



MONSANTO

Corn & Soybean Biotech Traits

- QA/QC Requirements -



ICIA Seminar
October 7, 2011

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Discussion

- Trait QA/QC
 - corn & soybeans
- Refuge blends
- Q & A



Trait QA/QC - Corn



Inbred corn seed

- 'Intended' and 'unintended' event testing

Hybrid corn seed

- *Product performance...*
 - one time hybrid qualification to check for background interference
 - encompasses trait efficacy or tolerance and commercial yield/agronomic performance
- *Trait purity...*
 - levels must be tested for each seed lot produced

Corn Trait Purity Testing



- Commonly asked questions
 - Do I have to test purity for every trait on every lot?
 - Is testing trait purity on a production field sufficient even if split into multiple lots?
 - Is it acceptable to conduct trait purity tests on bulk batches and minimize bag testing?
 - Do I need to test trait purity if corn units are purchased on the wholesale market?
 - If I re-bag, do I need to conduct trait purity testing?
 - Is trait purity testing on a '3x1' and '2x2' GenSS hybrid the same?

Corn Trait Purity Testing



- All hybrid seed lots must meet trait purity specifications prior to commercial sale.
- Bulk/sheller run tests
 - can complement BUT, does not replace finished lot tests
- One test per finished lot if trait is on the Female
- Each grade size of each finished lot must be tested when trait is on the Male inbred

Corn Trait Purity Testing



- Seed companies are responsible for maintaining copies of all trait purity tests including...
 - Wholesale purchases
 - Seed produced by
 - Growers
 - Subcontractors
 - Brokers
- When a hybrid is issued a new lot number, an additional trait purity test is required

Example:

blending several lots together to form one new lot

Requirements for Trait Testing GENVT2P hybrid seed



- ***Example of a seed testing scheme to validate minimum hybrid trait purity specifications –***

MON89034 (Cry2Ab and TIC105)	96%
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NK603 (CP4)	98%
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Requirements for Trait Testing GENVT2P hybrid seed



		Trait on Female Inbreds	
		Preliminary Testing	Finished Testing
EITHER	Test 400 seed BULK sample for herbicide tolerance and 90 seed BULK sample for Cry2Ab	AND	If 98% positive for herbicide tolerance, test 200 seeds/lot for herbicide tolerance ($\geq 98\%$ positive) and 30 seeds/lot for Cry2Ab at bagging ($\geq 96\%$ positive).
			If NOT 98% positive, test 400 seeds for herbicide tolerance ($\geq 98\%$ positive); If NOT 96% positive for Cry2Ab, test 90 seeds for Cry2Ab ($\geq 96\%$ positive) per graded seed lot.

		Trait on Male Inbreds	
		Preliminary Testing	Finished Testing
AND	Test 400 seed per size of a hand-graded BULK sample for herbicide tolerance ($\geq 98\%$) and 90 seed for Cry2Ab per size of a hand-graded BULK sample	AND	If 98% positive for herbicide tolerance, test 200 seeds/lot for herbicide tolerance ($\geq 98\%$ positive) and 30 seeds/lot for Cry2Ab at bagging ($\geq 96\%$ positive).
			If NOT 98% positive, test 400 seeds for herbicide tolerance ($\geq 98\%$ positive). If NOT 96% positive for Cry2Ab, test 90 seeds for Cry2Ab ($\geq 96\%$ positive) per graded seed lot.

OR	No BULK testing	AND	Test 400 seeds for herbicide tolerance ($\geq 98\%$ positive) and 90 seeds for Cry2Ab ($\geq 96\%$ positive) per graded seed lot.
			If NOT 96% positive for Cry2Ab, test 90 seeds for Cry2Ab ($\geq 96\%$ positive) per graded seed lot.

AND	No BULK testing	AND	Test 400 seeds for herbicide tolerance ($\geq 98\%$ positive) and 90 seeds for Cry2Ab ($\geq 96\%$ positive) per graded seed lot.
			If NOT 96% positive for Cry2Ab, test 90 seeds for Cry2Ab ($\geq 96\%$ positive) per graded seed lot.

Requirements for Trait Testing GENVT3P hybrid seed



- ***Example of a seed testing scheme to validate minimum hybrid trait purity specifications –***

MON88017 (CP4 and Cry3Bb)	98/96%
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MON89034 (Cry2Ab and TIC105)	96%
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Requirements for Trait Testing GENVT3P hybrid seed



