

Biosafety Clearing-House (BCH)

LIVING MODIFIED ORGANISM (LMO)

BCH-LMO-SCBD-14754-5

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

LAST UPDATED: 27 MAY 2013

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-BNØØ2-5
InVigor™ canola

<https://bch.cbd.int/database/record?documentID=14754>



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

Name

InVigor™ canola

EN

Transformation event

RF2 (B94-2)

Unique identifier

ACS-BNØØ2-5

Developer(s)

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

ORGANIZATION

Bayer CropScience

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

Description

Canola fertility restoration system displaying glufosinate herbicide tolerance. Contains the barstar gene from *Bacillus amyloliquefaciens*, and the bar gene from *Streptomyces hygroscopicus* to confer tolerance to the herbicide phosphinothricin (Glufosinate ammonium). Also contains neomycin phosphotransferase II (npt II) conferring kanamycin resistance.

EN

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-12083-7 ORGANISM | BRASSICA NAPUS (TURNIP, RAPESEED, CANOLA PLANT, OILSEED RAPE, RAPE, BRANA) |

Crops

Related LMO(s)

BCH-LMO-SCBD-14753-6 | ACS-BNØØ1-4 - InVigor™ canola | Changes in physiology and/or production - Fertility restoration Resistance to antibiotics - Kanamycin Resistance to herbicides - Glufosinate

[Show detection method\(s\)](#)

BCH-LMO-SCBD-14756-5 | ACS-BNØØ4-7 - InVigor™ canola | Changes in physiology and/or production - Reproduction - Male sterility Resistance to antibiotics - Kanamycin Resistance to herbicides - Glufosinate

[Show detection method\(s\)](#)

Characteristics of the modification process

Vector

pTVE743RE

EN

Techniques used for the modification

Agrobacterium-mediated DNA transfer

Genetic elements construct

P-ta29-TOBAC
1.500 kb

CS-barstar-BACAM
0.340 kb

T-nos-RHIRD
0.250 kb

P-rbcS-ARATH
1.840 kb

TP-rbcS
0.160 kb

CS-bar-STRHY
0.500 kb

T-tr7-RHIRD
0.200 kb

P-nos-RHIRD
0.400 kb

CS-nptII-ECOLX
1.000 kb

T-ocs-RHIRD
0.900 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-14974-7 BARSTAR |

Protein coding sequence | Changes in physiology and/or production (Fertility restoration)

BCH-GENE-SCBD-14972-12 PHOSPHINOTHRICIN N-ACETYLTRANSFERASE GENE |

Protein coding sequence | Resistance to herbicides (Glufosinate)

BCH-GENE-SCBD-15001-5 NEOMYCIN PHOSPHOTRANSFERASE II | (BACTERIA) |

Protein coding sequence | Resistance to antibiotics (Kanamycin)

BCH-GENE-SCBD-101407-6 PTA29 POLLEN SPECIFIC PROMOTER | (TOBACCO PLANT) |

Promoter

BCH-GENE-SCBD-100269-8 NOPALINE SYNTHASE GENE TERMINATOR |

Terminator

[BCH-GENE-SCBD-103851-5](#) RBCS PROMOTER | (THALE CRESS) |

Promoter

[BCH-GENE-SCBD-101902-4](#) RBCS TRANSIT PEPTIDE | (THALE CRESS) |

Transit signal

[BCH-GENE-SCBD-103067-9](#) TRANSCRIPT 7 GENE 3' UNTRANSLATED REGION |

Terminator

[BCH-GENE-SCBD-100270-6](#) NOPALINE SYNTHASE GENE PROMOTER |

Promoter

[BCH-GENE-SCBD-100271-5](#) OCTOPINE SYNTHASE GENE TERMINATOR |

Terminator

Notes regarding the genetic elements present in this LMO

Southern blot analysis indicated that a single copy of the T-DNA was inserted into the host genome at a single site. There was no indication from the tests that any sequences from the vector backbone were integrated into the genome.

EN

LMO characteristics

Modified traits

Resistance to herbicides

Glufosinate

Resistance to antibiotics

Kanamycin

Changes in physiology and/or production

Reproduction

Fertility restoration

Common use(s) of the LMO

Food

Feed

Detection method(s)

External link(s)

? [Event Specific Method for the Quantification of Oilseed rape RF2 Using Real-time PCR \(English \)](#)

Additional Information

Additional Information

Transgenic RF2 plants contain the barstar gene, isolated from *Bacillus amyloliquefaciens*. The barstar gene codes for a ribonuclease inhibitor (barstar enzyme) expressed only in the tapetum cells of the pollen sac during anther development. The ribonuclease inhibitor (barstar enzyme) inhibits barnase RNase expressed by lines engineered to be male sterile and together, the RNase and the ribonuclease inhibitor form a very stable one-to-one complex, in which the RNase is

inactivated. As a result, when pollen from the restorer line RF2 is crossed to a male sterile line, the resultant progeny express the RNase inhibitor in the tapetum cells of the anthers, allowing hybrid plants to develop normal anthers and restoring fertility.

RF2 was also 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.

Glufosinate tolerance in this canola line was the result of introducing a gene encoding the enzyme phosphinothricin-N-acetyltransferase (PAT) isolated from the common aerobic soil actinomycete, *Streptomyces hygroscopicus*. 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.

Other relevant website addresses and/or attached documents

- ? [ACS-BN002-5 - OECD](#) (English)
- ? [ACS-BN002-5 - CERA](#) (English)
- ? [MS1_RF1_RF2 - Aventis.pdf](#) (English)
- ? [ACS-BN004-7×ACS-BN001-4 - Japan.pdf](#) (English)
- ? [ACS-BN004-7×ACS-BN001-4 - ANZFA.pdf](#) (English)

[BCH-LMO-SCBD-14754-5](#)

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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