

GEPHE SUMMARY

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

PHENOTYPIC CHANGE

	Trait Category		
Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category="Physiology"#gephebase-summary-title)			
	Trait		
Fragrance (floral terpenoid volatiles; E- beta-ocimene) (<a fragrance"="" href="https://www.gephebase.org/search-criteria?/and+Trait=">https://www.gephebase.org/search-criteria?/and+Trait="Fragrance (floral terpenoid volatiles; E- beta-ocimene)"#gephebase-summary-title)			
	Trait State in Taxon A		
scent			
	Trait State in Taxon B		
no scent			
	Ancestral State		
Taxon A			
	Taxonomic Status		
Interspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status="Interspecific"#gephebase-summary-title)			
	Taxon A	Taxon B	
	Latin Name		Latin Name
Erythranthe lewisii (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="Erythranthe lewisii"#gephebase-summary-title)		Erythranthe cardinalis (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="Erythranthe cardinalis"#gephebase-summary-title)	
	Common Name		Common Name
-		-	
	Synonyms		Synonyms
Mimulus lewisii; Erythranthe lewisii (Pursh) G.L.Nesom & N.S.Fraga; Mimulus lewisii Pursh		Mimulus cardinalis; Erythranthe cardinalis (Douglas ex Benth.) Spach; Mimulus cardinalis Douglas ex Benth.	
	Rank		Rank
species		species	
	Lineage		Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; asterids; lamiids; Lamiales; Phrymaceae; Erythranthe		cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; asterids; lamiids; Lamiales; Phrymaceae; Erythranthe	
	Parent		Parent
Erythranthe () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=1502711)		Erythranthe () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=1502711)	
	NCBI Taxonomy ID		NCBI Taxonomy ID
69919 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=69919)		188299 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=188299)	
	is Taxon A an Intraspecies?		is Taxon B an Intraspecies?
No		No	

GENOTYPIC CHANGE

	Generic Gene Name		UniProtKB Arabidopsis thaliana
TPS02		P0CJ43 (http://www.uniprot.org/uniprot/P0CJ43)	
	Synonyms		GenebankID or UniProtKB
-		0	
	String		
-			
	Sequence Similarities		
Belongs to the terpene synthase family. Tpsb subfamily.			
	GO - Molecular Function		
GO:0000287 : magnesium ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0000287)			
GO:0010333 : terpene synthase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0010333)			
	GO - Biological Process		
GO:0016114 : terpenoid biosynthetic process (https://www.ebi.ac.uk/QuickGO/term/GO:0016114)			

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

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

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

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

Main Reference

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. lewisii* phenotype by reducing the expression of MILMS by RNA interference in transgenic *M. 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. lewisii* and *M. 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=~69919^/and+Trait=Fragrance/or+Taxon ID=~188299^/and+Trait=Fragrance/and+groupHaplotypes=true#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Taxon+ID=~69919^/and+Trait=+Fragrance/or+Taxon+ID=~188299^/and+Trait=+Fragrance/and+groupHaplotypes=true#gephebase-summary-title))

Related Haplotypes

2 ([https://www.gephebase.org/search-criteria?/or+Gene Gephebase=~OCYMENE SYNTHASE \(OS\)^/and+Taxon ID=~69919^/or+Gene Gephebase=~OCYMENE SYNTHASE \(OS\)^/and+Taxon ID=~188299^#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=~OCYMENE+SYNTHASE+(OS)^/and+Taxon+ID=~69919^/or+Gene+Gephebase=~OCYMENE+SYNTHASE+(OS)^/and+Taxon+ID=~188299^#gephebase-summary-title))

EXTERNAL LINKS

COMMENTS