

Biosafety Clearing-House (BCH)

LIVING MODIFIED ORGANISM (LMO)


BCH-LMO-SCBD-14794-18

[? Decisions on the LMO ? Risk Assessments](#)

LAST UPDATED: 20 FEB 2018

Living Modified Organism identity


The image below identifies the LMO through its unique identifier, trade name and a link to this page of the BCH. Click on it to download a larger image on your computer. For help on how to use it go to the LMO quick-links page.



MON-00021-9
Roundup Ready™ maize

CBD

<https://bch.cbd.int/database/record?documentID=14794>



Read barcode or type above URL into internet browser to access information on this LMO in the Biosafety Clearing-House © SCBD 2012

Name

Roundup Ready™ maize

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Transformation event

GA21 (G21)

Unique identifier

MON-00021-9

Developer(s)

- [ORGANIZATION: MONSANTO](#) | [BCH-CON-SCBD-14925-3](#)

ORGANIZATION

Monsanto
800 North Lindbergh Blvd.
St. Louis, MO
63167, United States of America
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Fax: +1 314 694-3080
Website: <http://www.monsanto.com>

Description

The GA21 line of maize was engineered to be tolerant of glyphosate-containing herbicides. The isolated endogenous maize epsps gene was modified through site-directed mutagenesis, such that its encoded enzyme was insensitive to inactivation by glyphosate, and inserted into the inbred AT maize variety. The modified maize line permits farmers to use glyphosate-

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containing herbicides for weed control in the cultivation of maize.

Recipient Organism or Parental Organisms

The term “Recipient organism” refers to an organism (either already modified or non-modified) that was subjected to genetic modification, whereas “Parental organisms” refers to those that were involved in cross breeding or cell fusion.

[BCH-ORGA-SCBD-246-6](#) ORGANISM | ZEA MAYS (MAIZE, CORN, MAIZE) |

Crops

Characteristics of the modification process

Vector

pDPG434

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Techniques used for the modification

Biolistic / Particle gun

Genetic elements construct

[P-act1-ORYSA](#)

1.370 kb

[I-1_act1-ORYSA](#)

0.000 kb

[TP-OPT](#)

0.370 kb

[CS-epsps-MAIZE](#)

1.340 kb

[T-nos-RHIRD](#)

0.240 kb

Introduced or modified genetic element(s)

Some of these genetic elements may be present as fragments or truncated forms. Please see notes below, where applicable.

[BCH-GENE-SCBD-100364-5](#) RICE ACTIN 1 GENE PROMOTER | (RICE) |

Promoter

[BCH-GENE-SCBD-100355-6](#) RICE ACTIN 1, INTRON | (RICE) |

Intron

[BCH-GENE-SCBD-101419-4](#) OPTIMIZED TRANSIT PEPTIDE |

Transit signal

[BCH-GENE-SCBD-100269-8](#) NOPALINE SYNTHASE GENE TERMINATOR |

Terminator

[BCH-GENE-SCBD-46333-8](#) 5-ENOLPYRUVYL SHIKIMATE-3-PHOSPHATE SYNTHASE | (MAIZE, CORN) |

Protein coding sequence | Resistance to herbicides (Glyphosate)

Notes regarding the genetic elements present in this LMO

The rice actin promoter contains the last 148bp of the 3' end of the rice actin promoter including the rice actin intron. The 5-enolpyruvyl shikimate-3-phosphate synthase (*epsps*) gene from maize was modified through site-directed mutagenesis, such that its encoded enzyme was insensitive to inactivation by glyphosate.

Southern blot analysis indicated that the transformed DNA integrated into the host genome at a single site. Analysis further indicated that no sequences from the vector backbone were integrated into the host genome.

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Analysis regarding the precise elements that were inserted into the recipient organism is not consistent amongst the various documents.

One set of analysis indicated that two complete copies and one partial copy of the transformation cassette were integrated at a single site into the host genome. The partial copy was composed of the rice actin promoter and the EPSPS coding sequence but not the nos terminator element.

Another set of analysis indicated that the following elements were integrated into the recipient organism:

- a mepsps gene cassette, truncated at the 5' end of the rice actin promoter sequence;
- three complete internal mepsps gene cassettes;
- a partial mepsps gene cassette containing the promoter, intron, otp, and a partial mepsps coding sequence terminating in a stop codon; and
- an additional partial gene cassette at the 3' end containing only the rice actin promoter and 5' mRNA leader sequence, but truncating before the start of the rice actin intron, followed by maize genomic DNA.

LMO characteristics

Modified traits

Resistance to herbicides
Glyphosate

Common use(s) of the LMO

Food
Feed
Biofuel

Detection method(s)

External link(s)

- ? [MON-00021-9 - EU Reference Laboratory for GM Food and Feed \(EURL-GMFF\)](#) (English)
- ? [MON-00021-9 - CropLife International Detection Methods Database](#) (English)

Additional Information

Additional Information

Glyphosate specifically binds to and inactivates the enzyme 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS), which is part of an important plant biochemical pathway called the shikimate pathway. The shikimate pathway is involved in the biosynthesis of the aromatic amino acids tyrosine, phenylalanine and tryptophan, as well as other aromatic compounds. When conventional plants are treated with glyphosate they cannot produce the aromatic amino acids essential to their survival. The EPSPS enzyme is present in all plants, bacteria and fungi, but not in animals, which do not synthesize their own aromatic amino acids. Thus, EPSPS is normally present in foods derived from plant and microbial sources.

Other relevant website addresses and/or attached documents

? [MON-ØØØ21-9 - OECD](#) (*English*)

[MON-ØØØ21-9 - CERA](#) (*English*)

? [MON-ØØØ21-9 - ANZFA](#) (*English*)

? [BATS \(2003\) Genetically Modified \(GM\) Crops: molecular and regulatory details, v.2.pdf](#) (*English*)

? [Safety Assessment of Roundup Ready Corn Event GA21 - Monsanto.pdf](#) (*English*)

? [GA21 - Monsanto Petition.pdf](#) (*English*)

[BCH-LMO-SCBD-14794-18](#)

Further Information

Questions about the Cartagena Protocol on Biosafety or the operation of the Biosafety Clearing-House may be directed to the Secretariat of the Convention on Biological Diversity.

**Secretariat of the Convention
on Biological Diversity**

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