

Seed Treatments and Bt Corn

- Seed corn anxiety – over \$200 per bag
- increase in price due to addition of seed treatments, transgenic traits, inflation, ...
- our job – help explain and interpret
- consistency in use of terms, avoid shortcuts and jargon

Transgenic Products

each has its own official name,
abbreviation, and product icon

**See Table 3 from Alabama
Cooperative Extension System
2010 Corn IPM Guide**

Transgenic Corn Brand Names



YieldGard
Agrisure
Herculex
Genuity

**Not enough information to
tell what kind of
transgenic technology is
in the bag**

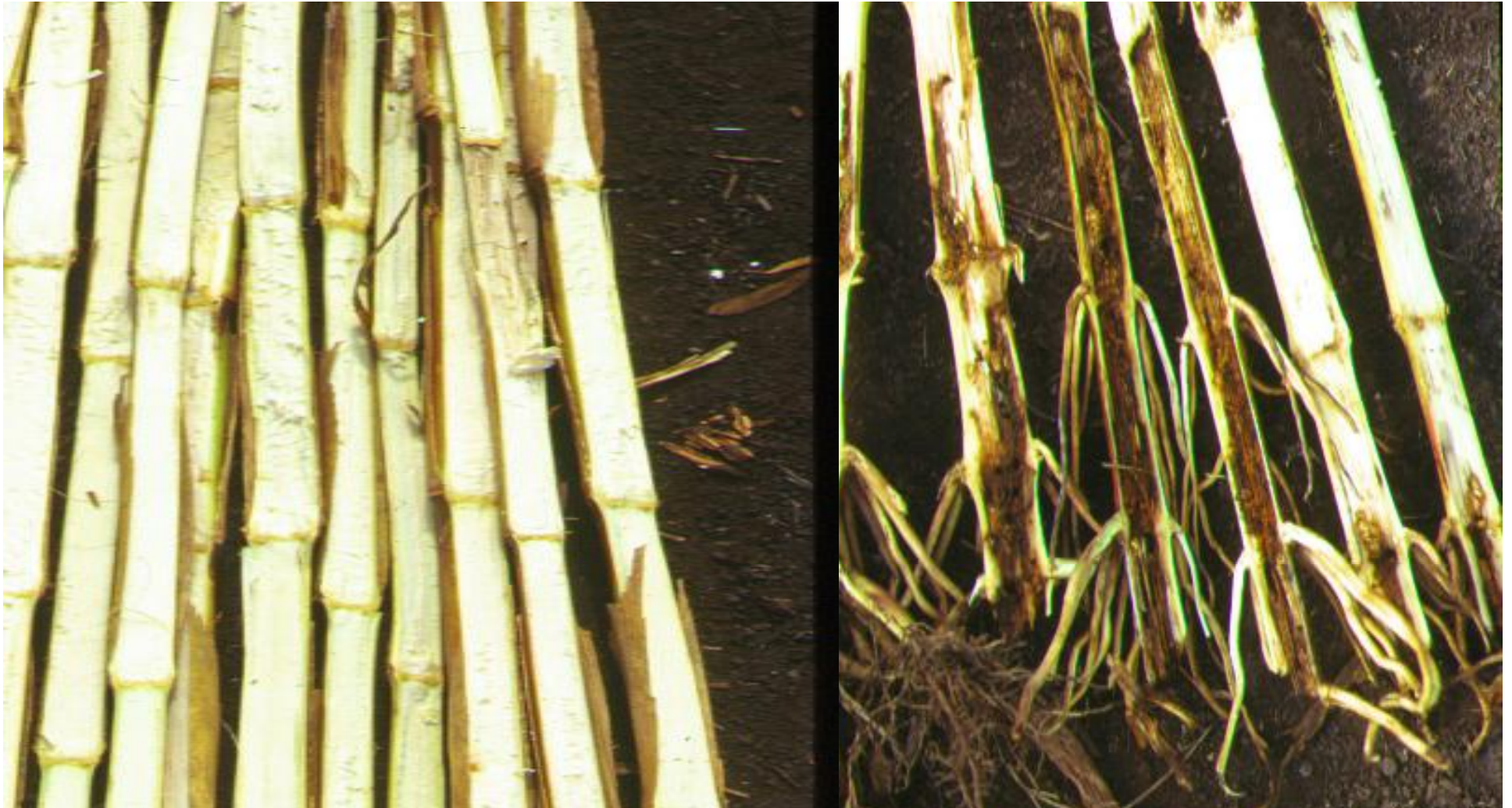
What is in That Bag of Seed?

