

## GEPHE SUMMARY

CYP76AD1 ( <a href="https://www.gephebase.org/search-criteria?/and+GeneGephebase=CYP76AD1#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+GeneGephebase=CYP76AD1#gephebase-summary-title</a> )	Gephebase Gene	GP00000210	GepheID
Published	Entry Status	Martin	Main curator

## PHENOTYPIC CHANGE

Morphology ( <a href="https://www.gephebase.org/search-criteria?/and+TraitCategory=Morphology#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+TraitCategory=Morphology#gephebase-summary-title</a> )	Trait Category		
Coloration ( <a href="https://www.gephebase.org/search-criteria?/and+Trait=Coloration#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait=Coloration#gephebase-summary-title</a> )	Trait		
Beta vulgaris - yellow	Trait State in Taxon A		
Beta vulgaris - red	Trait State in Taxon B		
Taxon A	Ancestral State		
Domesticated ( <a href="https://www.gephebase.org/search-criteria?/and+TaxonomicStatus=Domesticated#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+TaxonomicStatus=Domesticated#gephebase-summary-title</a> )	Taxonomic Status		
	Taxon A		Taxon B
Beta vulgaris ( <a href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Beta+vulgaris#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Beta+vulgaris#gephebase-summary-title</a> )	Latin Name	Beta vulgaris ( <a href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Beta+vulgaris#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Beta+vulgaris#gephebase-summary-title</a> )	Latin Name
-	Common Name	-	Common Name
Beta altissima; beet; Beta altissima Steud.; Beta vulgaris L.	Synonyms	Beta altissima; beet; Beta altissima Steud.; Beta vulgaris L.	Synonyms
species	Rank	species	Rank
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; Caryophyllales; Chenopodiaceae; Betoideae; Beta	Lineage	cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; Caryophyllales; Chenopodiaceae; Betoideae; Beta	Lineage
Beta () - (Rank: genus) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3554">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3554</a> )	Parent	Beta () - (Rank: genus) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3554">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3554</a> )	Parent
161934 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=161934">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=161934</a> )	NCBI Taxonomy ID	161934 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=161934">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=161934</a> )	NCBI Taxonomy ID
No	is Taxon A an Intraspecies?	No	is Taxon B an Intraspecies?

## GENOTYPIC CHANGE

CYP76AD1	Generic Gene Name	I3PFJ5 ( <a href="http://www.uniprot.org/uniprot/I3PFJ5">http://www.uniprot.org/uniprot/I3PFJ5</a> )	UniProtKB Beta vulgaris
Bv2g029890_ucyh; Bv_ucyh	Synonyms	HQ656024 ( <a href="https://www.ncbi.nlm.nih.gov/nuccore/HQ656024">https://www.ncbi.nlm.nih.gov/nuccore/HQ656024</a> )	GenebankID or UniProtKB
-	String		
Belongs to the cytochrome P450 family.	Sequence Similarities		
GO:0020037 : heme binding ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0020037">https://www.ebi.ac.uk/QuickGO/term/GO:0020037</a> )	GO - Molecular Function		
GO:0005506 : iron ion binding ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0005506">https://www.ebi.ac.uk/QuickGO/term/GO:0005506</a> )			
GO:0004497 : monooxygenase activity ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0004497">https://www.ebi.ac.uk/QuickGO/term/GO:0004497</a> )			
GO:0016705 : oxidoreductase activity, acting on paired donors, with incorporation or reduction of molecular oxygen ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0016705">https://www.ebi.ac.uk/QuickGO/term/GO:0016705</a> )			
-	GO - Biological Process		
	GO - Cellular Component		

GO:0016021 : integral component of membrane  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0016021>)

Presumptive Null

Yes ([https://www.gephebase.org/search-criteria?/and+Presumptive Null=~Yes^#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Presumptive+Null=~Yes^#gephebase-summary-title))

Molecular Type

Coding ([https://www.gephebase.org/search-criteria?/and+Molecular Type=~Coding^#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Molecular+Type=~Coding^#gephebase-summary-title))

Aberration Type

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

Insertion Size

1-9 bp

Molecular Details of the Mutation

5bp insertion resulting in frameshift

Experimental Evidence

Linkage Mapping ([https://www.gephebase.org/search-criteria?/and+Experimental Evidence=~Linkage Mapping^#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Experimental+Evidence=~Linkage+Mapping^#gephebase-summary-title))

Main Reference

The beet R locus encodes a new cytochrome P450 required for red betalain production. (2012) (<https://pubmed.ncbi.nlm.nih.gov/22660548>)

Authors

Hatlestad GJ; Sunnadeniya RM; Akhavan NA; Gonzalez A; Goldman IL; McGrath JM; Lloyd AM

Abstract

Anthocyanins are red and violet pigments that color flowers, fruits and epidermal tissues in virtually all flowering plants. A single order, Caryophyllales, contains families in which an unrelated family of pigments, the betalains, color tissues normally pigmented by anthocyanins. Here we show that CYP76AD1 encoding a novel cytochrome P450 is required to produce the red betacyanin pigments in beets. Gene silencing of CYP76AD1 results in loss of red pigment and production of only yellow betaxanthin pigment. Yellow betalain mutants are complemented by transgenic expression of CYP76AD1, and an insertion in CYP76AD1 maps to the R locus that is responsible for yellow versus red pigmentation. Finally, expression of CYP76AD1 in yeast verifies its position in the betalain biosynthetic pathway. Thus, this cytochrome P450 performs the biosynthetic step that provides the cyclo-DOPA moiety of all red betacyanins. This discovery will contribute to our ability to engineer this simple, nutritionally valuable pathway into heterologous species.

Additional References

## RELATED GEPHE

Related Genes

1 (MYB1) ([https://www.gephebase.org/search-criteria?/or+Taxon ID=~161934^/and+Trait=Coloration/and+groupHaplotypes=true#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Taxon+ID=~161934^/and+Trait=Coloration/and+groupHaplotypes=true#gephebase-summary-title))

Related Haplotypes

No matches found.

## EXTERNAL LINKS

## COMMENTS