

GEPHE SUMMARY

flavonoid 3',5'-hydroxylase (F3'5'H) (https://www.gephebase.org/search-criteria?/and+GeneGephebase=~flavonoid 3',5'-hydroxylase (F3'5'H)^#gephebase-summary-title)	Gephebase Gene		GepheID
	GP00000324		
	Entry Status	Martin	Main curator
Published			

PHENOTYPIC CHANGE

		Trait Category	
Morphology (https://www.gephebase.org/search-criteria?/and+TraitCategory=~Morphology^#gephebase-summary-title)		Trait	
Coloration (flowers) (https://www.gephebase.org/search-criteria?/and+Trait=~Coloration (flowers)^#gephebase-summary-title)		Trait State in Taxon A	
lochroma cyaneum; blue		Trait State in Taxon B	
lochroma cyaneum; gesnerioides		Ancestral State	
Data not curated		Taxonomic Status	
Interspecific (https://www.gephebase.org/search-criteria?/and+TaxonomicStatus=~Interspecific^#gephebase-summary-title)			
Taxon A		Taxon B	
lochroma cyaneum (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=~lochroma cyaneum^#gephebase-summary-title)		lochroma cyaneum (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=~lochroma cyaneum^#gephebase-summary-title)	
-		-	
lochroma cyaneum (Lindl.) M.L.Green		lochroma cyaneum (Lindl.) M.L.Green	
species		species	
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; asterids; lamiids; Solanales; Solanaceae; Solanoideae; Physaleae; lochroma		cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; asterids; lamiids; Solanales; Solanaceae; Solanoideae; Physaleae; lochroma	
lochroma () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 304104)		lochroma () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 304104)	
362357 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 362357)		362357 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 362357)	
is Taxon A an Intraspecies?		is Taxon B an Intraspecies?	
No		No	

GENOTYPIC CHANGE

		Generic Gene Name	
CYP75A2		P37120 (http://www.uniprot.org/uniprot/P37120)	
CYP75; CYPEG1		AIY22752 (https://www.ncbi.nlm.nih.gov/nuccore/AIY22752)	
-		UniProtKB Solanum melongena	
		GenebankID or UniProtKB	
		String	
		Sequence Similarities	
Belongs to the cytochrome P450 family.			
		GO - Molecular Function	
GO:0020037 : heme binding (https://www.ebi.ac.uk/QuickGO/term/GO:0020037)			
GO:0005506 : iron ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005506)			
GO:0004497 : monooxygenase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004497)			
GO:0016705 : oxidoreductase activity, acting on paired donors, with incorporation or reduction of molecular oxygen (https://www.ebi.ac.uk/QuickGO/term/GO:0016705)			
		GO - Biological Process	
GO:0009718 : anthocyanin-containing compound biosynthetic process (https://www.ebi.ac.uk/QuickGO/term/GO:0009718)			

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Yes (https://www.gephebase.org/search-criteria?/and+Presumptive Null=~Yes^#gephebase-summary-title)	Presumptive Null
Gene Loss (https://www.gephebase.org/search-criteria?/and+Molecular Type=~Gene Loss^#gephebase-summary-title)	Molecular Type
Complex Change (https://www.gephebase.org/search-criteria?/and+Aberration Type=~Complex Change^#gephebase-summary-title)	Aberration Type
Large deletion	Molecular Details of the Mutation
Linkage Mapping (https://www.gephebase.org/search-criteria?/and+Experimental Evidence=~Linkage Mapping^#gephebase-summary-title)	Experimental Evidence
Gene loss and parallel evolution contribute to species difference in flower color. (2011) (https://pubmed.ncbi.nlm.nih.gov/21551271)	Main Reference
Smith SD; Rausher MD	Authors
	Abstract

Although the importance of regulatory and functional sequence evolution in generating species differences has been studied to some extent, much less is known about the role of other types of genomic changes, such as fluctuation in gene copy number. Here, we apply analyses of gene function and expression of anthocyanin pigment pathway genes, as well as cosegregation analyses in backcross populations, to examine the genetic changes involved in the shift from blue to red flowers in Andean lochroma (*Solanaceae*). We demonstrate that deletion of a gene coding for an anthocyanin pathway enzyme was necessary for the transition to red floral pigmentation. The downregulation of a second pathway gene was also necessary for the novel flower color, and this regulatory pattern parallels the genetic change in the two other red-flowered species in the sister family *Convolvulaceae* in which flower color change has been examined genetically. Finally, we document a shift in enzymatic function at a third locus, but the importance of this change in the transition to red flowers depends on the exact order with which the three changes occurred. This study shows that gene inactivation or loss can be involved in the origin of phenotypic differences between species, thereby restricting the possibility of reversion to the ancestral state. It also demonstrates that parallel evolution of red flowers in three different species occurs via a common developmental/regulatory change but by mutations in different genes.

Additional References

RELATED GEPHE

1 (dihydroflavonol reductase (DFR)) (https://www.gephebase.org/search-criteria?/or+Taxon ID=~362357^/and+Trait=Coloration/and+groupHaplotypes=true#gephebase-summary-title)	Related Genes
No matches found.	Related Haplotypes

EXTERNAL LINKS

COMMENTS