Look for trademark icons on the bag



image courtesy Roger Leonard, LSU

images courtesy industry web sites

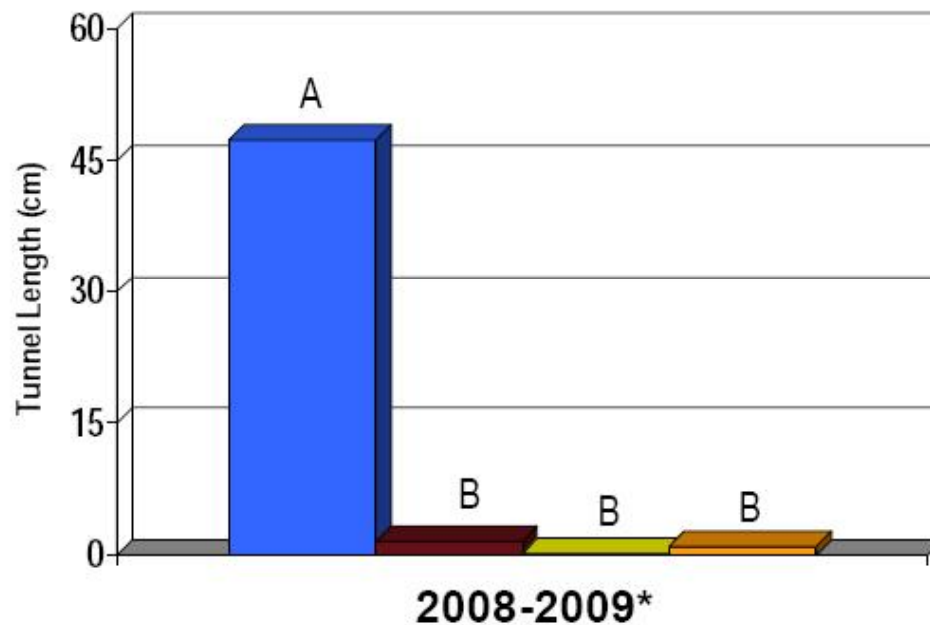


All of the "Above-Ground Caterpillar" kinds of Bt corn in Table 3 provide excellent control of stalkborers such as sugarcane borer



Sugarcane Borer Stalk Protection

■ non-Bt ■ Herculex XTRA ■ Genuity VT Triple Pro ■ SmartStax



Bt Non-Bt
Stalk Lodging Protection

Means designated with the same letter are not significantly different, Tukey's honest significant difference test, $P \leq 0.05$.

*Summary across 2 trials from Dr. Roger Leonard, LSU AgCenter and 1 from Egypt, Texas.

The products differ in how well they can control other caterpillar pests



photos courtesy R. Leonard, LSU

Table 3. Relative Efficacy of Various Bt Corn Products¹

version 2010.2

Product Trade Name (Abbreviation)	Corn Earworm (ear)	Fall Armyworm (whorl)	Corn Borer's (stalk)	Western Corn Rootworm (roots)	Back Cutworm (seedling)	Lesser-Cornstalk Borer ¹	Refuge Requirement ¹	Original Target Pests (Bt Protein)	Event(s)
Bt Corn for Controlling Above-Ground Caterpillars (Moths, Lepidoptera)									
Herclalex I (BT (HX 1))	Poor-Fair ²	Excellent	Excellent	None	Good	Good-Excellent	50%	Corn borer, western bean cutworm, black cutworm and fall armyworm resistance (Cry1F)	TC1507
Agisure CB:LL	Fair-Good	Good	Excellent	None	Poor	Poor-Fair	50%	Liberty (glyphosate) herbicide tolerance	Bt11
YieldGuard Corn Borer ³ (YGCb)	Fair-Good	Good	Excellent	None	Poor	Poor-Fair	50%	Corn borer protection (Cry1Ab)	MON 810
YieldGuard VT Pro (VT)	Very Good	Excellent	Excellent	None	Poor	Poor-Fair	20%	Corn borer, fall armyworm, corn earworm protection (Cry1A.105 and Cry2Ab)	MON 89034
Bt Corn for Controlling Below-Ground Rootworms (Beetles, Coleoptera)									
Agisure RW	None	None	None	Fair-Good	None	None	20%	Corn rootworm protection (modified Cry3A)	MIR604
Herclalex RW (RW (HARW))	None	None	None	Excellent	None	None	20%	Corn rootworm resistance (Cry34/35Ab1) Liberty (glyphosate herbicide tolerance)	DAS-39.22-7
YieldGuard Rootworm (YGRW)	None	None	None	Good	None	None	20%	Corn rootworm protection (Cry3Bb)	MON 863
YieldGuard VT Rootworm-RR2 (VTRR2)	None	None	None	Excellent	None	None	20%	Corn rootworm protection (Cry3Bb) Roundup (glyphosate) herbicide tolerance	MON 88017
Bt Corn for Controlling Above-Ground Caterpillars (Lepidoptera) and Below-Ground Rootworms (Coleoptera)									
YieldGuard Plus (YGPL)	Fair-Good	Good	Excellent	Good	Poor	Poor-Fair	50%	Corn borer protection (Cry1Ab) Corn rootworm protection (Cry3Bb)	MON 810 MON 863
YieldGuard VT Triple (VT3)	Fair-Good	Good	Excellent	Excellent	Poor	Poor-Fair	50%	Corn borer protection (Cry1Ab) Corn rootworm protection (Cry3Bb) Roundup (glyphosate) herbicide tolerance	MON 810 MON 88017
Agisure CB:LL:RW	Fair-Good	Good	Excellent	Fair-Good	Poor	Poor-Fair	50%	Corn borer protection (Cry1Ab) Corn rootworm protection (modified Cry3A) Liberty (glyphosate) herbicide tolerance	Bt11 MIR604

