

GEPHE SUMMARY

	Gephebase Gene		GepheID
RCO-A (#https://www.gephebase.org/search-criteria?/and+Gene+Gephebase+RCO-A)		GP00000961	
Published	Entry Status	Martin	Main curator

PHENOTYPIC CHANGE

	Trait Category		
Morphology (#https://www.gephebase.org/search-criteria?/and+Trait+Category+Morphology)			
	Trait		
Leaf shape (simplification) (#https://www.gephebase.org/search-criteria?/and+Trait+Leaf+shape+shape+shape)			
	Trait State in Taxon A		
Capsella rubella			
	Trait State in Taxon B		
Capsella grandiflora			
	Ancestral State		
Unknown			
	Taxonomic Status		
Interspecific (#https://www.gephebase.org/search-criteria?/and+Taxonomic+Status+Interspecific)			
Taxon A		Taxon B	
	Latin Name		Latin Name
Capsella rubella (#https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms+Capsella+rubella)		Capsella grandiflora (#https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms+Capsella+grandiflora)	
	Common Name		Common Name
-		-	
	Synonyms		Synonyms
Capsella rubella Reut.		Capsella grandiflora (Fauche & Chaub.) Boiss.	
	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
81985 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=81985)		264402 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=264402)	
	is Taxon A an Intraspecies?		is Taxon B an Intraspecies?
No		No	

GENOTYPIC CHANGE

	Generic Gene Name		UniProtKB Cardamine hirsuta
RCO		A0A023NDU4 (http://www.uniprot.org/uniprot/A0A023NDU4)	
	Synonyms		GenebankID or UniProtKB
-		0	
	String		
-			
	Sequence Similarities		
-			
	GO - Molecular Function		
GO:0003700 : DNA-binding transcription factor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0003700)			
GO:0043565 : sequence-specific DNA binding (https://www.ebi.ac.uk/QuickGO/term/GO:0043565)			
	GO - Biological Process		
-			
	GO - Cellular Component		
GO:0005634 : nucleus (https://www.ebi.ac.uk/QuickGO/term/GO:0005634)			

Presumptive Null

Unknown (<https://www.gephebase.org/search-criteria?/and+Presumptive Null=~Unknown~#gephebase-summary-title>)

Molecular Type

Cis-regulatory (<https://www.gephebase.org/search-criteria?/and+Molecular Type=~Cis-regulatory~#gephebase-summary-title>)

Aberration Type

Unknown (<https://www.gephebase.org/search-criteria?/and+Aberration Type=~Unknown~#gephebase-summary-title>)

Molecular Details of the Mutation

Complex haplotype

Experimental Evidence

Linkage Mapping (<https://www.gephebase.org/search-criteria?/and+Experimental Evidence=~Linkage Mapping~#gephebase-summary-title>)

Main Reference

Repeated evolutionary changes of leaf morphology caused by mutations to a homeobox gene. (2014) (<https://pubmed.ncbi.nlm.nih.gov/25127212>)

Authors

Sicard A; Thamm A; Marona C; Lee YW; Wahl V; Stinchcombe JR; Wright SI; Kappel C; Lenhard M

Abstract

Elucidating the genetic basis of morphological changes in evolution remains a major challenge in biology. Repeated independent trait changes are of particular interest because they can indicate adaptation in different lineages or genetic and developmental constraints on generating morphological variation. In animals, changes to “hot spot” genes with minimal pleiotropy and large phenotypic effects underlie many cases of repeated morphological transitions. By contrast, only few such genes have been identified from plants, limiting cross-kingdom comparisons of the principles of morphological evolution. Here, we demonstrate that the REDUCED COMPLEXITY (RCO) locus underlies more than one naturally evolved change in leaf shape in the Brassicaceae. We show that the difference in leaf margin dissection between the sister species *Capsella rubella* and *Capsella grandiflora* is caused by cis-regulatory variation in the homeobox gene RCO-A, which alters its activity in the developing lobes of the leaf. Population genetic analyses in the ancestral *C. grandiflora* indicate that the more-active *C. rubella* haplotype is derived from a now rare or lost *C. grandiflora* haplotype via additional mutations. In *Arabidopsis thaliana*, the deletion of the RCO-A and RCO-B genes has contributed to its evolutionarily derived smooth leaf margin, suggesting the RCO locus as a candidate for an evolutionary hot spot. We also find that temperature-responsive expression of RCO-A can explain the phenotypic plasticity of leaf shape to ambient temperature in *Capsella*, suggesting a molecular basis for the well-known negative correlation between temperature and leaf margin dissection.

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Additional References

RELATED GEPHE

No matches found.

Related Genes

No matches found.

Related Haplotypes

EXTERNAL LINKS

COMMENTS

@GxE Gene Loss / Trait Loss