GEPHE SUMMARY

Gephebase Gene
anthocyanin2 (an2) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^anthocyanin2 (an2)^#gephebase-summary-title)

GepheID
GP00002051

Entry Status
Published

Main curator
Courtier

PHENOTYPIC CHANGE

Trait Category
Morphology, Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category=^Morphology^/and+Trait Category=^Physiology^#gephebase-summary-title)

Trait
Coloration (anthocyanin accumulation in entire plant) (https://www.gephebase.org/search-criteria?/and+Trait=^Coloration (anthocyanin accumulation in entire plant)^#gephebase-summary-title)

Trait State in Taxon A
C. annuum

Trait State in Taxon B
C. annuum KC00134 - purple flowers; leaves; fruits

Ancestral State
Taxon A

Taxonomic Status
Domesticated (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Domesticated^#gephebase-summary-title)

Taxon A

Latin Name
Capsicum annuum (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Capsicum annuum^#gephebase-summary-title)

Common Name
-

Synonyms
Capsicum annuum L.; Capsicum annum; Capsicum capsicum

Rank
species

Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; asterids; lamiids; Solanales; Solanaceae; Solanoideae; Capsiceae; Capsicum

Parent
Capsicum (peppers) - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4071)

NCBI Taxonomy ID
4072 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4072)

is Taxon A an Infraspecies?
No

Taxon B

Latin Name
Capsicum annuum (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Capsicum annuum^#gephebase-summary-title)

Common Name
-

Synonyms
Capsicum annuum L.; Capsicum annum; Capsicum capsicum

Rank
species

Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; asterids; lamiids; Solanales; Solanaceae; Solanoideae; Capsiceae; Capsicum

Parent
Capsicum (peppers) - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4071)

NCBI Taxonomy ID
4072 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4072)

is Taxon B an Infraspecies?
Yes

Taxon B Description
KC00134

GENOTYPIC CHANGE

Generic Gene Name
AN2

Synonyms
-

String
-

Sequence Similarities
-

GO - Molecular Function
GO:0003677 : DNA binding (https://www.ebi.ac.uk/QuickGO/term/GO:0003677)

GO - Biological Process
-

GO - Cellular Component
GO:0005634 : nucleus (https://www.ebi.ac.uk/QuickGO/term/GO:0005634)

UniProtKB Petunia integrifolia
A4GRU8 (http://www.uniprot.org/uniprot/A4GRU8)

GenebankID or UniProtKB
()

Presumptive Null

No (https://www.gephebase.org/search-criteria?/and+Presumptive Null=^No^#gephebase-summary-title)

Molecular Type

Cis-regulatory (https://www.gephebase.org/search-criteria?/and+Molecular Type=^Cis-regulatory^#gephebase-summary-title)

Aberration Type

Insertion (https://www.gephebase.org/search-criteria?/and+Aberration Type=^Insertion^#gephebase-summary-title)

Insertion Size

1-10 kb

Molecular Details of the Mutation

insertion of a 4.2 kb non-LTR retrotransposon in the promoter (672 bp upstream of the start codon of CaAn2) which may activate expression of CaAn2 by recruiting transcription factors at the 3′ UTR

Experimental Evidence

Candidate Gene (https://www.gephebase.org/search-criteria?/and+Experimental Evidence=^Candidate Gene^#gephebase-summary-title)

Main Reference

A non-LTR retrotransposon activates anthocyanin biosynthesis by regulating a MYB transcription factor in Capsicum annuum. (2019) (https://pubmed.ncbi.nlm.nih.gov/31481212)

Authors

Jung S; Venkatesh J; Kang MY; Kwon JK; Kang BC

Abstract

The flavonoid compound anthocyanin is an important plant metabolite with nutritional and aesthetic value as well as anti-oxidative capacity. MYB transcription factors are key regulators of anthocyanin biosynthesis in plants. In pepper (Capsicum annuum), the CaAn2 gene, encoding an R2R3 MYB transcription factor, regulates anthocyanin biosynthesis. However, no functional study or structural analysis of functional and dysfunctional CaAn2 alleles has been performed. Here, to elucidate the function of CaAn2, we generated transgenic Nicotiana benthamiana and Arabidopsis thaliana plants expressing CaAn2. All of the tissues in these plants were purple. Promoter analysis of CaAn2 in purple C. annuum 'KC00134' plants revealed the insertion of a non-long terminal repeat (LTR) retrotransposon designated Ca-nLTR-A. To determine the promoter activity and functional domain of Ca-nLTR-A, various constructs carrying different domains of Ca-nLTR-A fused with GUS were transformed into N. benthamiana. Promoter analysis showed that the 3′ untranslated region (UTR) of the second open reading frame of Ca-nLTR-A is responsible for CaAn2 expression in 'KC00134'. Sequence analysis of Ca-nLTR-A identified transcription factor binding sites known to regulate anthocyanin biosynthesis. This study indicates that insertion of a non-LTR retrotransposon in the promoter may activate expression of CaAn2 by recruiting transcription factors at the 3′ UTR and thus provides the first example of exaptation of a non-LTR retrotransposon into a new promoter in plants.

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Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

1 (https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^anthocyanin2 (an2)^/and+Taxon ID=^4072^/or+Gene Gephebase=^anthocyanin2 (an2)^/and+Taxon ID=^4072^#gephebase-summary-title)

EXTERNAL LINKS

COMMENTS

@TE - Email reply of Soyoung Jung (Nov 2019): The mutation is in the same gene as the one identified by Borovsky et al. (2004) for pepper variety 5226 (purple-fruited) (gephe #87). Whether the 4.2-kb insertion is present in variety 5226 is unknown, so this entry is different from gephe entry #87.