continued

¹ Revised slightly from Alabama Cooperative Extension System 2010 Corn IPM Guide, <http://www.aces.edu/pubs/docs/A/ANR-0500-A/VC01-2010/corn.pdf>

e
e-

Original Target Pests (Bt Protein)

Event(s)

Corn borer, western bean cutworm, black cutworm and fall armyworm resistance

TC1507

(Cry1F)

Liberty (glufosinate) herbicide tolerance

Corn borer protection (Cry1Ab)

Bt11

Liberty (glufosinate) herbicide tolerance

Corn borer protection (Cry1Ab)

MON810

Corn borer, fall armyworm, corn earworm protection (Cry1A.105 and Cry2Ab)

MON89034

4 caterpillar-active protein combos

Gene event	Proteins	e.g.,
Mon810	Cry1Ab	YGCB
Bt11	Cry1Ab	Agrisure CB/LL
TC1507	Cry 1F	HXI
Mon89034	Cry1A.105 +Cry2Ab	GENVT3P
2011:		
MIR162	VIP3A	Agrisure Viptera

Genuity VT Triple Pro (GENVT3P)

Gene event

Mon810

Bt11

TC1507

Mon89034

2011:

MIR162

Proteins

Cry1Ab

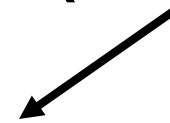
Cry1Ab

Cry 1F

Cry1A.105+Cry2Ab

VIP3A

**Genuity VT Triple
Pro (GENVT3P)**



**also includes herbicide tolerance and western
corn rootworm protection**

Genuity SmartStax (VT3P/HXX)

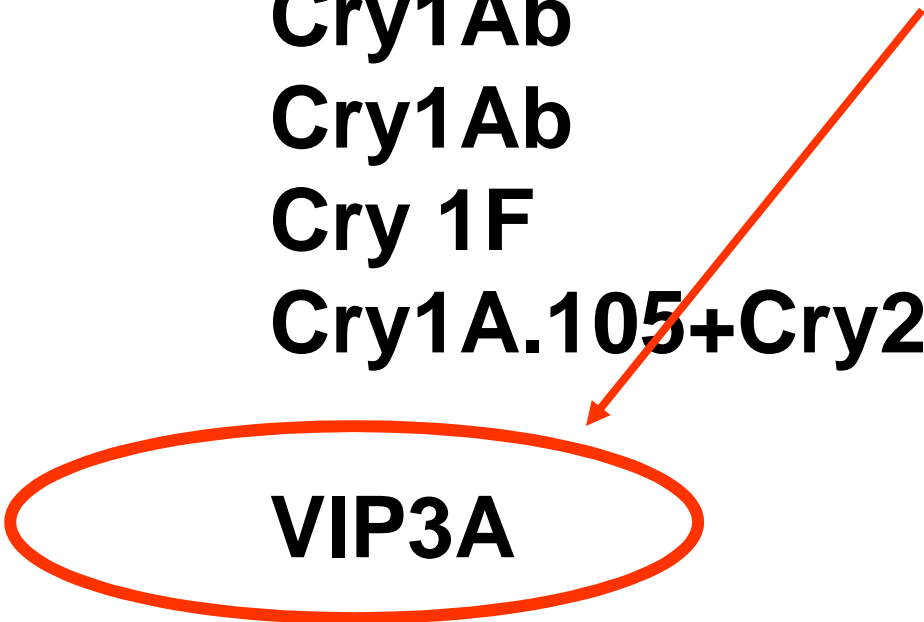
limited in SE in 2010, more in 2011

Gene event	Proteins	Genuity SmartStax (VT3P/HXX)
Mon810	Cry1Ab	
Bt11	Cry1Ab	↙
TC1507	Cry 1F	
Mon89034	Cry1A.105+Cry2Ab	
2011:		
MIR162	VIP3A	

