

Ruby (https://www.gephebase.org/search-criteria?/and+GeneGephebase=~Ruby^#gephebase-summary-title)	Gephebase Gene	GP00002106	GepelD
Published	Entry Status	Courtier	Main curator

Morphology (https://www.gephebase.org/search-criteria?/and+Trait+Category=^Morphology^#gephebase-summary-title)		Trait Category	
Coloration (fruit; cold-dependent) (https://www.gephebase.org/search-criteria?/and+Trait=^Coloration (fruit; cold-dependent)^#gephebase-summary-title)		Trait	
Citrus spp. - blood orange		Trait State in Taxon A	
Citrus sinensis - enhanced red		Trait State in Taxon B	
Taxon A		Ancestral State	
Domesticated (https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=^Domesticated^#gephebase-summary-title)		Taxonomic Status	
Taxon A		Taxon B	
Citrus (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Citrus^#gephebase-summary-title)		Citrus sinensis (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Citrus+sinensis^#gephebase-summary-title)	
-		sweet orange	
Citrus L., 1753; Eremocitrus Swingle; Fortunella Swingle; Microcitrus Swingle		Citrus x sinensis; sweet orange; Valencia orange; apfelsine; naranja; navel orange; Citrus sinensis (L.) Osbeck; Citrus sinensis	
genus		species	
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; rosids; malvids; Sapindales; Rutaceae; Aurantioideae		cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; rosids; malvids; Sapindales; Rutaceae; Aurantioideae; Citrus	
Aurantioideae () - (Rank: subfamily) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=1728959)		Citrus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=2706)	
2706 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=2706)		2711 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=2711)	
is Taxon A an Intraspecies?		is Taxon B an Intraspecies?	
Yes		Yes	
Taxon A Description		Taxon B Description	
Citrus spp. - Sicilian blood oranges - varieties Moro (Reeds); Tarocco; Maltaise Sanguine; Doppio Sanguigno and Sanguinelli		Citrus sinensis - variety Moro (CRA); also called Moro (I)	

	Generic Gene Name	UniProtKB Citrus sinensis
Ruby	H6U1F1 (http://www.uniprot.org/uniprot/H6U1F1)	
	Synonyms	GenebankID or UniProtKB
-	JN402330 (https://www.ncbi.nlm.nih.gov/nuccore/JN402330)	
	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)		
		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
Deletion (https://www.gephebase.org/search-criteria?/and+Aberration Type=~Deletion~#gephebase-summary-title)	Deletion Size
1-10 kb	Molecular Details of the Mutation
Recombination between the LTRs of the TE (Tcs1) insertion which led to just one LTR. The single LTR still confers responsiveness to cold temperatures. This recombination event results in enhanced expression of Ruby in Maro (I).	Experimental Evidence
Candidate Gene (https://www.gephebase.org/search-criteria?/and+Experimental Evidence=~Candidate Gene~#gephebase-summary-title)	Main Reference
Retrotransposons control fruit-specific, cold-dependent accumulation of anthocyanins in blood oranges. (2012) (https://pubmed.ncbi.nlm.nih.gov/22427337)	Authors
Butelli E; Licciardello C; Zhang Y; Liu J; Mackay S; Bailey P; Reforgiato-Recupero G; Martin C	Abstract
Traditionally, Sicilian blood oranges (<i>Citrus sinensis</i>) have been associated with cardiovascular health, and consumption has been shown to prevent obesity in mice fed a high-fat diet. Despite increasing consumer interest in these health-promoting attributes, production of blood oranges remains unreliable due largely to a dependency on cold for full color formation. We show that Sicilian blood orange arose by insertion of a Copia-like retrotransposon adjacent to a gene encoding Ruby, a MYB transcriptional activator of anthocyanin production. The retrotransposon controls Ruby expression, and cold dependency reflects the induction of the retroelement by stress. A blood orange of Chinese origin results from an independent insertion of a similar retrotransposon, and color formation in its fruit is also cold dependent. Our results suggest that transposition and recombination of retroelements are likely important sources of variation in <i>Citrus</i> .	Additional References

RELATED GEPHE

No matches found.	Related Genes
2 (https://www.gephebase.org/search-criteria?/or+Gene Gephebase=~Ruby~/and+Taxon ID=~2706~/or+Gene Gephebase=~Ruby~/and+Taxon ID=~2711~#gephebase-summary-title)	Related Haplotypes

EXTERNAL LINKS

COMMENTS

@TE