



Convention on
Biological Diversity

Scientific records on the Biosafety Clearing-House

Austein McLoughlin
Associate Programme Management Officer
16 May 2023



UNITED NATIONS DECADE ON
**ECOSYSTEM
RESTORATION**
2021-2030



What type of scientific records are on the BCH?

- Living modified organisms
- Genetic elements
- Organisms
- Biosafety Virtual Library Resources
- Laboratories for detection and identification of LMOs
- Risk assessments generated by an independent or non-regulatory process

Reference

- Risk assessment generated by a regulatory process
- Biosafety experts

National

Snapshot of the BCH

- 17,400+ records published
 - 940+ LMOs
 - 840+ genetic elements
 - 260+ organisms
 - 70+ laboratories
 - 1570+ virtual library resources
 - 2600+ risk assessments
 - 360+ biosafety experts



Living Modified Organism records

LIVING MODIFIED ORGANISM (LMO)

[BCH-LMO-SCBD-15168-16](#) | [PDF](#) | [Print](#) | [Share](#) | [Compare](#) | [Edit](#)

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

LAST UPDATED: 25 SEP 2020

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-88913-8
Roundup Ready™ Flex™ cotton

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

<https://bch.cbd.int/database/record?documentID=15168>



Name

Roundup Ready™ Flex™ cotton

EN

Transformation event

MON88913 (88913)

Does this LMO have a unique identifier?

Yes

Unique identifier

MON-88913-8

Living Modified Organism records

[BCH-LMO-SCBD-15168-16](#) | MON-88913-8 - Roundup Ready™ Flex™ cotton | Monsanto | Resistance to herbicides (Glyphosate)

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

[LMO Information](#)

[Decisions on the LMO](#)

[Risk Assessments](#)



Display cross-references with external database(s): [Biotradestatus](#) ▼

For further information about the external database click on the database name below; to visit the original database page containing information on this LMO click on the [↗](#) icon beside the database name

Country	BCH Decisions	Biotradestatus ↗
Australia	105384        	     
Brazil	104515        	     
Canada	11353        	     
China	44897        	     
Colombia	39601        	     
	104929         	
	105374         	

Living Modified Organism records

LIVING MODIFIED ORGANISM (LMO)

[BCH-LMO-SCBD-15168-16](#) | [PDF](#) | [Print](#) | [Share](#) | [Compare](#) | [Edit](#)

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

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MON-88913-8
Roundup Ready™ Flex™ cotton

CBD

<https://bch.cbd.int/database/record?documentID=15168>



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™ Flex™ cotton

EN

Transformation event

MON88913 (88913)

Does this LMO have a unique identifier?

Yes

Unique identifier

MON-88913-8



Developer(s)

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

ORGANIZATION:

Monsanto
800 North Lindbergh Blvd.
St. Louis, MO
63167, United States of America
Phone: + 1 314 694-1000
Fax: +1 314 694-3080
Website: <http://www.monsanto.com>

Description

Roundup Ready® Flex cotton (MON 88913) was developed to allow the use of glyphosate, the active ingredient in the herbicide Roundup®, as a weed control option in cotton production. This genetically engineered cotton contains a novel form of the plant enzyme 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS) that allows MON 88913 to survive otherwise lethal applications of glyphosate. The *epsps* gene introduced into MON 88913 was isolated from a strain of the common soil bacterium *Agrobacterium tumefaciens* strain CP4; the EPSPS enzyme expressed by this gene is tolerant to glyphosate. MON 88913 cotton contains two copies of the EPSPS gene to confer tolerance to glyphosate later in the growing season, specifically after the fifth true leaf stage.