also includes herbicide tolerance and western corn rootworm protection

Products containing Agrisure Viptera available 2011

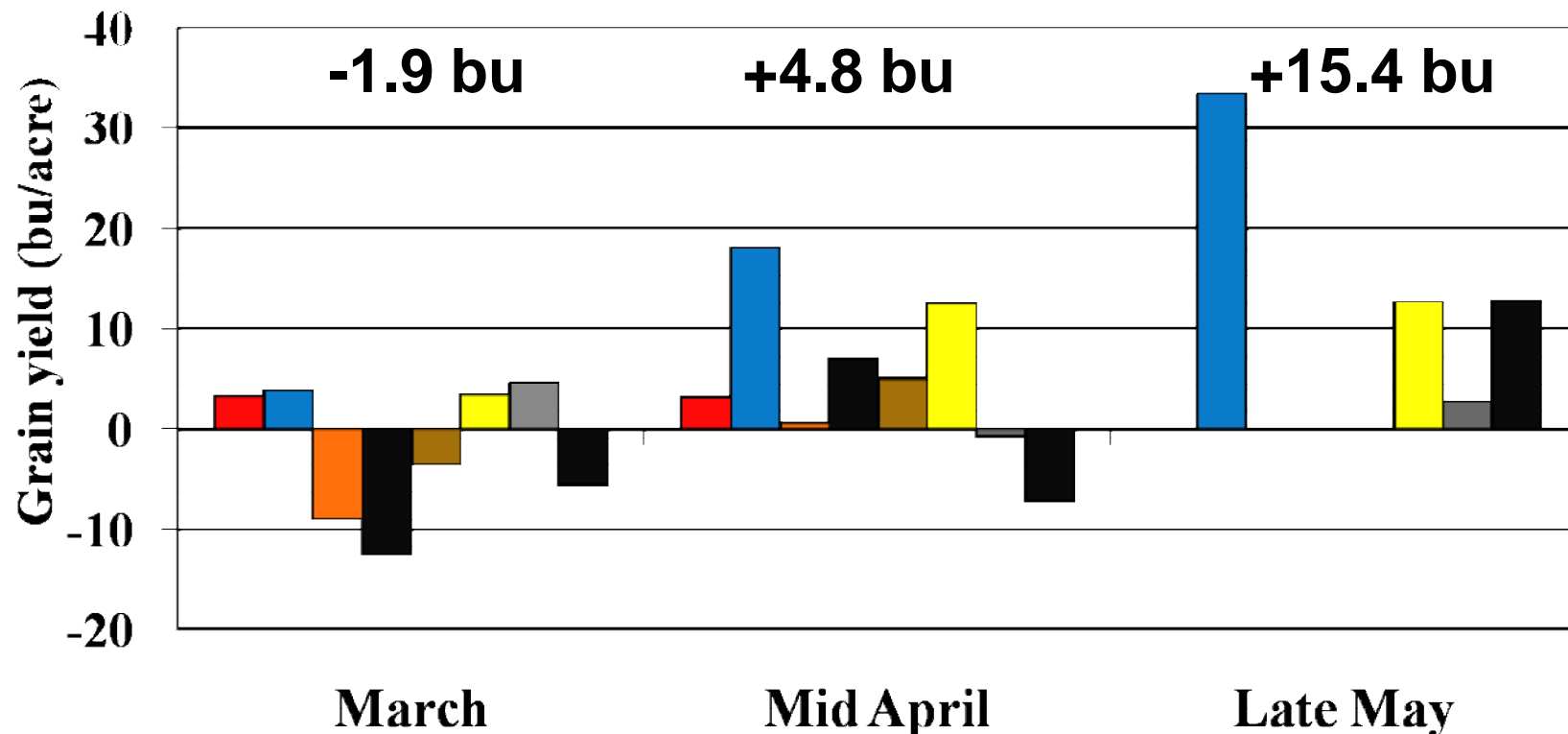
Gene event	Proteins	Agrisure Viptera trait
Mon810	Cry1Ab	
Bt11	Cry1Ab	
TC1507	Cry 1F	
Mon89034	Cry1A.105+Cry2Ab	
2011:		
MIR162	VIP3A	



