

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 also lead to questions or cause confusion about their spectrum of control or refuge requirements to delay resistance. This bulletin provides a handy one-stop-guide to understand sales materials, bag tags, and the hybrids you purchase.

Table 1 lists the names of the important 'events' (transformations of one or more genes) in corn, their more familiar Trade Names, the protein(s) expressed, and their pest targets. Table 2 lists specific trait packages (combinations of events) sold by various seed companies, with their spectrum of control and refuge requirements. In recent years, the pyramiding of Bt traits allowed for the reduction of some refuges from 20% to 10% or 5%, depending on the trait package. Some hybrids still require a structured refuge planted as a block or series of rows, but many hybrids are now sold as a convenient refuge-in-the-bag (RIB). But it is still important to take the following steps:

- * Understand the **biology** of each trait, the expected level of control, and refuge requirements;
- * **Confirm that the seed you ordered the previous year** is the seed delivered in the spring;
- * Keep good **planting records** and save a representative sample of **bag tags**;
- * For herbicide applications, **Ask Twice-Spray Once**, especially if you hire a custom applicator;
- * Most important, if you see **unexpected damage or poor performance** of a trait (especially damage from corn rootworm), 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.

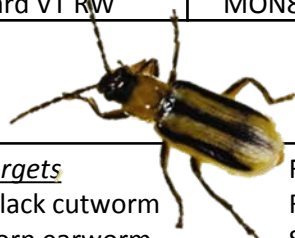


This is critical to **identify and manage cases of rootworm Bt resistance**.

This bulletin strives for completeness, but keeping track of Bt traits isn't easy. For a searchable, easy-to-use database of GM crop approvals, see the ISAAA web site at <http://www.isaaa.org/gmapprovaldatabase>

Table 1. Event names for proteins expressed in Bt corn plants

Trade name	Event name	Protein(s) expressed	Insect Target or Herbicide Activity
Agrisure CB/LL	Bt11	Cry1Ab+PAT	corn borer + <i>glufosinate tolerance</i>
Agrisure Duracade	5307	eCry3.1Ab	rootworm
Agrisure RW	MIR604	mCry3A	rootworm
Agrisure Viptera	MIR162	Vip3Aa	broad lesp control
Herculex 1 or CB	TC1507	Cry1F + PAT	corn borer + <i>glufosinate tolerance</i>
Herculex RW	DAS-59122-7	Cry34Ab1/Cry35Ab1+PAT	rootworm + <i>glufosinate tolerance</i>
Roundup Ready 2	NK603	CP4 EPSPS	<i>glyphosate tolerance</i>
YieldGard CB	MON810	Cry1Ab	corn borer
YieldGard VT Pro	MON89034	Cry1A.105+Cry2Ab2	broad lesp control
YieldGard VT RW	MON88017	Cry3Bb1+CP4 EPSPS	rootworm + <i>glyphosate tolerance</i>



Abbreviations used in Table 2 on page 2

Insect targets

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

Herbicide activity

GT	<i>glyphosate tolerant</i>
LL	Liberty Link, <i>glufosinate-tolerant</i>
RR2	Roundup Ready 2, <i>glyphosate-tolerant</i>

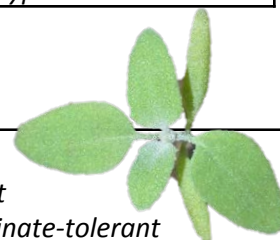


Table 2. Bt corn trait packages, with spectrum of control and refuge requirements. (Updated April 2015)