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-12080-6](#) ORGANISM | GOSSYPIUM HIRSUTUM (COTTON) |

Crops

Point of collection or acquisition of the recipient organism or parental organisms

Variety: 'Coker 312'

EN

Characteristics of the modification process

Vector

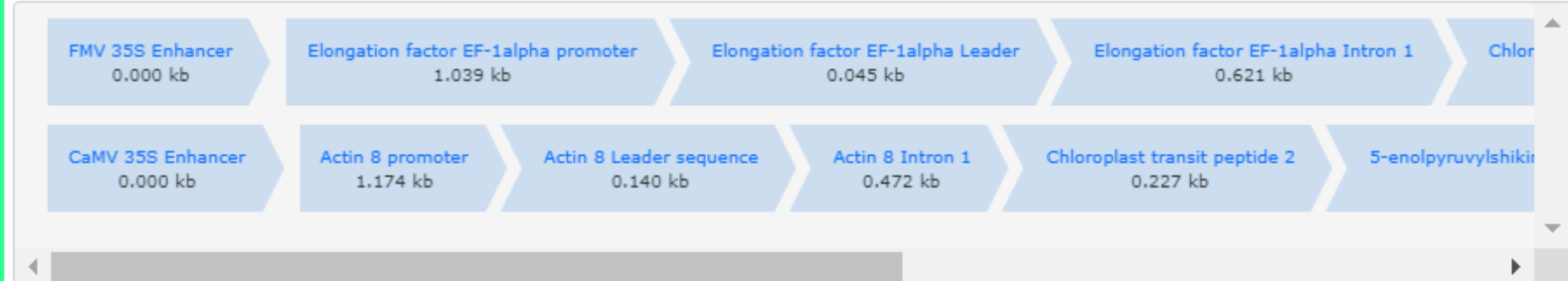
PV-GHGT35

EN

Techniques used for the modification

Agrobacterium-mediated DNA transfer

Genetic elements construct



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-14979-7](#) 5-ENOLPYRUVYLSHIKIMATE-3-PHOSPHATE SYNTHASE GENE | AGROBACTERIUM TUMEFACIENS (AGROBACTERIUM) |

Protein coding sequence | Resistance to herbicides (Glyphosate)

[BCH-GENE-SCBD-103903-1](#) ELONGATION FACTOR EF-1ALPHA PROMOTER | ARABIDOPSIS THALIANA (THALE CRESS, MOUSE-EAR CRESS, ARABIDOPSIS, ARATH) |

Promoter

[BCH-GENE-SCBD-103904-1](#) ELONGATION FACTOR EF-1ALPHA LEADER | ARABIDOPSIS THALIANA (THALE CRESS, MOUSE-EAR CRESS, ARABIDOPSIS, ARATH) |

Leader

[BCH-GENE-SCBD-103905-1](#) ELONGATION FACTOR EF-1ALPHA INTRON 1 | ARABIDOPSIS THALIANA (THALE CRESS, MOUSE-EAR CRESS, ARABIDOPSIS, ARATH) |

Intron

[BCH-GENE-SCBD-100365-6](#) CHLOROPLAST TRANSIT PEPTIDE 2 | ARABIDOPSIS THALIANA (THALE CRESS, MOUSE-EAR CRESS, ARABIDOPSIS, ARATH) |

[BCH-GENE-SCBD-105196-2](#) FMV 35S ENHANCER | FIGWORT MOSAIC VIRUS (FIGWORT MOTTLE VIRUS, FMV, CMOVb) |

Leader

[BCH-GENE-SCBD-105197-2](#) CAMV 35S ENHANCER | CAULIFLOWER MOSAIC VIRUS (CAMV) |

Leader

Notes regarding the genetic elements present in this LMO

Information on the inserted DNA sequences

The transforming plasmid PV-GHGT35 carried a transfer DNA sequence comprising of two codon-optimised *Agrobacterium tumefaciens* 5-enolpyruvylshikimate-3-phosphate synthase (*epsps*) cassettes:

(1) the first *epsps* coding sequence under the regulation of a chimeric transcriptional promoter (*Figwort mosaic virus* 35S promoter enhancer and *Arabidopsis thaliana* elongation factor EF-1 alpha (*tsf1*) promoter), *tsf1* leader and intron sequences, an *A. thaliana* chloroplast transit peptide 2 sequence and a *Pisum sativum* ribulose-1,5-bisphosphate carboxylase/oxygenase (rubisco) E9 transcript termination and polyadenylation sequence (T-E9).

