

Biosafety Clearing-House (BCH)

LIVING MODIFIED ORGANISM (LMO)


BCH-LMO-SCBD-116038-1

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

LAST UPDATED: 03 MAY 2021

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.



Drought tolerant sugarcane

CBD

<https://bch.cbd.int/database/record?documentID=116038>



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

Name

Drought tolerant sugarcane

EN

Transformation event

NXI-1T

Developer(s)

- **ORGANIZATION:** PT PERKEBUNAN NUSANTARA XI | [BCH-CON-SCBD-116034-1](#)

ORGANIZATION

PT Perkebunan Nusantara XI
Surabaya
60175, Indonesia
Phone: +62 031 3524596
Email: sekretariat@ptpn11.co.id
Website: <https://ptpn11.co.id/>

Description

The sugarcane (*Saccharum officinarum*) was modified for abiotic (drought, salt) stress tolerance through the action of choline dehydrogenase, which leads to increased glycine betaine biosynthesis. Glycine betaine maintains cell water potential by osmotic adjustment. The expression of choline dehydrogenase may also increase sugar content and promote early maturing.

The sugarcane also contains *Escherichia coli* neomycin phosphotransferase II and hygromycin B phosphotransferase for kanamycin and hygromycin resistance, respectively.

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-115592-1](#) ORGANISM | SACCHARUM OFFICINARUM L. - SUGARCANE, SUGAR CANE |

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

Sugarcane cultivar CF1426

EN

Related LMO(s)

[BCH-LMO-SCBD-116035-1](#) | Drought tolerant sugarcane | Changes in physiology and/or production - Yield, Ripening Resistance to antibiotics - Hygromycin, Kanamycin Selectable marker genes and reporter genes Tolerance to abiotic stress - Drought, Salinity

Characteristics of the modification process

Vector

pMLH2113

EN

Techniques used for the modification

Agrobacterium-mediated DNA transfer

Genetic elements construct

P-35S-CaMV 0.000 kb	L-omega-TMV 0.000 kb	TP-gdh1-SOLLC 0.069 kb	CS-betA-ECOLX 1.750 kb	T-nos-RHIRD 0.000 kb
P-35S-CaMV 0.000 kb	CS-hpt-ECOLX 0.000 kb	T-35S-CaMV 0.000 kb		
P-nos-RHIRD 0.000 kb	CS-nptII-ECOLX 0.000 kb	T-nos-RHIRD 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-100287-7](#) CAMV 35S PROMOTER |

Promoter

[BCH-GENE-SCBD-116036-1](#) GLUTAMATE DEHYDROGENASE MITOCHONDRIAL TRANSIT PEPTIDE - SOLANUM LYCOPERSICUM - TOMATO, SOLLC |

[BCH-GENE-SCBD-116037-1](#) CHOLINE DEHYDROGENASE - ESCHERICHIA COLI - ECOLX |

Changes in physiology and/or production - Yield, Growth rate, Ripening Tolerance to abiotic stress - Drought, Salinity

[BCH-GENE-SCBD-100269-8](#) NOPALINE SYNTHASE GENE TERMINATOR |

Terminator

[BCH-GENE-SCBD-14991-8](#) HYGROMYCIN B PHOSPHOTRANSFERASE GENE | (BACTERIA) |

Protein coding sequence | Resistance to antibiotics (Hygromycin), Selectable marker genes and reporter genes

BCH-GENE-SCBD-100270-6 NOPALINE SYNTHASE GENE PROMOTER |

Promoter

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

Protein coding sequence | Resistance to antibiotics (Kanamycin)

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

Terminator

BCH-GENE-SCBD-105197-2 CAMV 35S ENHANCER |

Leader

BCH-GENE-SCBD-104820-3 OMEGA 5' UNTRANSLATED LEADER | (TMV) |

Leader

Notes regarding the genetic elements present in this LMO

The modified sugarcane contains three gene cassettes: *Escherichia coli* choline dehydrogenase (*betA*); *E. coli* neomycin phosphotransferase (*nptII*) and *E. coli* hygromycin B phosphotransferase (*hph*).

The *betA* sequence is under control of a *Cauliflower mosaic virus* (CaMV) 35S promoter and *Agrobacterium tumefaciens* nopaline synthase (*nos*) terminator. At the 5' end of the *betA* coding sequence is a 5' leader sequence from *Tobacco mosaic virus* for enhanced translation and a *Solanum lycopersicum* glutamate dehydrogenase mitochondrial transit peptide, which directs the translated protein to the mitochondria.

The *hph* coding sequence is under transcriptional control of a CaMV 35S promoter and terminator.

The *nptII* coding sequence is under transcriptional control of a *nos* promoter and terminator.

Important notes:

- The donor organism for the *betA* is not clear. *E. coli* (one of the suggested donors) was chosen as a placeholder.
- The order of the genetic cassettes is unclear and could be in a different order. However, the genetic elements within each cassette are likely correct.
- The CaMV promoter associated with the *betA* coding sequence may have two tandem repeats of -419 to -90 (E12 ; enhancer).

EN

LMO characteristics

Modified traits

Resistance to antibiotics

Hygromycin

Kanamycin

Tolerance to abiotic stress

Drought

Salinity

Changes in physiology and/or production

Ripening

Yield

Selectable marker genes and reporter genes

Common use(s) of the LMO

Food

Biofuel

Additional Information

Other relevant website addresses and/or attached documents

? [EUGenius - NXI-1T sugarcane](#) (*English*)

? [ISAAA - NXI-1T sugarcane](#) (*English*)

? [Application No AU 200059458 B2 - Early-maturing sugarcane with high sugar content.pdf](#) (*English*)

? [Efficient Promoter Cassettes for Enhanced Expression of Foreign Genes in Dicotyledonous and Monocotyledonous plants.pdf](#) (*English*)

? [Sugarcane Water Stress Tolerance Mechanisms and Its Implications on Developing Biotechnology Solutions.pdf](#) (*English*)

[BCH-LMO-SCBD-116038-1](#)

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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