Trait Family Product	Bt protein(s)	Insects controlled or suppressed Above-ground-----In soil	Herbicide tolerant?	Refuge %, placement (for the MIDWEST)	
AGRISURE					
Agrisure CB/LL/RW	Cry1Ab mCry3A	ECB CEW FAW SB	RW	LL	20% structured-adjacent
Agrisure 3000GT	Cry1Ab mCry3A	ECB CEW FAW SB	RW	GT LL	20% structured-adjacent
Agrisure Artesian 3011A	Cry1Ab mCry3A	ECB CEW FAW SB	RW	GT LL	20% structured-adjacent
Agrisure Viptera 3110	Cry1Ab Vip3A	BCW CEW ECB FAW SB WBC	---	GT LL	20% structured-½ mile
Agrisure Viptera 3111	Cry1Ab mCry3A Vip3A	BCW CEW ECB FAW SB WBC	RW	GT LL	20% structured-adjacent
Agrisure 3122 E-Z Refuge	Cry1Ab Cry1F mCry3A Cry34/35Ab1	BCW ECB FAW WBC CEW SB	RW	GT	5% in the bag (RIB)
Agrisure Viptera 3220 E-Z Refuge	Cry1Ab Cry1F Vip3A	BCW CEW ECB FAW SB WBC	---	GT	5% in the bag (RIB)
Agrisure Duracade 5122 E-Z Refuge	Cry1Ab Cry1F mCry3A eCry3.1Ab	BCW CEW ECB FAW SB WBC	RW	GT	5% in the bag (RIB)
Agrisure Duracade 5222 E-Z Refuge	Cry1Ab Cry1F Vip3A mCry3A eCry3.1Ab	BCW CEW ECB FAW SB WBC	RW	GT	5% in the bag (RIB)
HERCULEX					
Herculex 1 (HX1)	Cry1F	BCW ECB FAW WBC CEW	---	LL	20% structured-½ mile
Herculex RW (HXRW)	Cry34/35Ab1	----	RW	RR2 (most)	20% structured-adjacent
Herculex XTRA (HXX)	Cry1F Cry34/35Ab1	BCW ECB FAW WBC CEW	RW		20% structured-adjacent
OPTIMUM					
TRIssect	Cry1F mCry3A	BCW ECB FAW WBC CEW	RW	LL RR2	20% structured-adjacent
Intrasect	Cry1F Cry1Ab	BCW ECB FAW WBC CEW SB	---	LL RR2	5% structured-½ mile
Intrasect Leptra	Cry1F Cry1Ab Vip3A	BCW CEW ECB FAW SB WBC	---	LL RR2	5% structured-adjacent
Intrasect XTra	Cry1F Cry1Ab Cry34/35Ab1	BCW ECB FAW WBC CEW SB	RW	LL RR2	20% structured-adjacent
Intrasect XTreme	Cry1F Cry1Ab mCry3A Cry34/35Ab1	BCW ECB FAW WBC CEW SB	RW	LL RR2	5% structured-adjacent
AcreMax (AM)	Cry1F Cry1Ab	BCW ECB FAW WBC CEW SB	---	LL RR2	5% in the bag (RIB)
AcreMax RW (AMRW)	Cry34/35Ab1	---	RW	LL RR2	10% in the bag (RIB)
AcreMax1 (AM1)	Cry1F Cry34/35Ab1	BCW ECB FAW WBC CEW	RW	LL RR2	10% in the bag (RW) & 20% structured-½ mile (CB)
AcreMax TRIssect (AMT)	Cry1F Cry1Ab mCry3A	BCW ECB FAW WBC CEW SB	RW	LL RR2	10% in the bag (RIB)
AcreMax Xtra (AMX)	Cry1F Cry1Ab Cry34/35Ab1	BCW ECB FAW WBC CEW SB	RW	LL RR2	10% in the bag (RIB)
AcreMax XTrem (AMXT)	Cry1F Cry1Ab mCry3A Cry34/35Ab1	BCW ECB FAW WBC CEW SB	RW	LL RR2	5% in the bag (RIB)
YIELDGARD / GENUITY					
YieldGard CB (YGCB)	Cry1Ab	ECB CEW FAW SB	---	RR2	20% structured-½ mile
YieldGard VT Rootworm	Cry3Bb1	----	RW	RR2	20% structured-adjacent
YieldGard VT Triple	Cry1Ab Cry3Bb1	ECB CEW FAW SB	RW	RR2	20% structured-adjacent
Genuity VT Double PRO or as RIB complete	Cry1A.105 Cry2Ab2	CEW ECB FAW SB	---	RR2	5% structured-½ mile 5% in the bag (RIB)
Genuity VT Triple PRO or as RIB complete	Cry1A.105 Cry2Ab2 Cry3Bb1	CEW ECB FAW SB	RW	RR2	20% structured-adjacent 10% in the bag (RIB)
Genuity SmartStax RIB Complete	Cry1A.105 Cry2Ab2 Cry1F Cry3Bb1 Cry34/35Ab1	BCW CEW ECB FAW SB WBC	RW	LL RR2	5% in the bag (RIB)
OTHER					
Smartstax (Mycogen) or as Refuge Advanced	Cry1A.105 Cry2Ab2 Cry1F Cry3Bb1 Cry34/35Ab1	BCW CEW ECB FAW SB WBC	RW	LL RR2	5% structured-adjacent 5% in the bag (RIB)
Powercore	Cry1A.105 Cry2Ab2 Cry1F	BCW CEW ECB FAW	This product is pending approvals		