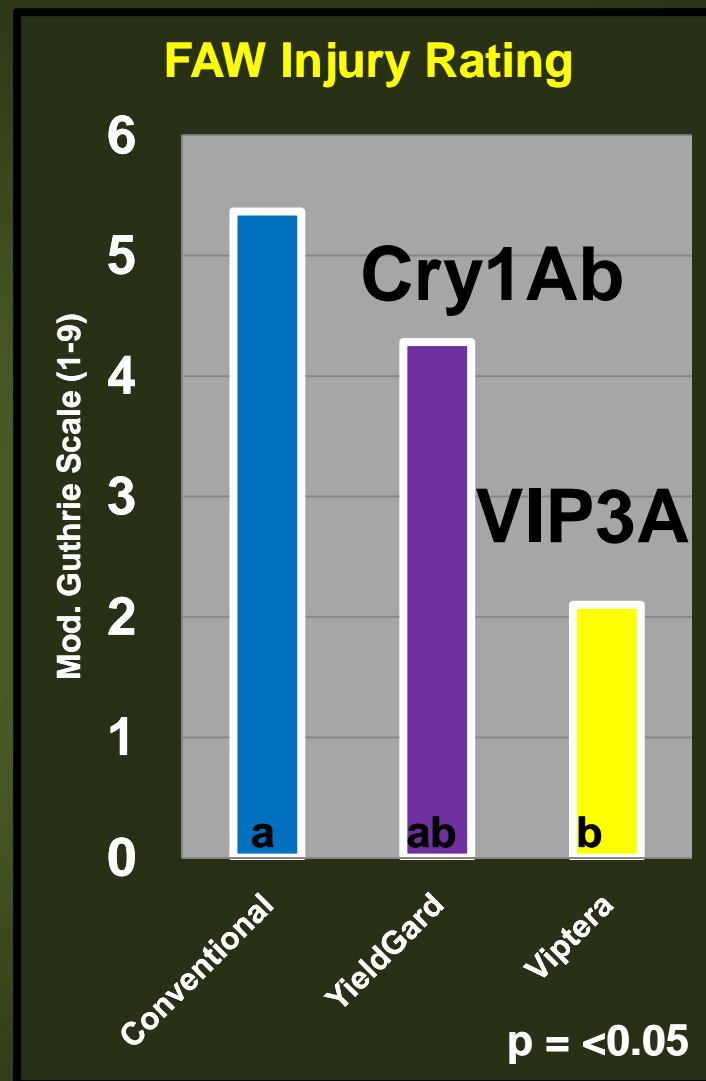
VIP3A will be stacked with genes for corn borer protection, herbicide tolerance and western corn rootworm protection

Yield Difference of Cry1Ab Bt Corn Over Susceptible Corn in South GA

(few or no stalk borers)