(2) the second *epsps* coding sequence regulated by another chimeric transcriptional promoter (*Cauliflower mosaic virus* 35S enhancer and *A. thaliana* actin 8 (*act8*) promoter), *act8* leader and intron sequences, *A. thaliana* chloroplast targeting peptide 2 and T-E9.

High levels of transcription are expected from both cassettes due to the presence of viral enhancer sequences. The EPSPS protein is expected to accumulate in the chloroplast due to the transit signal peptide.

Vector information

Monsanto constructed the double border, binary plasmid vector PV-GHGT35 for the transformation of cotton variety Coker 312. The plasmid contains a single copy of two *epsps* expression cassettes within the T-DNA region. The T-DNA region of PV-GHGT35 was incorporated into the target cotton genome using *Agrobacterium*-mediated transformation. Plasmid PV-GHGT35 also contains several genes from the plasmid backbone necessary for maintenance and selection of the plasmid that are not ultimately incorporated into the plant genome. Plasmid PV-GHGT35 contains both vegetative and bacterial origins of replication that allow replication of the plasmid in both *A. tumefaciens* and *Escherichia coli*. The plasmid contains the *aad* gene encoding the Tn7 adenyltransferase that provides resistance to spectinomycin and streptomycin. The plasmid also contains a sequence, known as *rop*, which represses the formation of RNA primer thereby allowing maintenance and copy number control of the plasmid in *Escherichia coli*.

Note on genetic element sizes:

The promoter for both genetic constructs are chimeric promoters containing viral enhancer sequences. Thus, the size of the promoters (Elongation factor 1 alpha and Actin 8) in the 'Genetic elements construct' reflects the size of chimeric promoters (FMV 35S enhancer + Elongation factor 1 alpha promoter; CaMV 35S enhancer + Actin 8 promoter).

EN

Living Modified Organism records

LMO characteristics

Modified traits

Resistance to herbicides
Glyphosate

Common use(s) of the LMO

Fiber/textile

Detection method(s)

External link(s)

[MON-88913-8 - EU Reference Laboratory for GM Food and Feed \(EURL-GMFF\) \(JRC \) \[English \]](#)

[MON-88913-8 - CropLife International Detection Methods Database \(CropLife \) \[English \]](#)



Meeting challenges in a growing world

AIATA

Home	About Us	Crop Protection	Plant Biotechnology	Resources	Contact Us
database home	technology overview	about us	library	intellectual property	

The CropLife International Detection Methods Database

Background

Genetically modified (GM) crops were first introduced in 1994 and have now been adopted by farmers in more

 **SEARCH THE
DATABASE**
Filter products by crop, protein,
developer, and more.

Additional Information

Additional Information

The EPSPS enzyme is part of the shikimate pathway, an important biochemical pathway in plants involved in the production of aromatic amino acids and other aromatic compounds. When conventional plants are treated with glyphosate, the plants cannot produce the aromatic amino acids needed for growth and survival. EPSPS is present in all plants, bacteria, and fungi. It is not present in animals, since these organisms are unable to synthesize their own aromatic amino acids. Because the aromatic amino acid pathway is not present in mammals, birds, or aquatic life forms, glyphosate has little, if any, toxicity for these organisms. The EPSPS enzyme is naturally present in foods derived from plant and microbial sources.

