

Certified Reference Materials

AOCS 0406-A2

Report of the certification process for

Non-Modified

Maize

Second Batch

Zoe Serelis
Technical Services Manager

Tiffanie West
Technical Director



ISO 17034:2016
A2LA Certificate 3438.01

Legal Notice

Neither AOCS nor any person acting on behalf of AOCS is responsible for the use which might be made of the following information.

AOCS Mission Statement

AOCS advances the science and technology of oils, fats, proteins, surfactants, and related materials, enriching the lives of people everywhere.

More information regarding AOCS is available at www.aocs.org

Table of Contents

Abstract.....	4
Acknowledgements.....	5
Glossary.....	6
Introduction	7
Material Processing	7
Trait Verification.....	7
Certified Value and Measurement Uncertainty	8
Homogeneity	8
References.....	10

Abstract

This report describes the preparation and certification of maize CRM AOCS 0406-A2 produced by AOCS Technical Services in 2021. This CRM has been prepared according to ISO 17034:2016 and is intended to serve as control material for third party testing of maize or grain for transformation events. The non-modified maize powder was provided by Bayer CropScience, St. Louis, MO. It was prepared by grinding the bulk seed at Bayer CropScience. The certified value of AOCS 0406-A2 was based on the purity of the bulk seed material and is 0 g/kg. The powder was aliquoted and bottled in 27-mL glass headspace vials and sealed under a nitrogen gas environment at Illinois Crop Improvement Association. The absence of MON 87403, MON 87411, MON 87419, MON 88017, MON 89034, MON 87460, MON 87427, MON 87429, MON 94804, MON 95275 and MON 95379 events in AOCS 0406-A2 was verified using event-specific, qualitative PCR analysis by Eurofins-GeneScan, New Orleans, LA (an ISO 17025-accredited laboratory). CRM samples should be stored in a dry, sealed container at ambient or cooler conditions 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 Jack Milligan, Bayer CropScience, for offering AOCS the opportunity to manufacture and distribute these products; to 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

<i>AOCS</i>	American Oil Chemists' Society
<i>Conventional Crop</i>	Crop variety with no history of modern biotechnology and 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
<i>Cycle threshold (Ct)</i>	Number of PCR cycles required for the fluorescent signal to cross a threshold that exceeds background level
<i>DNA</i>	Deoxyribonucleic Acid
<i>Detection Limit</i>	Lowest level at which target DNA can be detected in a sample and be reliably tested by PCR methods. It is typically expressed as a percentage: the ratio of the number of modern biotechnology derived genomes to the number of crop genomes times 100 percent
<i>EC</i>	European Commission
<i>Genome</i>	The full set of genes and associated DNA characteristic of an organism
<i>GMO</i>	Organism that has had genetic sequences modified using molecular-level techniques
<i>ISO</i>	International Organization for Standardization
<i>PCR</i>	Polymerase Chain Reaction: technique used to determine whether a sample of plant tissue contains a particular DNA sequence. PCR relies on primer sets that zero in on a particular target DNA sequence and a special DNA-copying enzyme (DNA polymerase) that makes enough copies of the target sequence for identification and measurement
<i>Qualitative PCR</i>	PCR methods that determine the presence or absence of a specific target DNA sequence at a particular level of detection
<i>Quantitation Limit</i>	Lowest level at which the amount of target DNA sequence in a sample can be reliably quantified. It is typically expressed as the ration of the number of transgenic genomes to the number of crop genomes times 100 percent
<i>Quantitative PCR</i>	PCR methods that estimate the relative amount of target DNA sequence in a mixture of DNA molecules

Introduction

Plant biotechnology is an extension of traditional plant breeding. It allows plant breeders to develop crops with specific beneficial 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 non-modified bred matrix. The European Commission has mandated that from 18 April 2004, a method for detecting a new biotech event and Certified Reference Material must be available before the EC will consider authorizing acceptance of a new genetically modified crop. Several nations outside Europe also require grain and ingredients to be labeled above a threshold level before accepting a shipment.

To meet the above analytical requirements for GM determination, AOCS 0406-A2 was manufactured from maize seed according to ISO 17034:2016 and in accordance with EC No 1829/2003, EC No 641/2004 and EC No 619/2011. This CRM is available from AOCS.

Material Processing

Bayer CropScience milled ~10 kg of non-modified maize seed. All of the seed powder was passed through a 500 μ m mesh sieve. The seed powder was delivered to AOCS who contracted Illinois Crop Improvement Association for packaging the samples. The powder was aliquoted and bottled in 27-mL glass headspace vials and sealed under a nitrogen gas environment.

Trait Verification

The absence of the MON 87403, MON 87411, MON 87419, MON 88017, MON 89034, MON 87460, MON 87427, MON 87429, MON 94804, MON 95275 and MON 95379 events in the non-modified maize material was assessed on 10 random vials of AOCS 0406-A2. AOCS used the Random Number Generator function of Microsoft Excel to select samples for verification of trait absence. Sample numbers that were randomly selected were sent to Eurofins-GeneScan, New Orleans, LA (an ISO 17025-accredited laboratory) for event-specific, qualitative PCR analysis to verify the absence of the traits in the samples (Table1).