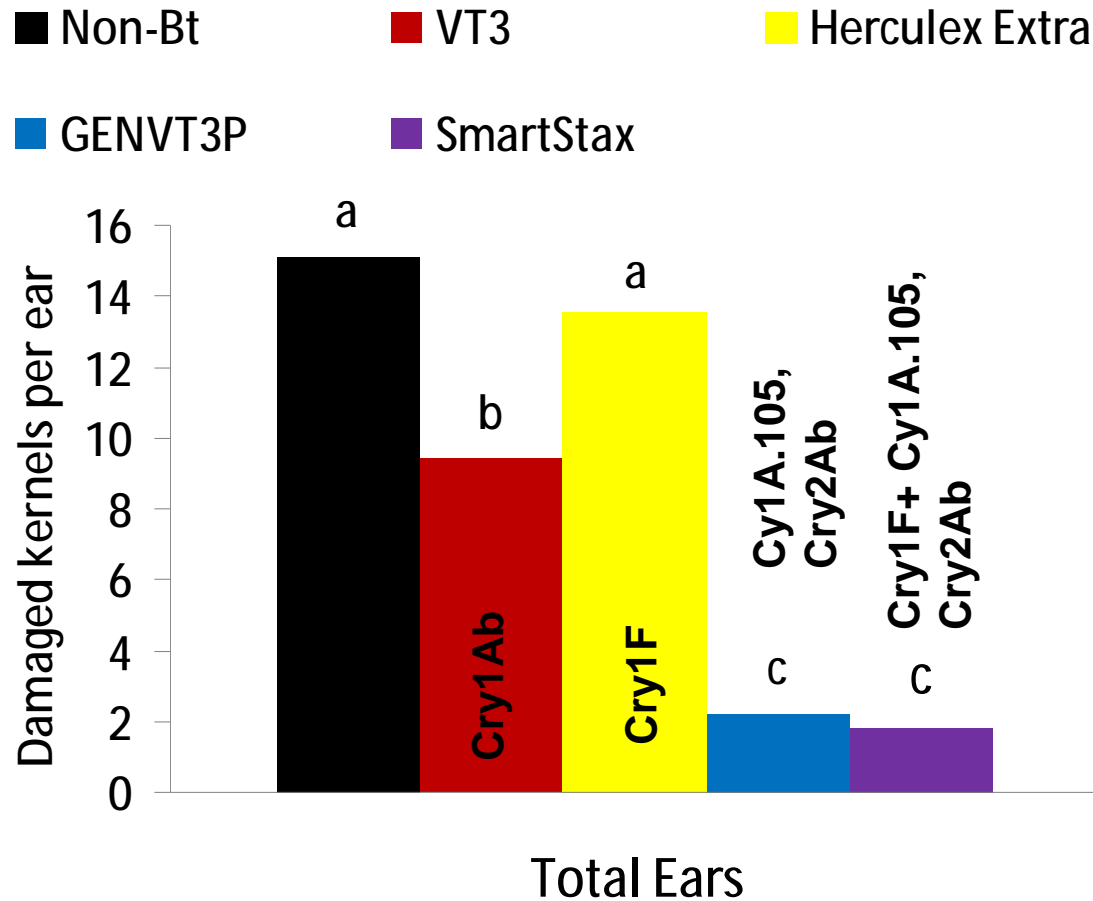


Fall Armyworm



Data courtesy R. Leonard, LSU

Effect of SmartStax and Other Bt Traits on Ear Infestation and Kernel Damage by Corn Earworm



Protected LSD, $P = 0.05$

Slide courtesy David Buntin UGA

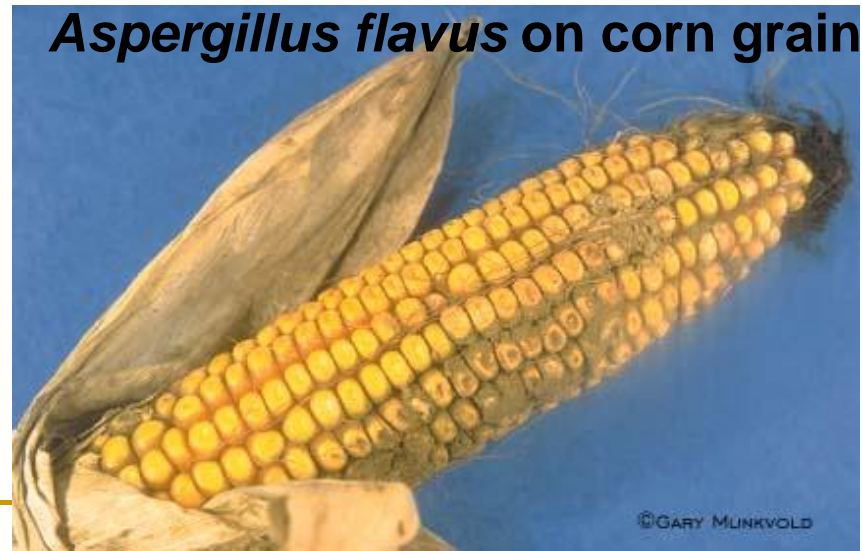
New Bt Traits and Possible Reduction in Aflatoxin Contamination Associated with Insect Ear Damage

New stacked traits:
Initial reports of improved grain quality and possibly reduced aflatoxin contamination

????????????????



Aspergillus flavus on corn grain.