		Trait on Female Inbreds		Trait on Male Inbreds	
		Preliminary Testing	Finished Testing	Preliminary Testing	Finished Testing
EITHER	Test 400 seed BULK sample for herbicide tolerance and 90 seed BULK sample for Cry2Ab	AND	<p>If 98% positive for herbicide tolerance, test 200 seeds/lot for herbicide tolerance ($\geq 98\%$ positive) and 30 seeds/lot for Cry2Ab and Cry3Bb at bagging ($\geq 96\%$ positive).</p> <p>If NOT 98% positive, test 400 seeds for herbicide tolerance ($\geq 98\%$ positive) and 30 seeds/lot for Cry3Bb ($\geq 96\%$ positive).</p> <p>If NOT 96% positive for Cry2Ab, test 90 seeds for Cry2Ab ($\geq 96\%$ positive) per graded seed lot.</p>	AND	<p>Test 400 seed per size of a hand-graded BULK sample for herbicide tolerance ($\geq 98\%$) and 90 seed for Cry2Ab per size of a hand-graded BULK sample</p> <p>AND</p> <p>If 98% positive for herbicide tolerance, test 200 seeds/lot for herbicide tolerance ($\geq 98\%$ positive) and 30 seeds/lot each for Cry2Ab and Cry3Bb at bagging ($\geq 96\%$ positive).</p> <p>If NOT 98% positive, test 400 seeds for herbicide tolerance ($\geq 98\%$ positive) and 30 seeds/lot for Cry3Bb ($\geq 96\%$ positive) per graded seed lot.</p> <p>If NOT 96% positive for Cry2Ab, test 90 seeds for Cry2Ab ($\geq 96\%$ positive) per graded seed lot.</p>
	OR	No BULK testing	AND	<p>Test 400 seeds for herbicide tolerance ($\geq 98\%$ positive), 30 seeds for Cry3Bb and 90 seeds for Cry2Ab ($\geq 96\%$ positive) per graded seed lot.</p> <p>If NOT 98% positive, test 400 seeds for herbicide tolerance ($\geq 98\%$ positive) and 30 seeds/lot for Cry3Bb ($\geq 96\%$ positive) per graded seed lot.</p> <p>If NOT 96% positive for Cry2Ab, test 90 seeds for Cry2Ab ($\geq 96\%$ positive) per graded seed lot.</p>	AND

Requirements for Trait Testing GenSS hybrid seed



- ***Example of a seed testing scheme to validate minimum hybrid trait purity specifications –***

MON88017 x MON89034 x TC1507 x DAS59122-7

(CP4, Cry3Bb, TIC105, Cry2Ab, Cry1F, Cry34, Cry35, PAT)

CP4	98%
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Other events	96%
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Requirements for Trait Testing GenSS hybrid seed



		Trait on Female Inbreds	
		Preliminary Testing	Finished Testing
EITHER	Test as indicated for GENVT3P and 400 seed BULK sample for glufosinate tolerance	AND	Test as indicated for GENVT3P and if 96% positive for glufosinate tolerance, test 200 seeds/lot for glufosinate tolerance and 30 seeds/lot for Cry34 (≥96% positive) at bagging.
			If NOT 96% positive for glufosinate, test 400 seeds for glufosinate tolerance and 90 seeds for both Cry1F and Cry34 per graded seed lot.
OR	No BULK testing	AND	Test as indicated for GENVT3P and test 400 seed for glufosinate tolerance (96% Positive) and 30 seeds/lot for Cry34 (≥96% positive) at bagging. If NOT 96% positive for glufosinate, test 400 seeds for glufosinate tolerance and 90 seeds for both Cry1F and Cry34 per graded seed lot.

		Trait on Male Inbreds	
		Preliminary Testing	Finished Testing
	Test as indicated for both GENVT3P and test 400 seeds per size of a hand-graded BULK sample for glufosinate tolerance (≥96% positive) and 90 seed per size of a hand-graded BULK sample for Cry34.	AND	Test as indicated for GENVT3P and if 96% positive for glufosinate, test 200 seeds for glufosinate tolerance and 30 seeds for Cry1F and Cry34 per lot at bagging.
			Test as indicated for GENVT3P and if NOT 96% positive for glufosinate, test 400 seeds for glufosinate tolerance and 90 seeds for both Cry1F and Cry34 per graded seed lot.
	No BULK testing	AND	Test as indicated for GENVT3P and test 400 seed for glufosinate tolerance (≥96% positive) and 30 seeds/lot for Cry34 (≥96% positive) at bagging. If NOT 96% positive for glufosinate, test 400 seeds for glufosinate tolerance and 90 seeds for both Cry1F and Cry34 per graded seed lot.

Trait QA/QC - Soybeans



Soybean varieties

- *Varietal performance...*
 - ‘Intended’ and ‘unintended’ event testing
 - one time verification of commercial tolerance to Roundup® herbicide and yield performance
- *Trait purity...*
 - levels must be tested for each seed lot produced

Soybean Trait Testing



- Production requirements
 - Crop stage, Roundup® herbicide rate & formulation, application date
- Each finished lot of Roundup Ready® and RR2Y soybeans must be trait purity tested

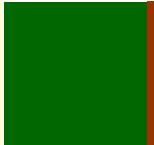
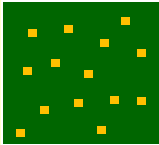
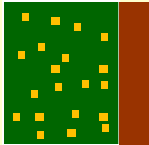
Other corn & soybean requirements



- Retain a file sample of each hybrid and variety for each lot which is consistent with state/federal seed laws.

RIB update

- Blender qualification
- Hybrid specifications
- Seed color
- Trait testing

Product	MON Genuity® SmartStax® & DAS SmartStax	MON Genuity® SmartStax® RIB & DAS SmartStax RIB	Pioneer Optimum® AcreMax™ 1
Above Ground	3 genes	3 genes	1 gene
Below Ground	3 genes	3 genes	2 genes
Herbicide	Glyphosate Glufosinate	Glyphosate Glufosinate	Glyphosate Glufosinate
Refuge Required (Corn Belt)	5% Structured	5% RIB	20% Above Structured 10% Below RIB
Refuge Examples			

Q&A



Contact information...

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