

Biosafety Clearing-House (BCH)

LIVING MODIFIED ORGANISM (LMO)

BCH-LMO-SCBD-14766-7

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

LAST UPDATED: 13 SEP 2012

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.



ACS-ZM002-1
Liberty Link™ maize

CBD

<https://bch.cbd.int/database/record?documentID=14766>



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

Name

Liberty Link™ maize

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Transformation event

T14

Unique identifier

ACS-ZM002-1

Developer(s)

- **ORGANIZATION:** BAYER CROPSCIENCE | [BCH-CON-SCBD-7088-7](#)

ORGANIZATION

Bayer CropScience

Website: <http://www.bayercropscience.com>

Description

Glufosinate tolerance in T14 maize is the result of introducing a gene encoding the enzyme phosphinothricin-N-acetyltransferase (PAT) isolated from the common aerobic soil actinomycete, *Streptomyces viridochromogenes*, the same organism from which glufosinate was originally isolated. The PAT enzyme catalyzes the acetylation of phosphinothricin, detoxifying it into an inactive compound. The PAT enzyme is not known to have any toxic properties.

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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

pDH51 (derived from pUC)

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Techniques used for the modification

Osmotic shock

Genetic elements construct

CS-bla-ECOLX
0.000 kb

V-OriC-SYNTH
0.000 kb

P-35S-CaMV
0.000 kb

CS-pat-STRVR
0.000 kb

T-35S-CaMV
0.000 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-15002-4 PHOSPHINOTHRICIN N-ACETYLTRANSFERASE GENE |

Protein coding sequence | Resistance to herbicides (Glufosinate)

BCH-GENE-SCBD-14975-5 BETA-LACTAMASE GENE | (BACTERIA) |

Protein coding sequence | Resistance to antibiotics (Ampicillin)

BCH-GENE-SCBD-100287-7 CAMV 35S PROMOTER |

Promoter

BCH-GENE-SCBD-101411-3 PUC ORIGIN OF REPLICATION |

Plasmid Vector

BCH-GENE-SCBD-100290-6 CAMV 35S TERMINATOR |

Terminator

Notes regarding the genetic elements present in this LMO

The *pat* gene introduced is a was synthetic version which was modified to optimize its expression in plants without altering the amino acid sequence of the PAT enzyme.

Inserted DNA sequences

The *pat* gene is derived from the microorganism *Streptomyces viridochromogenes* strain Tu494, and encodes for the enzyme phosphinothricin acetyl transferase (PAT). This modifies and inactivates the herbicide glufosinate ammonium, and its presence thus confers to the plant tolerance to this herbicide. The *pat* gene was modified at the DNA sequence level to increase its level of expression in the plant. The modification to the DNA sequence of the gene did not result in any changes to the amino acid sequence of the PAT protein. Corn T25 contains the 35S promoter and terminator sequences derived from cauliflower mosaic virus (CaMV). The relevant promoter sequences are from pos. 6808 -7437 and the relevant terminator sequences are from pos. 7429 -7632 of the CaMV genome sequence (Franck et

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al., Cell21. (1980). pp. 285-294). The 35S promoter directs high level constitutive expression and is widely used as a promoter for high expression of genes.

DNA cassette:

bla (0.86) | Ori-pUC (2.63) | P-35S (0.52) >> space (0.029) >> *pat* (0.53) >> space (0.019) >> T-35S(0.2)

Note: the symbols >> and << indicate the sense and anti-sense direction of transcription, respectively, between different elements (typically, promoter - coding sequence - terminator). The symbol | indicates elements that may be cloned adjacently in a cassette but that presumably are not transcribed together. The numbers in parenthesis indicate the approximate length in Kb of each genetic element.

Molecular analyses of shows that event T14 contains 3 disrupted copies of the vector. All of these copies appear to contain an intact P-35S - *pat* - T-35s cassette and ori-pUC. None of these copies have an intact *bla* gene. In one of these copies *bla* gene appears to contain an insert and in two others it is truncated.

Information on the vector

The vector used for the production of the recombinant maize T25 is plasmid pUC/AC. To construct the plasmid, the synthetic *pat* gene was cloned into the Sal1, between the CaMV derived 35S gene promoter and terminator sequences of the pUC derived plasmid. The chimeric *pat* gene cassette (35S promoter: *pat*::35S terminator) can be isolated as a 1.3 kb EcoR1 fragment. The construct contains no other plant expressible genes. The pUC sequences include an ampicillin resistance (*ampR*) gene and a bacterial origin of replication. The *ampR* gene has regulatory signals recognized in bacteria but not functional in transgenic corn cells.

LMO characteristics

Modified traits

Resistance to herbicides
Glufosinate
Resistance to antibiotics
Ampicillin

Common use(s) of the LMO

Food
Feed
Biofuel

Additional Information

Additional Information

The maize line T14 was genetically engineered to express tolerance to glufosinate ammonium, the active ingredient in phosphinothricin herbicides (Basta®, Rely®, Finale®, and Liberty®).

Glufosinate chemically resembles the amino acid glutamate and acts to inhibit an enzyme, called glutamine synthetase, which is involved in the synthesis of glutamine. Essentially, glufosinate acts enough like glutamate, the molecule used by glutamine synthetase to make glutamine, that it blocks the enzyme's usual activity. Glutamine synthetase is also involved in ammonia detoxification. The action of glufosinate results in reduced glutamine levels and a corresponding increase in concentrations of ammonia in plant tissues, leading to cell membrane disruption and cessation of photosynthesis resulting in plant withering and death.

Cultured protoplasts obtained from a yellow dent corn line were transformed using a chemically mediated direct DNA introduction method. Transformed cell colonies were selected for the presence of the pat gene by regeneration on medium containing glufosinate ammonium. The primary transformant T14 was then backcrossed with parental lines of the yellow dent corn type. The resulting line displayed field tolerance to phosphinothricin-containing herbicides, thereby permitting farmers to use this herbicide for weed control in maize cultivation.

Other relevant website addresses and/or attached documents

? [OECD UID Database](#) (*English*)

? [CERA GM Database](#) (*English*)

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

[BCH-LMO-SCBD-14766-7](#)

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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