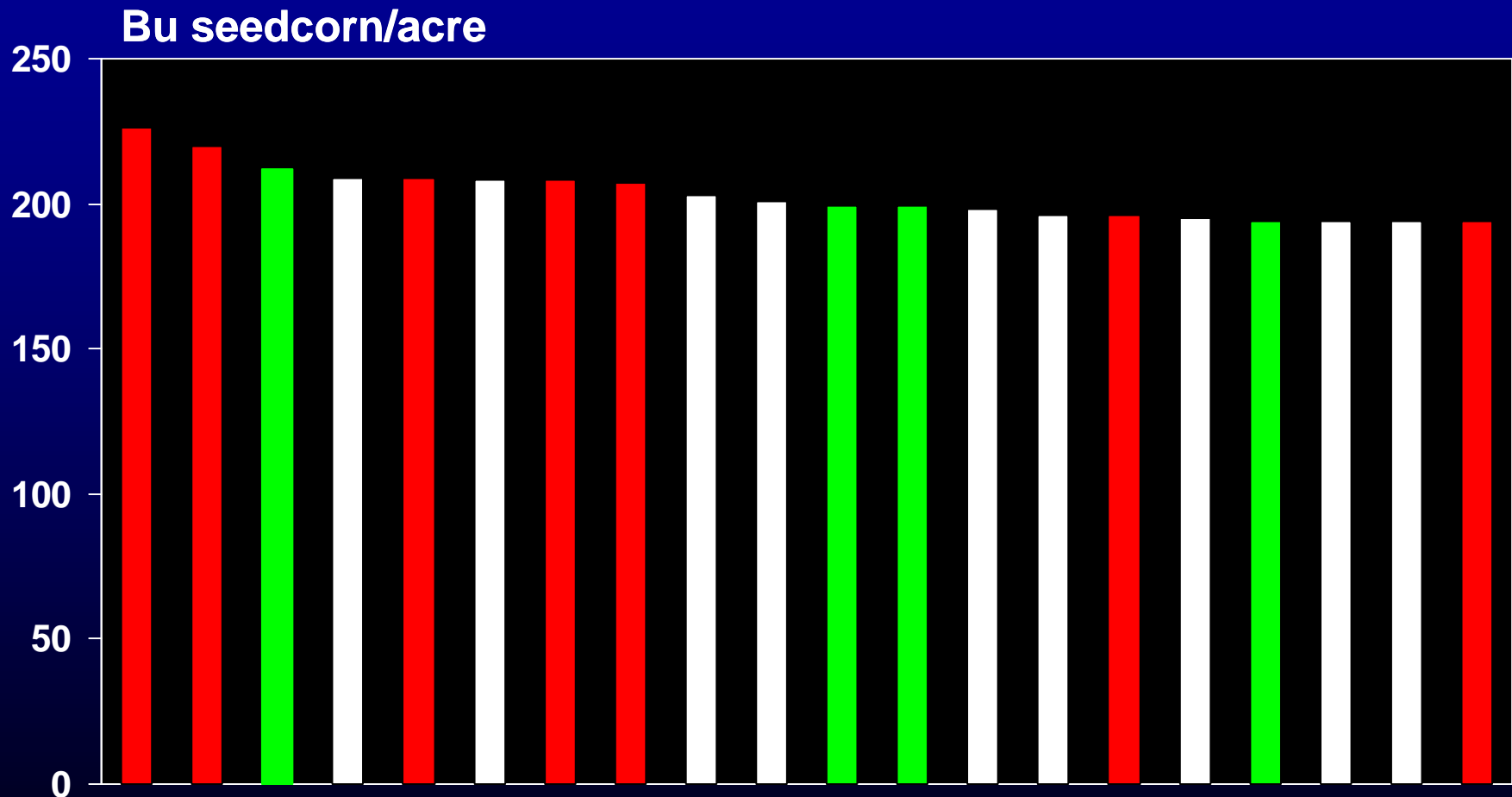
How much does Bt corn for caterpillars cost? Will it be worth it?

- n Cry1Ab or Cry1F costs about \$3.70 per acre
- n Cry1A.105/Cry2Ab (GENVT3P) costs about \$10.50/acre

(compared to the same hybrid with Roundup tolerance alone)

Corn Yield Responses

YieldGard, Herculex, and Stacked Traits



Recommended planting date

2009 Winnsboro OVT's

How much does Bt corn for caterpillars cost? Will it be worth it?

- If stalk borers are present, yield returns of 10 bu/A are not uncommon for any caterpillar Bt corn
- Normal planting date, no corn borers, maybe 3 bu/A advantage for Cry1A.105/Cry2Ab (GENVT3P) – check yield potential of hybrids
- Late planting: GENVT3P gives 3-5 bu over Cry1Ab, 5-15 bu over conventional varieties

Corn earworm and fall armyworm pressure increases with later planting dates



photos courtesy R. Leonard, LSU

The Bottom Line for the Farmer

- Choose corn hybrid well adapted to the farm
- Any of the "Bt corn" products will help protect against sugarcane borers
- If corn has to be planted late, then any of the Bt corn products will help but products with the newer proteins will give the greatest protection from fall armyworm and corn earworm

Genuity VT Triple Pro Cry1A.105/Cry2Ab

Genuity SmartStax Cry1A.105/Cry2Ab+Cry1F

Agrisure Viptera VIP3A + stalk borer

Changes in Refuge Requirements



Bt corn:

Single genes



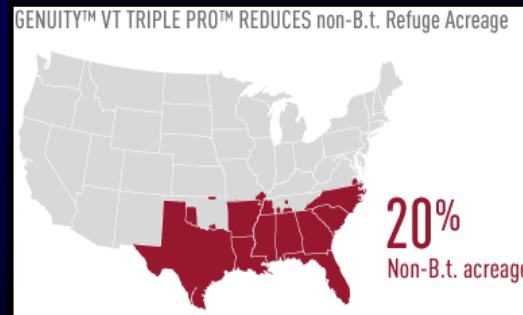
Multiple genes

% non-Bt corn:

50%



20%



What is in That Bag of Seed?

