Certified Reference Materials

AOCS 0911-A

Report for the certification process for

Non-modified

Soybean Certified Reference Material

First Batch

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Abstract

This report describes the preparation and certification of the soybean certified reference material (CRM) AOCS 0911-A produced by AOCS Technical Services in 2011. The CRM has been prepared according to ISO Guides 30 through 35 and is intended to serve as control material for third-party testing of soybeans for biotechnology-derived events. The purity of the Non-modified soybeans was verified using BPS-CV127-9 event-specific, qualitative PCR analysis by Eurofins GeneScan, Metairie, LA (an ISO 17025 accredited laboratory). AOCS 0911-A is available in 27-mL glass headspace vials. The soybeans (“non-modified”) were provided by BASF Plant Science L.P. and were clean grain. AOCS devitalized the bulk soybeans at BASF and then transferred the coarsely milled material to AOCS. The soybeans were further processed by grinding the bulk sources according to standard soybean processing protocols by Texas A&M University and were then packaged under a nitrogen gas environment at Illinois Crop Improvement Association. The powder sample shall be stored dry in a sealed container at ambient or lower temperature and in the dark.
Acknowledgements

The authors would like to express sincere appreciation and gratitude to several individuals and their companies for support and guidance throughout this project. Thanks go to Angela McKean, BASF Plant Science L.P., for offering AOCS the opportunity to manufacture and distribute these products; to Richard Clough, Texas A&M University, for providing expertise for milling/processing the soybeans into a uniform blend; to John McKinney, Sandra Harrison, and Charlie Drennan at Illinois Crop Improvement Association for packaging the samples; and to Frank Spiegelhalter, Greg Ditta, E. Pearce Smith, and Daniel Thompson, Eurofins GeneScan for event-specific, qualitative PCR analysis, including the provision of information on running the analyses and interpreting the results.
Glossary

AOCS  American Oil Chemists' Society

BPS-CV127-9  Imidazolinone herbicide-tolerant soybean plants derived from a single transformation event and produced by the introduction of an imidazolinone tolerance-conferring acetohydroxyacid synthase large subunit gene from Arabidopsis thaliana (L.) Heynh. into the soybean plant genome

DNA  Deoxyribonucleic acid is the linear, double-helical macromolecule that makes up the genetic material of most organisms

Detection Limit  Lowest level at which target DNA can exist in a sample and be reliably detected by PCR methods; often abbreviated as “LOD”

EC  European Commission

Genome  The full set of genes and associated DNA characteristic of an organism

GMO  Genetically modified/engineered organism in which the genetic material has been changed through modern biotechnology in a way that does not occur naturally by multiplication and/or natural recombination

ISO  International Organization for Standardization
Non-modified Crop  
Crop variety with no history of modern biotechnology modification and which is produced through plant breeding techniques that rely on selecting and mating parent plants possessing promising traits and repeatedly selecting for superior performance among their offspring.

Modern Biotechnology  
Organism that has had genetic sequences modified using molecular-level techniques.

PCR  
Polymerase Chain Reaction is a technique used to determine whether a sample contains a particular DNA sequence. PCR relies on primer sets that bind to a particular target DNA sequence and a special DNA copying enzyme (DNA polymerase) that generates copies of the target sequence.

Qualitative PCR  
PCR methods that determine the presence or absence of a specific target DNA sequence at a particular limit of detection.
Introduction

Plant biotechnology is an extension of traditional plant breeding. It allows plant breeders to develop crops with specific traits including insect, disease, and herbicide resistance; processing advantages; and nutritional enhancement. An important component for identifying these new traits is a Certified Reference Material created from leaf, seed, or grain containing the new trait as well as a CRM created from the corresponding Non-modified crop. The European Commission (EC) has mandated that from 18 April 2004, a method for detecting a new event derived from modern biotechnology and Reference Material must be available before the EC will consider authorizing a new food or feed derived from modern biotechnology. Several nations outside of Europe also require grain and ingredients to be labeled above a threshold level before accepting a shipment.

To meet the above analytical requirements for biotechnology-derived event determination, AOCS 0911-A was manufactured from soybeans according to ISO Guides 30 through 35 and in accordance with EC No 1829/2003, EC No 641/2004, and EC No 619/2011. The CRM is available from AOCS.

Material Processing

BASF Plant Science L.P. delivered 14 kg of non-modified soybeans, devitalized by AOCS on the BASF premises, to AOCS. The materials were clean grain. Before the materials were shipped to Texas A&M University for processing to a uniform particle size, primary samples were taken from randomly selected areas and depths to form a 3 kg composite sample in accordance with the International Seed Testing Association’s (ISTA) Seed Science and Technology Rules for batches up to 100 kg. Ten (10) working samples of 100 g each were prepared from the composite sample and sent to Eurofins GeneScan, Metairie, LA (an ISO 17025 accredited laboratory) for BPS-CV127-9 event-specific, qualitative PCR analysis. The analyses performed by Eurofins GeneScan were used to assess the purity and homogeneity of the seed lot.
These non-modified soybeans were processed according to industry-standard soybean processing procedures, packaged in 27-mL glass headspace vials, and sealed under a nitrogen gas environment.

**Trait Verification**

The absence of the CV127 trait was assessed on ten (10) random vials of 0911-A. AOCS used the Microsoft Excel Random Number Generator function of Microsoft Excel to select samples for verification of the trait absence. Sample numbers that were randomly selected were sent to Eurofins GeneScan, Metairie, LA (an ISO 17025 accredited laboratory) for BPS-CV127-9 event-specific, qualitative PCR analysis. These results are presented in Table 1. This data shows that no contamination occurred during the packaging of AOCS 0911-A.