EN

Other relevant website addresses and/or attached documents

 [MON 88913-8 - APHIS \[English \]](#)

 [Euginius: MON88913 \[English \]](#)



Records referencing this document

[Show in search](#)

	Record type	Field	Record(s)
 Show	Laboratory for detection and identification of LMOs	LMO(s) detectable by the laboratory	7
 Show	Living Modified Organism	Recipient Organism" or "Parental Organisms	11
 Show	Risk Assessment generated by a regulatory process	Living modified organism(s)	43
 Show	Country's Decision or any other Communication	Living modified organism(s)	47

 [BCH-LMO-SCBD-15168-16](#)

 [Report](#)

Living Modified Organism records

Hide	Risk Assessment generated by a regulatory process		Living modified organism(s)		43
Page 1 of 2 « First < Prev 1 2 Next > Last » 1 - 25 of 43 Items per page 25					
Country	Title	UId	Updated on		
Australia	DIR 066 Risk Assessment and Risk Management Plan	BCH-RA-AU-105383-5	07 Apr 2022 04:27		
Malaysia	RISK ASSESSMENT REPORT OF THE GENETIC MODIFICATION ADVISORY COMMITTEE (GMAC) FOR AN APPLICATION FOR APPROVAL FOR RELEASE OF PRODUCTS OF MON88913 COTTON FOR SUPPLY OR OFFER TO SUPPLY	BCH-RA-MY-258455-1	23 Dec 2021 16:20		
South Africa	Risk assessment of MON88913 (RR flex)	BCH-RA-ZA-114283-1	11 Feb 2019 13:06		
United States of America	Biotechnology Consultation Note to the File BNF No. 000098	BCH-RA-US-114147-1	17 Dec 2018 20:12		
Costa Rica	ALGODÓN ROUNDUP READY FLEX (RR FLEX)	BCH-RA-CR-43305-6	28 Nov 2017 14:24		
Costa Rica	ALGODÓN ROUNDUP READY FLEX® (EVENTO MON-88913-8)	BCH-RA-CR-43303-6	28 Nov 2017 14:19		
Mexico	Solicitud 032/2016_Etapa Comercial, Gossypium hirsutum. evento MON-88913-8	BCH-RA-MX-112683-1	31 Oct 2017 19:19		
Mexico	Solicitud 025/2016 Etapa Comercial Gossypium hirsutum I evento MON-88913-8	BCH-RA-MX-112676-1	31 Oct 2017 18:58		
Show	Country's Decision or any other Communication		Living modified organism(s)		47

Summary of LMO records

- Content
 - More detailed and standardized descriptions
 - Efforts to add reliable sources (peer-reviewed publications, regulatory documents, patents, GenBank)
 - Removal of non-reliable sources (e.g. Wikipedia) and broken links
 - QR code improvement to Quick-Links
- Linkages
 - Automated links for detection methods - EURL-GMFF maintained + CropLife Detection methods database added
 - Manual addition of EUginius
 - Biotradestatus link maintained
 - Trait mapping with OECD and FAO databases

Improvements to other record types

- Genetic elements (GENE)
 - GMO Genetic Elements Thesaurus (with EUginius)
 - Sequence information
 - Other reliable sources



- Organisms (ORGA)
 - NCBI Taxonomy browser or ICTV name
 - UniProt organism code
 - Biology document
 - Genome sequence
 - Other databases



Adamse et al. BMC Bioinformatics (2021) 22:48
https://doi.org/10.1186/s12859-020-03880-0

BMC Bioinformatics

DATABASE

Open Access

GMO Genetic Elements Thesaurus
(GMO-GET): a controlled vocabulary
for the consensus designation of introduced
or modified genetic elements in genetically
modified organisms



Paulien Adamse^{1*}, Emilie Dagand², Karen Bohmert-Tatarev^{2,3}, Daniela Wahler², Manoela Miranda^{4,5},
Esther J. Kok¹ and Joachim Bendiek^{2,6}

XX-YYY-ZZZZZ

XX = type of genetic element

YYY = gene name/symbol

ZZZZZ = UniProt code of donor organism

CS-cry2Ab-BACTU

(*Bacillus thuringiensis* Cry2Ab protein)