**Seed treatments:
must be listed on the
bag, see Table 2**

***clothianidin* – Poncho
series, Acceleron A6,
A9**

***thiamethoxam* – Cruiser
series, Avicta Complete
Corn,**

***imidacloprid* – Gaucho,
many generics**



Table 2. Corn Seed Treatments and Their Relative Efficacy for Control of Seedling Insect Pests in Field Corn versions on 2010.1

Insecticide Common name, rate	Relative Efficacy of the Seed Treatment ¹												
	Common Billbug	White Crust	White- worms	Seedcorn Maggot	Cutworm ²	Sugarcane Beetle	Southern Green Stink bug	Brown Stink bug	Chinch Bug	Southern Corn Rootworm ³	Western Corn Rootworm	Lesser Granitalk Borer	
PONCHO 250 or Acceleron A8*	NT	F	G	F	F	F	F	NT	G	F, NL	NT	G, NL	
PONCHO 500	F	G	G	F	P	G	F	NL	G	F	F	G, NL	
PONCHO 1250 or Acceleron A9*	G	F	F	F	F	G	G	G, NL	F	F	F	F, NL	
CRUISER EXTREME 250	NT	F	G	F	F	F	F	NT	F	F, NL	NT	G, NL	
CRUISER EXTREME 500 or Avicta Complete corn**	NL	G	G	F	F	F	F	NL	F	F	NL	G, NL	
CRUISER EXTREME 1250	G	F	F	F	F	G	G	NT	F	F	F	F, NL	
GATHIO 600, IMIDA-B-AG 5, FST, SENATOR, IMIDACTOCORUS	NT	G	G	F	NT	NT	NL	NT	F	G, NL	NT	NT	
LATITUDE	NL	F, NL	G	G	NL	NL	NL	NL	F, NL	G, NL	NL	NL	
CONCUR	NL	F	G	G	NL	NL	NL	NL	F, NL	G, NL	NL	NL	
KICKSTART	NL	F, NL	F?	F	NL	NL	NL	NL	NL	F?, NL	NL	NL	
KERNEL GUARD SUPREME KICKSTART VP	NL	F, NL	F?	F	NL	NL	NL	NL	NL	NL	NL	NL	

¹ E = highly effective, C = effective, F = inconsistent results, P = not effective, based on trials in the Southeastern U.S.; L = insect is on the label for this product; LS = manufacturer has indicated the insecticide can suppress, but not control, the particular insect; NT = insect is not on the label for this product. In this case it is best to assume that the product is ineffective against that particular pest, unless there is specific knowledge to the contrary showing good efficacy in the field.

² In the Southeast, several species of cutworms overwinter as medium to large sized larvae. They may be capable of eating considerable numbers of seedlings before they enter the larval stage of the insecticide. Black cutworm, the cutworm that appears on the label of most of these products, has a different life cycle, in which eggs are laid in the spring, so that black cutworm larvae will be small if they have hatched out by the time the corn is planted.

³ Field corn rootworm larvae are a seedling pest, but a field season pest like western corn rootworm larvae.

⁴ Fb = ground, field, and/or corn rootworm.

⁵ C indicates for this active ingredient, are available. See label.

*Acceleron seed treatment also contains 3 fungicides (ipconazole, metalaxyl, and trifloxystrobin)

**Avicta Complete Corn contains a nematocide (abamectin) and three fungicides (mefenoxam, fludioxonil, and azoxystrobin)

Seed Treatments and Coatings



clothianidin, thiomethoxam, imidacloprid

Insect pests of seedling corn

Rootworms



Wireworms



Billbugs



Sugarcane beetles



White grubs



Lesser cornstalk borer



Cutworms



Armyworms



Chinch bugs



Stinkbugs



Seed corn maggot



Early season insects in corn

- lots of them, living in the soil or on the soil surface
- hard to scout for
- make decision to use "insurance" based on risk
- Since most seed is treated with an insecticide seed treatment the decision is what rate of seed treatment to order

What Rate Should Be Used

for Louisiana, the 250 mg
a.i./kernel rate of clothianidin or
thiamethoxam is probably not
enough

order the 500 rate if possible

high risk situations: 1250 rate may
pay off

Watch Out for Overwintering Cutworms

- Large caterpillars can eat quite a few seedlings before they die
- No-till or cover crop fields: burn down at least 30 days before planting or overspray with a cheap pyrethroid

alabamacrops.com

- IPM Guides tab
- pick "corn"

- the official 2010 versions of Tables 2&3 in the IPM Guide are slightly older than the handouts passed out today