Table 1. Trait verification testing on AOCS 0406-A2 non-modified maize performed by Eurofins- GeneScan, New Orleans, LA (an ISO 17025-accredited laboratory) for absence of MON 87411, MON 87403, MON 88017, MON 89034, MON 87460, MON 87427, MON 87419 and MON 87429.

AOCS 0406-A2 Sample	Trait Presence
Sample # 21	Negative
Sample # 105	Negative
Sample # 158	Negative
Sample # 276	Negative
Sample # 333	Negative
Sample # 475	Negative
Sample # 560	Negative
Sample # 617	Negative
Sample # 722	Negative
Sample # 854	Negative

Certified Value and Measurement Uncertainty

The genetic purity of the seed lot used to produce AOCS 0406-A2 was assessed by Bayer CropScience. A total of 3750 maize seeds were subjected to individual seed testing for the presence of MON 87411, MON 87403, MON 88017, MON 89034, MON 87460, MON 87427, MON 87419 and MON 87429 by qualitative event-specific PCR. 3750 of the 3750 seeds tested negative for the presence of MON 87411, MON 87403, MON 88017, MON 89034, MON 87460, MON 87427, MON 87419 and MON 87429.

Purity estimation was calculated using SeedCalc8 (Remund *et al.*, 2008). The % impurity in the sample was 0%, when 3750 seeds were tested.

The measurement uncertainty is the expanded uncertainty using the value of the upper bound of impurity at 0.8 g/kg. The standard uncertainty can be obtained by dividing the expanded uncertainty by $2\sqrt{3}$ (rectangular distribution).

The standard uncertainty for AOCS 0406-A2 is 0.2 g/kg.

Homogeneity

The homogeneity of AOCS 0406-A2 is related to the purity of the seeds. 3750 out of 3750 seeds tested negative for the MON 87411, MON 87403, MON 88017, MON 89034, MON 87460, MON 87427, MON 87419 and MON 87429 maize event by event-specific PCR. Based on the sample impurity of 0%, as determined using SeedCalc8, the batch was expected to be homogenous.

In addition, the homogeneity of the MON 87403, MON 87411, MON 87419, MON 88017, MON 89034, MON 87460, MON 87427, MON 87429, MON 94804, MON 95275 and MON 95379 trait was confirmed when 10 random vials of AOCS 0406-A2 were selected and were sent to Eurofins-GeneScan, New Orleans, LA (an ISO 17025-accredited laboratory) for event-specific, qualitative PCR analysis to verify the absence of MON 87403, MON 87411, MON 87419, MON 88017, MON 89034, MON 87460, MON 87427, MON 87429, MON 94804, MON 95275 and MON 95379 in the samples (See Trait Verification section and Table 1).

Stability

Time, temperature and light are regarded as the most relevant influences on the stability of CRM (Linsinger, et al., 2001). The influence of light is mitigated by shipping and storing the vials in boxes, thus minimizing the possibility of degradation due to light. The influence of temperature is mitigated by storing the vials in a temperature-controlled room, and shipping vials at ambient temperature.

Stability of these CRMs has been listed as 1 year from the certification date. The materials were processed and are stored at ambient temperature, under nitrogen gas, in 27 mL glass headspace vials. These materials are expected to be stable for longer than the estimated expiration date. The stability of the powder material will be reevaluated at time of expiration. If the samples still test negative for the presence of the intended trait, the certificates will be extended.

References

Eurofins GeneScan; 2219 Lakeshore Drive, Suite 400, New Orleans, LA 70122;
Telephone: +1 504 297 4330 Toll Free: +1 866 535 2730 Fax: +1 504 297 4335
<https://www.eurofinsus.com/food-testing/testing-services/gmo/>

Illinois Crop Improvement Association, 3105 Research Road, Champaign, IL 61826;
Telephone: +1 217 359 4053 Fax: +1 217 359 4075; <https://www.ilcrop.com/>

International Seed Testing Association, International Rules of Seed Testing: Seed Science and Technology Rules, 2012

ISO 17025:2005 and ISO 17025:2017, General Requirements for the Competence of Testing and Calibration Laboratories

ISO 17034:2016, General Requirements for the Competence of Reference Material Producers

Linsinger, T., Pauwels, J., van der Veen, A. *et al.* Homogeneity and stability of reference materials. *Accred Qual Assur* 6, 20–25 (2001). doi.org/10.1007/s007690000261

Regulation (EC) No 1829/2003 of the European Parliament and of the Council of 22 September 2003 on genetically modified food and feed eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32003R1829&from=en

Remund K, Simpson R, Laffont J-L, Wright D, and Gregoire S. Seedcalc8. 2008 <https://www.seedtest.org/en/services-header/tools/statistics-committee/statistical-tools-seed-testing.html>