

GEPHE SUMMARY

	Gephebase Gene		GepheID
Cinnamate-CoA ligase 1 (CNL1) (https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=Cinnamate-CoA+ligase+1+(CNL1)^#gephebase-summary-title)		GP00001767	
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 (https://www.gephebase.org/search-criteria?/and+Trait=Fragrance^#gephebase-summary-title)			
	Trait State in Taxon A		
Capsella grandiflora ; benzaldehyde is the major constituent of its floral scent			
	Trait State in Taxon B		
Red Shepherd's Purse Capsella rubella ; 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
Capsella grandiflora (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Capsella+grandiflora^#gephebase-summary-title)		Capsella rubella (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Capsella+rubella^#gephebase-summary-title)	
	Common Name		Common Name
-		-	
	Synonyms		Synonyms
Capsella grandiflora (Fauche & Chaub.) Boiss.		Capsella rubella Reut.	
	Rank		Rank
species		species	
	Lineage		Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; rosids; malvids; Brassicales; Brassicaceae; Camelineae; Capsella		cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; rosids; malvids; Brassicales; Brassicaceae; Camelineae; Capsella	
	Parent		Parent
Capsella () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3718)		Capsella () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3718)	
	NCBI Taxonomy ID		NCBI Taxonomy ID
264402 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=264402)		81985 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=81985)	
	is Taxon A an Intraspecies?		is Taxon B an Intraspecies?
No		No	

GENOTYPIC CHANGE

	Generic Gene Name		UniProtKB Populus davidiana
CNL		A0A172W603 (http://www.uniprot.org/uniprot/A0A172W603)	
	Synonyms		GenebankID or UniProtKB
-		0	
	String		
-			
	Sequence Similarities		
-			
	GO - Molecular Function		
GO:0016874 : ligase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0016874)			
	GO - Biological Process		
-			
	GO - Cellular Component		
-			
			Presumptive Null
Yes (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)			

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

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

serine-to-arginine exchange at position 453 (T-to-A nucleotide exchange at genomic position 7 539 424) - this mutation is located immediately next to highly conserved amino acids predicted to be involved in adenosine monophosphate and coenzyme A binding; it involves two biochemically very dissimilar amino acids; and the serine at this position is conserved

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=))

	Taxon A	Taxon B	Position
Codon	-	-	7539424
Amino-acid	Ser	Arg	453

Main Reference

Repeated Inactivation of the First Committed Enzyme Underlies the Loss of Benzaldehyde Emission after the Selfing Transition in *Capsella*. (2016)
(<https://pubmed.ncbi.nlm.nih.gov/27916528>)

Authors

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Abstract

The enormous species richness of flowering plants is at least partly due to floral diversification driven by interactions between plants and their animal pollinators [1, 2]. Specific pollinator attraction relies on visual and olfactory floral cues [3-5]; floral scent can not only attract pollinators but also attract or repel herbivorous insects [6-8]. However, despite its central role for plant-animal interactions, the genetic control of floral scent production and its evolutionary modification remain incompletely understood [9-13]. Benzenoids are an important class of floral scent compounds that are generated from phenylalanine via several enzymatic pathways [14-17]. Here we address the genetic basis of the loss of floral scent associated with the transition from outbreeding to selfing in the genus *Capsella*. While the outbreeding *C. grandiflora* emits benzaldehyde as a major constituent of its floral scent, this has been lost in the selfing *C. rubella*. We identify the *Capsella* CNL1 gene encoding cinnamate:CoA ligase as responsible for this variation. Population genetic analysis indicates that CNL1 has been inactivated twice independently in *C. rubella* via different novel mutations to its coding sequence. Together with a recent study in *Petunia* [18], this identifies cinnamate:CoA ligase as an evolutionary hotspot for mutations causing the loss of benzenoid scent compounds in association with a shift in the reproductive strategy of *Capsella* from pollination by insects to self-fertilization.

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Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

1 ([https://www.gephebase.org/search-criteria?/or+Gene+Gephebase="+Cinnamate-CoA+ligase+1+\(CNL1\)^/and+Taxon+ID="+264402^/or+Gene+Gephebase="+Cinnamate-CoA+ligase+1+\(CNL1\)^/and+Taxon+ID="+81985"#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=))

EXTERNAL LINKS

COMMENTS

And also @Introgression of the *C. rubella*-like haplotype back into *C. grandiflora*