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UniProt organism code



BLAST Align Peptide search ID mapping SPARQL

Taxonomy ▾

Advanced | List

Search

Taxonomy - *Arabidopsis thaliana* (species)

[Download](#) ▾ [View proteins](#) ▾ [View proteomes](#) ▾

Mnemonic name | ARATH

Taxon ID | 3702

Scientific name | *Arabidopsis thaliana*

Parent | *Arabidopsis*

Common name | Mouse-ear cress

Other names | Arbisopsis thaliana
mouse-ear cress
thale cress
thale-cress
Arabidopsis thaliana (L.) Heynh., 1842
[5 more names](#)

Rank | species

Lineage | cellular organisms > Eukaryota (eucaryotes) > Viridiplantae > Streptophyta > Streptophytina > Embryophyta > Tracheophyta > Euphyllophyta > Spermatophyta > Magnoliopsida (flowering plants) > Mesangiospermae > eudicotyledons > Gunneridae > Pentapetalae > rosids > malvids > Brassicales > Brassicaceae (mustard family) > Camelineae > *Arabidopsis*

Strains | cv. Cha-0 (cv. Champex-0)
cv. Cha-1 (cv. Chabary-1)
cv. Cha-2 (cv. Chabary-2)
cv. Chi-0 (cv. Chisdra-0, cv. Chi0)
cv. Chi-1 (cv. Chisdra-1)
[451 more strains](#)

Links | www.ncbi.nlm.nih.gov [↗](#)
www.marylandbiodiversity.com [↗](#)
www.naturespot.org.uk [↗](#)
www.nzpcn.org.nz [↗](#)
www.pnwflowers.com [↗](#)
[30 more links](#)

Improvements to other record types

- Genetic elements (GENE)
 - GMO Genetic Elements Thesaurus (with EUginius)
 - Sequence information
 - Other reliable sources



- Organisms (ORGA)
 - NCBI Taxonomy browser or ICTV name
 - UniProt organism code
 - Biology document
 - Genome sequence
 - Other databases + sources



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XX-YYY-ZZZZZ

XX = type of genetic element
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CS-cry2Ab-BACTU

(*Bacillus thuringiensis* Cry2Ab protein)



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Examples of additional (reference) information for an ORGA record

Other relevant website addresses and/or attached documents

- [NCBI Taxonomy Browser - Spodoptera frugiperda \[English \]](#)
- [GenBank - Genome - Spodoptera frugiperda \(fall armyworm\) \[English \]](#)
- [UniProtKB Taxonomy - Spodoptera frugiperda \(Fall armyworm\) \[English \]](#)
- [CABI - Datasheet - Spodoptera frugiperda \(fall armyworm\) \[English \]](#)
- [Biology, invasion and management of the agricultural invader Fall armyworm, Spodoptera frugiperda \(Lepidoptera Noctuidae\).pdf \[English \]](#)
- [Molecular Ecology Resources - 2020 - Zhang - Genetic structure and insecticide resistance characteristics of fall armyworm.pdf \[English \]](#)
- [Biology and nutrition of Spodoptera frugiperda \(Lepidoptera Noctuidae\) fed on different food sources.pdf \[English \]](#)
- [Bioecology of fall armyworm Spodoptera frugiperda \(J. E. Smith\), its management and potential patterns of seasonal spread in Africa.PDF \[English \]](#)
- [Genetic characterization of fall armyworm infesting South Africa and India indicate recent introduction from a common source population.pdf \[English \]](#)
- [Understanding the factors influencing fall armyworm \(Spodoptera frugiperda J.E. Smith\) damage in African smallholder maize fields and quantifying its impact on yield. A case study in Eastern Zimbabwe.pdf \[English \]](#)



Records referencing this document

[Show in search](#)

