

## Biosafety Clearing-House (BCH)

LIVING MODIFIED ORGANISM (LMO)

BCH-LMO-SCBD-14835-11

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

LAST UPDATED: 23 NOV 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.



<https://bch.cbd.int/database/record?documentID=14835>

FLO-40685-2  
Moonvista™ carnation



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

Name

Moonvista™ carnation EN

Transformation event

123.8.8 (40685)

Unique identifier

FLO-40685-2

Developer(s)

- **PERSON:** STEPHEN CHANDLER | [BCH-CON-SCBD-4953-5](#)

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**PERSON**

Stephen Chandler  
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**RELATED ORGANIZATION**

Description

Moonvista™ is a carnation variety in which the flowers have a violet/mauve colour due to the insertion of *Viola sp.* flavonoid 3', 5'-hydroxylase gene and *Petunia hybrida* EN

dihydroflavonol-4-reductase to enable the biosynthesis of delphinidin (anthocyanin) pigment. The flowers also carry a variant form of acetolactate synthase from *Nicotiana tabacum* for selection sulfonylurea selection during transformation.

**NOTE: This LMO was formerly referred to with the UID FLO-40685-1.**

#### 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-4954-7](#) ORGANISM | DIANTHUS CARYOPHYLLUS (CARNATION, DIACA) |

Crops

#### Related LMO(s)

[BCH-LMO-SCBD-14772-7](#) | FLO-11363-2 - Moonshadow™ carnation | Stephen Chandler Changes in quality and/or metabolite content - Pigmentation / Coloration Resistance to herbicides - Chlorsulfuron, Sulfonylurea

[BCH-LMO-SCBD-14829-8](#) | FLO-11226-9 - Moonshade™ carnation | Stephen Chandler Changes in quality and/or metabolite content - Pigmentation / Coloration Resistance to herbicides - Chlorsulfuron, Sulfonylurea

[BCH-LMO-SCBD-48219-6](#) | FLO-40689-6 - Moonaqua™ carnation | Dr Yoshikazu Tanaka Changes in quality and/or metabolite content - Pigmentation / Coloration Resistance to herbicides - Chlorsulfuron, Sulfonylurea

[BCH-LMO-SCBD-14830-8](#) | FLO-11351-8 - Moonshade™ carnation | Stephen Chandler Changes in quality and/or metabolite content - Pigmentation / Coloration Resistance to herbicides - Chlorsulfuron, Sulfonylurea

[BCH-LMO-SCBD-14833-8](#) | FLO-11400-3 - Moonshade™ carnation | Stephen Chandler Changes in quality and/or metabolite content - Pigmentation / Coloration Resistance to herbicides - Chlorsulfuron, Sulfonylurea

[BCH-LMO-SCBD-14831-8](#) | FLO-11959-4 - Moonshade™ carnation | Stephen Chandler Changes in quality and/or metabolite content - Pigmentation / Coloration Resistance to herbicides - Chlorsulfuron, Sulfonylurea

[BCH-LMO-SCBD-14832-7](#) | FLO-11988-6 - Moonshade™ carnation | Stephen Chandler Changes in quality and/or metabolite content - Pigmentation / Coloration Resistance to herbicides - Chlorsulfuron, Sulfonylurea

### Characteristics of the modification process

#### Vector

pCGP1991

EN

#### Techniques used for the modification

Agrobacterium-mediated DNA transfer

#### Genetic elements construct

P-35S-CaMV 0.190 kb	L-cab-PETHY 0.078 kb	CS-SuRB-TOBAC 3.761 kb	T-SuRB-TOBAC 0.000 kb
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P-CHS 1.157 kb	CS-F35H-VIOLA 1.788 kb	T-D8 0.818 kb
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P-DFR-PETHY 0.000 kb	CS-DFR-PETHY 4.957 kb	T-DFR-PETHY 0.000 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-15009-4** DIHYDROFLAVONOL-4-REDUCTASE | (PETUNIA) |

Protein coding sequence | Changes in quality and/or metabolite content (Pigmentation / Coloration)

**BCH-GENE-SCBD-15177-7** ACETOHYDROXY ACID SYNTHASE GENE | (TOBACCO PLANT) |

Protein coding sequence | Resistance to herbicides (Chlorsulfuron, Sulfonylurea)

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

Promoter

**BCH-GENE-SCBD-101901-3** 5' UNTRANSLATED LEADER OF CHLOROPHYLL A/B-BINDING PROTEIN | (PETUNIA) |

Leader

**BCH-GENE-SCBD-103771-1** CHALCONE SYNTHASE GENE PROMOTER | (COMMON SNAPDRAGON, SNAPDRAGON) |

Promoter

**BCH-GENE-SCBD-43793-4** FLAVONOID 3', 5'-HYDROXYLASE GENE | (PANSIES) |

Protein coding sequence | Changes in quality and/or metabolite content (Pigmentation / Coloration)

