Detection of maize derived materials by Real-Time PCR — maize detection method using *hmg*

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1 Purpose and Scope

This document describes a taxon-specific quantitative Real-Time PCR method for the determination of the presence of maize DNA. The maize-specific reference assay amplifies a 79 base pair portion of the gene coding for the high mobility group protein (*hmg*), a maize endogenous gene[1] (GenBank accession number AJ131373.1).
This method is intended for use by an operator trained in performing Real-Time PCR analyses.
The method, when validated, may be applicable to DNA isolated from seed and grain containing mixtures, plant material, and food and feed. Its primary use is as a comparator in quantitative determination of transgenic maize in seed and grain, but it also can be used to show that DNA is of suitable quality or quantity for a PCR reaction. DNA can be extracted using a suitable DNA extraction method if the method is validated for the matrix before use. The DNA to be analyzed should be tested for quality and quantity prior to the use in the Real-Time PCR assay. Before use, the DNA extraction and PCR method should be subjected to an in-house validation procedure (ISO 17025).

2 Principle

Detection of the maize taxon-specific DNA sequence of the *hmg* gene is performed in a in a real-time PCR using a forward and reverse primer and a *hmg*-specific probe labeled with FAM fluorescent reporter and TAMRA fluorescence quencher. The *hmg* gene is present in a single copy per haploid genome.

3 Reagents and materials

3.1 General

Only chemicals and water of analytical grade, appropriate for molecular biology, should be used. Solutions should be prepared by dissolving the corresponding reagents in water and be autoclaved unless otherwise indicated. For all operations for which gloves are used it should be ensured that these are powder-free. The use of

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aerosol protected pipette tips (for protection against cross contamination) is recommended.

3.2 PCR reagents

Ready-to-use PCR reagent mixtures or mixtures of individual components are typically used. It is important to avoid contamination of all buffers with DNA or DNAse enzymes. Oligonucleotides used for this method are shown in Table 1.

Table 1 — Maize *hmg* Oligonucleotides

Name	DNA sequence (5' → 3')
Forward Primer	TTG GAC TAG AAA TCT CGT GCT GA
Reverse Primer	GCT ACA TAG GGA GCC TTG TCC T
Probe*	CAA TCC ACA CAA ACG CAC GCG TA

*The probe is labeled with 6-FAM as a reporter dye and TAMRA as a quencher dye. Alternate reporter dyes and/or quencher dyes may be used if it can be shown to yield similar results.

4 Apparatus

The usual laboratory equipment is required, and a Real-Time PCR device suitable for the excitation of fluorescent molecules and the detection of fluorescence signals generated during PCR.

5 Procedure

The DNA used for the reaction should be of sufficient quality to avoid inhibition of the PCR reaction.

5.1 PCR setup

The method described applies for a total reaction volume of 25 µl per PCR (Table 2). The method has been validated. Changes to the method would need to be validated.

Thaw the reagents, if necessary, and handle as recommended. Prepare a PCR master mix which contains all the components except for the sample DNA. Aliquot master mix and add control or sample DNA just prior to running the PCR reaction.

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Table 2 — PCR Reaction Setup

Reagent	Final Concentration	Volume per reaction (µL)
Nuclease-free water	-	6.2
TaqMan Universal PCR Master Mix (2×)	1×	12.5
Forward primer (10 µM) *	300 nM	0.75
Reverse primer (10 µM) *	300 nM	0.75
probe (10 µM) *	160 nM	0.8
Control/Sample DNA	≤250 ng	4

* Different stock concentration for primers and probe may be used, as long as final concentration and total reaction component ratios are maintained

5.2 Thermocycling parameters

Run the PCR on the Real-Time PCR detection platform with general cycling conditions listed in Table 3. Check manufacturer product bulletin for specific PCR platform compatibility and cycling parameters.

Table 3 — Cycling Program*

Stage	Temp. °C	Time	Fluorescence measurement	Cycles
1	50	2 min	no	1
2	95	10 min	no	1
3	95	15 sec	no	45
	60	1 min	yes	

* Changes to the conditions included in this table are not recommended and must be validated.

6 Citations

Method provided by Bayer CropScience, Chesterfield, MO, USA.

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