	Record type	Field	Record(s)
Show	Living Modified Organism	Recipient Organism" or "Parental Organisms	1
Show	Genetic element	Donor organism(s)	1

Improvements to other record types

- Biosafety Virtual Library Resources (VLR)
 - DOI link provided instead of 'regular' URL
 - PDF file provided when possible
 - Additional keywords added and categories selected
 - Link to other records in BCH (e.g. LMO, GENE, etc.)
- Risk assessments (regulatory; RA)
 - Information link to FAO GM Foods and OECD BioTrack databases



Laboratories for the detection and identification of LMOs (LAB)

- LAB records were split from ORG records

LABORATORY FOR DETECTION AND IDENTIFICATION OF LMOs (LAB) [BCH-LAB-SCBD-263554-1](#) | [PDF](#) | [Print](#) | [Share](#) | [Edit](#) | [Close](#)

LAST UPDATED: 21 MAR 2023

General Information

Laboratory name and coordinates

MINISTRY OF AGRICULTURE AND FORESTRY (MOAF/TAGEM) [BCH-ORG-SCBD-262924-1](#)
Government agency (Sub-national)

Üniversiteler Mah. Dumlupınar Bulvarı, Eskişehir Yolu 10. Km, Çankaya
Ankara
Türkiye
Phone: + 90 312 307 60 00
Email: birgul.guner@tarimorman.gov.tr

Services and activities performed

Organization of inter-laboratory comparisons
Capacity-building or training

Associated ORG record

- Secretariat fills in details (websites, accreditation) when possible

Registries

- LMO, genetic element and organism registries maintained
- Improved sorting for stacked events (“X” vs “X”)

Living Modified Organism (LMO) Registry

942

The LMO Registry provides summary information on all living modified organisms registered in the BCH, including transformation events, genetic modifications and the [unique identification code](#) (if available) for each record. Links to all decisions and risk assessment reports that refer to these organisms are accessible through the records in the registry.

[View registry](#)

Organism Registry

269

The Organism Registry includes summary information on those organisms that have been registered in the BCH as parental, recipient or donor organisms. The registry includes links to the records on each organism where further information about relevant biological characteristics, including information on taxonomic classification, common name, origin, centre of origin and centre of genetic diversity can be found. Links to records that reference the organism are provided at the bottom of each individual record.

[View registry](#)

Genetic Element Registry

852

The Genetic Element Registry provides a summary of information on the genetic elements associated with the LMOs registered in the BCH, including information on the donor organism, conferred traits and biological function. The registry includes links to the records on each genetic element where more details may be found. LMOs containing the particular genetic element are referenced at the bottom of the individual record.

[View registry](#)



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Summary: organizations partnering with the BCH on scientific information

- European Union Reference Laboratory for Genetically Modified Food and Feed
- CropLife International
- Organisation for Economic Co-operation and Development
- Food and Agriculture Organization of the United Nations
- Federal Office of Consumer Protection and Food Safety and Wageningen Food Safety Research (European GMO INitiative for a Unified Database System)



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Potential considerations

- Links to other databases
 - EUginius: LMOs, detection methods, genetic element names
 - Further links to FAO & OECD? Other database suggestions?
- LAB records
 - Recent decision CP-10/11 on detection and identification of LMOs urges Parties to upload information on their laboratories using LAB format
 - Some Parties indicated that they may wish to be aware of changes to certain LAB records; control information related to national laboratories; and/or display national laboratories on countries profile
- OECD unique identifiers
 - Specify “OECD” in the field on LMO records
 - Process underway at OECD for LM animals



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Thank you

Secretariat of the Convention on Biological Diversity

413 St. Jacques Street, Suite 800
Montreal, Quebec, Canada H2Y 1N9
Tel. +1 514 288 2220

secretariat@cbd.int

bch@cbd.int

cbd.int

bch.cbd.int

bch.cbd.int/protocol



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