

Biosafety Clearing-House (BCH)

LIVING MODIFIED ORGANISM (LMO)


BCH-LMO-SCBD-14760-9

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

LAST UPDATED: 23 JUL 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-BN005-8 X ACS-BN003-6
InVigor™ canola

<https://bch.cbd.int/database/record?documentID=14760>



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

MS8 x RF3

Unique identifier

ACS-BN005-8 x ACS-BN003-6

Developer(s)

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

ORGANIZATION

Bayer CropScience

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

Description

The stacked canola line ACS-BN005-8 x ACS-BN003-6 was obtained through the conventional cross breeding of each of the parental organisms. This results in a line with male-sterility, fertility restoration, pollination control system displaying glufosinate herbicide tolerance

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-9845-4 ORGANISM | BRASSICA RAPA (CANOLA PLANT) |

Crops

BCH-LMO-SCBD-14759-8 LIVING MODIFIED ORGANISM | ACS-BN005-8 - INVIGOR™ CANOLA |

Changes in physiology and/or production - Reproduction - Male sterility Resistance to herbicides - Glufosinate

BCH-LMO-SCBD-14755-7 LIVING MODIFIED ORGANISM | ACS-BN003-6 - INVIGOR™ CANOLA |

Changes in physiology and/or production - Fertility restoration Resistance to herbicides - Glufosinate

Characteristics of the modification process

Vector

pTHW107 and pTHW118

EN

Techniques used for the modification

Cross breeding

Genetic elements construct

P-ta29-TOBAC 1.510 kb	CS-barnase-BACAM 0.340 kb	T-Barnase3UTR-BACAS 0.110 kb	T-nos-RHIRD 0.260 kb
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P-ta29-TOBAC 1.510 kb	CS-barstar-BACAM 0.270 kb	T-barstar 0.040 kb	T-nos-RHIRD 0.260 kb
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P-rbcS-ARATH 1.730 kb	CS-bar-STRHY 0.550 kb	T-tr7-RHIRD 0.210 kb
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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-14973-6 BARNASE |

Protein coding sequence | Changes in physiology and/or production (Reproduction, Male sterility)

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

Promoter

BCH-GENE-SCBD-104825-2 BARNASE 3' UNTRANSLATED REGION |

Terminator

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

Terminator

BCH-GENE-SCBD-101409-2 BARSTAR GENE TERMINATOR |

Terminator

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

Promoter

Notes regarding the genetic elements present in this LMO

DNA insert from ACS-BN005-8 vector pTHW107

ACS-BN005-8 is a male-sterile canola line that cannot produce viable pollen due to the presence of the barnase gene. The line also contributes a copy of the bar gene which confers tolerance to the herbicide glufosinate.

DNA insert from ACS-BN003-6 vector pTHW118

ACS-BN003-6 is a fertility restorer canola line that inhibits the action of the barnase ribonuclease through the expression of the barstar gene. The line also contributes a copy of the bar gene which confers tolerance to the herbicide glufosinate.

EN

For additional information on this LMO, please refer to the records of the parental LMOs.

LMO characteristics

Modified traits

Resistance to herbicides

Glufosinate

Changes in physiology and/or production

Reproduction

Male sterility

Fertility restoration

Common use(s) of the LMO

Food

Feed

Detection method(s)

External link(s)

? [ACS-BN005-8 - EU Reference Laboratory for GM Food and Feed \(EURL-GMFF\)](#) (English)

? [ACS-BN003-6 - EU Reference Laboratory for GM Food and Feed \(EURL-GMFF\)](#) (English)

? [ACS-BN005-8 x ACS-BN003-6 - CropLife International Detection Methods Database](#) (English)

Additional Information

Additional Information

The canola lines MS8 and RF3 were developed using genetic engineering techniques to provide a pollination control system for the production of hybrid oilseed rape (MS8xRF3) expressing male sterility and tolerance to glufosinate ammonium. The novel hybridization system involves the use of two parental lines, a male sterile line MS8 and a fertility restorer line RF3. The transgenic MS8 plants do not produce viable pollen grains and cannot self-pollinate. In order to completely restore

fertility in the hybrid progeny, line MS8 must be pollinated by a modified plant containing a fertility restorer gene, such as line RF3. The resultant F1 hybrid seed, derived from the cross between MS8 x RF3, generates hybrid plants that produce pollen and are completely fertile.

The male-sterile trait was introduced in MS8 by inserting the barnase gene, isolated from *Bacillus amyloliquefaciens*, a common soil bacterium that is frequently used as a source for industrial enzymes. The barnase gene encodes for a ribonuclease enzyme (RNase) that is expressed only in the tapetum cells of the pollen sac during anther development. The RNase affects RNA production, disrupting normal cell functioning and arresting early anther development, thus leading to male sterility.

The transgenic line RF3 was produced by genetically engineering plants to restore fertility in the hybrid line. Transgenic RF3 plants contain the barstar gene, also 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) specifically inhibits barnase RNase expressed by the MS8 line. 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 RF3 is crossed to the male sterile line MS8, the resultant progeny express the RNase inhibitor in the tapetum cells of the anthers, allowing hybrid plants to develop normal anthers and restoring fertility.

Both transgenic lines MS8 and RF3 were 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.

Other relevant website addresses and/or attached documents

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

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

? [InVigor™ canola - Monsanto.pdf](#) (*English*)

[BCH-LMO-SCBD-14760-9](#)

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.

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on Biological Diversity**

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