

GEPHE SUMMARY

	Gephebase Gene	GephelD
OCYMENE SYNTHASE (OS) (https://www.gephebase.org/search-criteria/?and+Gene)	GP00001760	
Gephebase=^OCYMENE SYNTHASE (OS)^#gephebase-summary-title)		Main curator
	Entry Status	
Published	Courtier	

PHENOTYPIC CHANGE

	Trait Category	
Physiology (https://www.gephebase.org/search-criteria/?and+Trait)		
Category=^Physiology^#gephebase-summary-title)		
Fragrance (floral terpenoid volatiles; E- beta-ocimene) (https://www.gephebase.org/search-criteria/?and+Trait=^Fragrance+(floral+terpenoid+volatiles;+E+-beta-ocimene)^#gephebase-summary-title)	Trait	
scent	Trait State in Taxon A	
no scent	Trait State in Taxon B	
Taxon A	Ancestral State	
	Taxonomic Status	
Interspecific (https://www.gephebase.org/search-criteria/?and+Taxonomic)		
Status=^Interspecific^#gephebase-summary-title)		
Taxon A		Taxon B
Erythranthe lewisiai	Latin Name	Latin Name
(https://www.gephebase.org/search-criteria/?and+Taxon+and+Synonyms=^Erythranthe+lewisiai^#gephebase-summary-title)		
-	Common Name	
Mimulus lewisiai; Erythranthe lewisiai (Pursh) G.L.Nesom & N.S.Fraga; Mimulus lewisiai Pursh	Synonyms	
species	Rank	
cellular organisms; Eukaryota; Viriplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphylophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; asterids; lamiids; Lamiales; Phrymaceae; Erythranthe	Lineage	
Erythranthe () - (Rank: genus)	Parent	
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 1502711)		
69919	NCBI Taxonomy ID	NCBI Taxonomy ID
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 69919)		
No	is Taxon A an Infraspecies?	is Taxon B an Infraspecies?
	No	

GENOTYPIC CHANGE

TPS02	Generic Gene Name	UniProtKB Arabidopsis thaliana
-	Synonyms	GenebankID or UniProtKB
-	String	
Belongs to the terpene synthase family. Tpsb subfamily.	Sequence Similarities	
GO:0000287 : magnesium ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0000287)	GO - Molecular Function	
GO:0010333 : terpene synthase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0010333)		
GO:0016114 : terpenoid biosynthetic process (https://www.ebi.ac.uk/QuickGO/term/GO:0016114)	GO - Biological Process	

GO - Cellular Component

GO:0009507 : chloroplast (<https://www.ebi.ac.uk/QuickGO/term/GO:0009507>)

Presumptive Null

Yes ([https://www.gephebase.org/search-criteria?/and+Presumptive Null=%27Yes%27#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Presumptive%20Null=%27Yes%27#gephebase-summary-title))

Molecular Type

Coding ([https://www.gephebase.org/search-criteria?/and+Molecular Type=%27Coding%27#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Molecular%20Type=%27Coding%27#gephebase-summary-title))

Aberration Type

SNP ([https://www.gephebase.org/search-criteria?/and+Aberration Type=%27SNP%27#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Aberration%20Type=%27SNP%27#gephebase-summary-title))

SNP Coding Change

Unknown

Molecular Details of the Mutation

multiple candidate coding sequence differences - together they eliminate the ability of the enzyme to produce E-beta-ocimene - effect of individual mutations not tested

Experimental Evidence

Linkage Mapping ([https://www.gephebase.org/search-criteria?/and+Experimental Evidence=%27Linkage Mapping%27#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Experimental%20Evidence=%27Linkage%20Mapping%27#gephebase-summary-title))

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	-	-	-

Floral volatile alleles can contribute to pollinator-mediated reproductive isolation in monkeyflowers (*Mimulus*). (2014) (<https://pubmed.ncbi.nlm.nih.gov/25319242>)

Authors

Byers KJ; Vela JP; Peng F; Riffell JA; Bradshaw HD

Abstract

Pollinator-mediated reproductive isolation is a major factor in driving the diversification of flowering plants. Studies of floral traits involved in reproductive isolation have focused nearly exclusively on visual signals, such as flower color. The role of less obvious signals, such as floral scent, has been studied only recently. In particular, the genetics of floral volatiles involved in mediating differential pollinator visitation remains unknown. The bumblebee-pollinated *Mimulus lewisii* and hummingbird-pollinated *Mimulus cardinalis* are a model system for studying reproductive isolation via pollinator preference. We have shown that these two species differ in three floral terpenoid volatiles - d-limonene, β -myrcene, and E- β -ocimene - that are attractive to bumblebee pollinators. By genetic mapping and *in vitro* analysis of enzyme activity we demonstrate that these interspecific differences are consistent with allelic variation at two loci, LIMONENE-MYRCENE SYNTHASE (LMS) and OCIMENE SYNTHASE (OS). *Mimulus lewisii* LMS (MILMS) and OS (MIOS) are expressed most strongly in floral tissue in the last stages of floral development. *Mimulus cardinalis* LMS (McLMS) is weakly expressed and has a nonsense mutation in exon 3. *Mimulus cardinalis* OS (McOS) is expressed similarly to MIOS, but the encoded McOS enzyme produces no E- β -ocimene. Recapitulating the *M. A. cardinalis* phenotype by reducing the expression of MILMS by RNA interference in transgenic *M. A. lewisii* produces no behavioral difference in pollinating bumblebees; however, reducing MIOS expression produces a 6% decrease in visitation. Allelic variation at the OCIMENE SYNTHASE locus is likely to contribute to differential pollinator visitation, and thus promote reproductive isolation between *M. A. lewisii* and *M. A. cardinalis*. OCIMENE SYNTHASE joins a growing list of 'speciation genes' ('barrier genes') in flowering plants.

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Additional References

Less is more: Independent loss-of-function OCIMENE SYNTHASE alleles parallel pollination syndrome diversification in monkeyflowers (*Mimulus*). (2017) (<https://pubmed.ncbi.nlm.nih.gov/28724593>)

RELATED GEPHE

Related Genes

1 (LIMONENE-MYRCENE SYNTHASE (LMS)) ([https://www.gephebase.org/search-criteria?/or+Taxon ID=%2769919%27/and+Trait=Fragrance/or+Taxon ID=%27188299%27/and+Trait=Fragrance/and+groupHaplotypes=true#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Taxon%20ID=%2769919%27/and+Trait=Fragrance/or+Taxon%20ID=%27188299%27/and+Trait=Fragrance/and+groupHaplotypes=true#gephebase-summary-title))

Related Haplotypes

2 ([https://www.gephebase.org/search-criteria?/or+Gene Gephebase=%27OCYMENE SYNTHASE \(OS\)%27/and+Taxon ID=%2769919%27/or+Gene Gephebase=%27OCYMENE SYNTHASE \(OS\)%27/and+Taxon ID=%27188299%27#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene%20Gephebase=%27OCYMENE%20SYNTHASE%20(OS)%27/and+Taxon%20ID=%2769919%27/or+Gene%20Gephebase=%27OCYMENE%20SYNTHASE%20(OS)%27/and+Taxon%20ID=%27188299%27#gephebase-summary-title))

EXTERNAL LINKS

COMMENTS