**BCH-GENE-SCBD-103772-2** D8 GENE TERMINATOR | (PETUNIA) |

Terminator

**BCH-GENE-SCBD-101415-9** TI PLASMID LEFT BORDER REPEAT |

Plasmid vector

**BCH-GENE-SCBD-101416-6** TI PLASMID RIGHT BORDER REPEAT |

Plasmid vector

**BCH-GENE-SCBD-100390-7** ACETOHYDROXY ACID SYNTHASE GENE TERMINATOR | (TOBACCO PLANT) |

Terminator

**BCH-GENE-SCBD-105798-1** DIHYDROFLAVONOL-4-REDUCTASE PROMOTER | (PETUNIA) |

Promoter

**BCH-GENE-SCBD-105799-1** DIHYDROFLAVONOL-4-REDUCTASE TERMINATOR | (PETUNIA) |

Terminator

Notes regarding the genetic elements present in this LMO

#### Gene expression

Three gene cassettes are present: *Nicotiana tabacum* acetolactate synthase (ALS; acetohydroxy acid synthase), *Petunia hybrida* dihydroflavonol-4-reductase (DFR) and *Viola sp.* flavonoid3', 5'-hydroxylase (F3'5'H).

EN

Transcription of ALS is under control of a *Cauliflower mosaic virus* (CaMV) 35S promoter and a *N. tabacum* ALS terminator. A 5' untranslated leader sequence from *P. hybrida* chlorophyll a/b-binding protein is also present at the 5' end of ALS, but is not expected to be translated. The leader sequence promotes high levels of transcription of ALS.

Transcription of DFR is under control of its endogenous promoter and terminator. The coding sequence contains 6 exons and 5 introns.

Transcription of F3'5'H is under control of an *Antirrhinum majus* chalcone synthase promoter and a *P. hybrida* D8 terminator.

**Note:**

- The size of the ALS coding sequence includes the size of the terminator (3.76 kb = size of ALS coding sequence + ALS terminator)
- The size of the DFR coding sequence represents the size of the full genomic cone (4.96 kb = DFR promoter + DFR coding sequence + DFR terminator)
- The T-DNA is present at one integration locus and contains one copy of each T-DNA component as determined by Southern blot analysis

There are up to five copies of each integrated component of the T-DNA, and integration of T-DNA has occurred at four loci. Estimated copy numbers of T-DNA components integrated in transgenic line FLO-40685-1 as follows: LB - 2 copies, NtALS (SurB) - 2 copies, VhF3'5'H - 4 copies, PhDFR - 2 copies, RB - 5 copies.

## LMO characteristics

### Modified traits

Resistance to herbicides  
Sulfonylurea  
Changes in quality and/or metabolite content  
Pigmentation / Coloration

### Common use(s) of the LMO

Ornamental

## Detection method(s)

### External link(s)

? [FLO-40685-2 - EU Reference Laboratory for GM Food and Feed \(EURL-GMFF\)](#) ( English )

## Additional Information

### Additional Information

These carnations were developed using recombinant DNA techniques to produce flowers with a unique violet/mauve colour by introducing two genes from petunia (*Petunia hybrida*) that function

together in the biosynthesis of the anthocyanin pigment delphinidin. The transgenic lines were derived from the parent cultivar 'White Unesco', which is a white coloured carnation that was selected for a mutation in the dihydroflavonol reductase (DFR) encoding gene that did not allow for expression of a functional enzyme, and thus did not produce the anthocyanin type pigments that give rise to blue and red coloured flowers. The two genes from *Petunia hybrida* introduced into the transgenic carnation lines included a functional dihydroflavonol reductase encoding gene (*dfr*) and a gene (*hf1*) encoding the enzyme flavonoid 3', 5'-hydroxylase (F3'5'H), a member of the NADPH-Cytochrome P450 reductase family. Expression of the F3'5'H encoding gene allows for the production of blue coloured delphinidin anthocyanin pigments, which are not normally found in carnations.

Tolerance to sulfonyl urea herbicides was produced via the introduction of a chlorsulfuron tolerant version of the acetolactate synthase (ALS) encoding gene from tobacco (SuRB).

Other relevant website addresses and/or attached documents

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

? [SNIF - Netherlands](#) ( *English* )

? [ISAAA Database](#) ( *English* )

? [EUginus - FLO-4Ø685-2](#) ( *English* )

[BCH-LMO-SCBD-14835-11](#)

## 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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