**Table 1. Results for the verification of AOCS 0911-A [non-modified soybean] material as tested by Eurofins GeneScan with BPS-CV127-9 event-specific, qualitative PCR analysis.**

<table>
<thead>
<tr>
<th>Sample</th>
<th>BPS-CV127-9 Presence</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOCS 0911-A 34</td>
<td>Negative</td>
</tr>
<tr>
<td>AOCS 0911-A 58</td>
<td>Negative</td>
</tr>
<tr>
<td>AOCS 0911-A 59</td>
<td>Negative</td>
</tr>
<tr>
<td>AOCS 0911-A 161</td>
<td>Negative</td>
</tr>
<tr>
<td>AOCS 0911-A 175</td>
<td>Negative</td>
</tr>
<tr>
<td>AOCS 0911-A 233</td>
<td>Negative</td>
</tr>
<tr>
<td>AOCS 0911-A 331</td>
<td>Negative</td>
</tr>
<tr>
<td>AOCS 0911-A 373</td>
<td>Negative</td>
</tr>
<tr>
<td>AOCS 0911-A 401</td>
<td>Negative</td>
</tr>
</tbody>
</table>
The AOCS 0911-A CRM was prepared from non-modified soybeans. Sample heterogeneity was not considered because there was no blending of non-modified and modern biotechnology-derived soybeans into defined mixtures.

**Certified Value and Measurement Uncertainty**

The genetic purity of the seed lot used to produce AOCS 0911-A was assessed by BASF Plant Science L.P. A total of 3000 soybean seeds were subjected to testing for the presence of CV127 by qualitative event-specific PCR. 3000 of the 3000 seeds tested negative for the presence of CV127. Purity estimation was calculated using SeedCalc8 (Remund et al., 2008). The % impurity in the samples was 0%, when 3000 seeds were tested. Based on the upper bound of true % purity and with 95% confidence, the true certified value is < 1.0 g/kg.

The measurement uncertainty \((U_{CRM})\) is the expanded uncertainty with a coverage factor of 1.65 and a confidence level of 95%. It is obtained by combining the uncertainties from the purity assessment \((u_{char,rel})\) and the homogeneity assessment \((u_{bb,rel})\):

\[
u_{CRM,rel} = \sqrt{u_{char,rel}^2 + u_{bb,rel}^2}
\]

\[
U_{CRM} = 1.65 \times u_{CRM,rel} \times \text{purity estimation} \times 1000 \text{ g/kg}
\]

The expanded measurement uncertainty for this CRM is 0.5 g/kg. It should be noted that the purity estimation (in bold) does not apply to non-genetically modified materials.

**Homogeneity**

The homogeneity of AOCS 0911-A is related to the purity of the seeds. 3000 out of 3000 seeds tested negative for the CV127 soybean trait by event-specific PCR.
sample impurity of 0%, as determined using SeedCalc8, the batch was expected to be homogenous.

After the non-modified soybean seed was ground and bottled as described above, ten samples of AOCS 0911-A were randomly selected using the Microsoft Excel Random Number Generator function and were sent to Eurofins GeneScan, Metairie, LA (an ISO 17025 accredited laboratory) for BPS-CV127-9 event-specific, qualitative PCR analysis. The test results for the non-modified soybean bulk material are presented in Table 2 and further confirm the homogeneity of AOCS 0911-A.

Table 2. Results of the homogeneity testing performed by Eurofins GeneScan on the 0911-A non-modified soybean material.

<table>
<thead>
<tr>
<th>Sample</th>
<th>BPS-CV127-9 Presence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homogeneity Sample 1</td>
<td>Negative</td>
</tr>
<tr>
<td>Homogeneity Sample 2</td>
<td>Negative</td>
</tr>
<tr>
<td>Homogeneity Sample 3</td>
<td>Negative</td>
</tr>
<tr>
<td>Homogeneity Sample 4</td>
<td>Negative</td>
</tr>
<tr>
<td>Homogeneity Sample 5</td>
<td>Negative</td>
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<tr>
<td>Homogeneity Sample 6</td>
<td>Negative</td>
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<tr>
<td>Homogeneity Sample 7</td>
<td>Negative</td>
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<tr>
<td>Homogeneity Sample 8</td>
<td>Negative</td>
</tr>
<tr>
<td>Homogeneity Sample 9</td>
<td>Negative</td>
</tr>
<tr>
<td>Homogeneity Sample 10</td>
<td>Negative</td>
</tr>
</tbody>
</table>
Stability

Stability of these CRMs has been listed as 1 year from the certification date. This material was processed and are stored at ambient or lower temperature, under nitrogen, in glass headspace vials. This material is expected to be stable for longer than the estimated expiration date. The stability of the powder material will be reevaluated at the time of expiration. If the samples are still representative of the certified value, the certificate will be extended.
References


Illinois Crop Improvement Association; 3105 Research Road, Champaign, IL 61822; Telephone: +1 217 359 4053; Fax: +1 217 359 4075. http://www.ilcrop.com, accessed January 31, 2012

International Seed Testing Association; International rules for seed testing: Seed science and technology rules, Volume 21, Supplement, Rules, 1993

ISO Guide 30:1992 (E/F) Terms and definitions used in connection with reference materials


ISO Guide 33:2000 (E) Uses of certified reference materials

ISO Guide 34:2009 (E) General requirements for the competence of reference material producers


ISO 17034:2016 (E) General requirements for the competence of reference material producers
