	RW	GT	5% RIB
HERCULEX					
Herculex 1 (HX1)	Cry1F	BCW ECB FAW SB SWCB WBC *CEW*	---	LL	20% structured ½ mile
Herculex RW (HXRW)	Cry34/35Ab1	---	RW	RR2 (most)	20% structured w/in, adj
Herculex XTRA (HXX)	Cry1F Cry34/35Ab1	BCW ECB FAW SB SWCB WBC *CEW*	RW		20% structured w/in, adj
OPTIMUM					
Intrasect (YHR)	Cry1F Cry1Ab	BCW ECB FAW SB SWCB WBC *CEW*	---	LL RR2	5% structured ½ mile
AcreMax (AM)	Cry1F Cry1Ab	BCW ECB FAW SB SWCB WBC *CEW*	---	LL RR2	5% RIB
[a] Leptra (VYHR) [b] AcreMax Leptra (AML)	Cry1F Cry1Ab Vip3A	BCW CEW ECB FAW SB SWCB TAW WBC	---	LL RR2	[a] 5% structured ½ mile [b] 5% RIB
AcreMax RW (AMRW)	Cry34/35Ab1	---	RW	LL RR2	10% RIB
AcreMax1 (AM1)	Cry1F Cry34/35Ab1	BCW ECB FAW SB SWCB WBC *CEW*	RW	LL RR2	10% RIB (RW) + 20% structured ½ mile (ECB)
TRIsect (CHR)	Cry1F mCry3A	BCW ECB FAW SB SWCB WBC *CEW*	RW	LL RR2	20% structured w/in, adj
[a] Intrasect TRIsect (CYHR) [b] AcreMax TRIsect (AMT)	Cry1F Cry1Ab mCry3A	BCW ECB FAW SB SWCB WBC *CEW*	RW	LL RR2	[a] 20% structured w/in, adj [b] 10% RIB
[a] Intrasect Xtra (YXR) [b] AcreMax Xtra (AMX)	Cry1F Cry1Ab Cry34/35Ab1	BCW ECB FAW SB SWCB WBC *CEW*	RW	LL RR2	[a] 20% structured w/in, adj [b] 10% RIB
[a] Intrasect Xtreme (CYXR) [b] AcreMax XTreme (AMXT)	Cry1F Cry1Ab mCry3A Cry34/35Ab1	BCW ECB FAW SB SWCB WBC *CEW*	RW	LL RR2	[a] 5% structured w/in, adj [b] 5% RIB
YIELDGARD / GENUITY					
YieldGard CB (YGCB)	Cry1Ab	ECB SWCB *CEW FAW SB*	---	RR2	20% structured ½ mile
YieldGard VT Rootworm	Cry3Bb1	---	RW	RR2	20% structured w/in, adj
YieldGard VT Triple	Cry1Ab Cry3Bb1	ECB SWCB *CEW FAW SB*	RW	RR2	20% structured w/in, adj
[a] Genuity VT Double PRO [b] or 'RIB complete'	Cry1A.105 Cry2Ab2	CEW ECB FAW SB SWCB	---	RR2	[a] 5% structured ½ mile [b] 5% RIB
[a] Genuity VT Triple PRO [b] or 'RIB complete'	Cry1A.105 Cry2Ab2 Cry3Bb1	CEW ECB FAW SB SWCB	RW	RR2	[a] 20% structured w/in, adj [b] 10% RIB
[a] Genuity SmartStax [b] or 'RIB Complete'	Cry1A.105 Cry2Ab2 Cry1F Cry3Bb1 Cry34/35Ab1	BCW CEW ECB FAW SB SWCB WBC	RW	LL RR2	[a] 5% structured w/in, adj [b] 5% RIB
OTHERS					
[a] Powercore [b] Powercore Refuge Adv.	Cry1A.105 Cry2Ab2 Cry1F	BCW CEW ECB FAW SB SWCB WBC	---	LL RR2	[a] 5% structured ½ mile [b] 5% RIB
[a] Smartstax [b] Smartstax Refuge Adv.	Cry1A.105 Cry2Ab2 Cry1F Cry3Bb1 Cry34/35Ab1	BCW CEW ECB FAW SB SWCB WBC	RW	LL RR2	[a] 5% structured w/in, adj [b] 5% RIB