

GEPHE SUMMARY

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

PHENOTYPIC CHANGE

	Trait Category
Morphology (https://www.gephebase.org/search-criteria?/and+Trait Category=Morphology^#gephebase-summary-title)	
Leaf shape (simplification) (https://www.gephebase.org/search-criteria?/and+Trait=^Leaf shape (simplification)^#gephebase-summary-title)	Trait
Capsella rubella	Trait State in Taxon A
Capsella grandiflora	Trait State in Taxon B
Unknown	Ancestral State
Interspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Interspecific^#gephebase-summary-title)	Taxonomic Status

Taxon A	Latin Name	Taxon B	Latin Name
Capsella rubella (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Capsella rubella^#gephebase-summary-title)		Capsella grandiflora (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Capsella grandiflora^#gephebase-summary-title)	
-	Common Name	-	Common Name
Capsella rubella Reut.	Synonyms	Capsella grandiflora (Fauche & Chaub.) Boiss.	Synonyms
species	Rank	species	Rank
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; rosids; malvids; Brassicales; Brassicaceae; Camelinae; Capsella	Lineage	cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; rosids; malvids; Brassicales; Brassicaceae; Camelinae; Capsella	Lineage
Capsella () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 3718)	Parent	Capsella () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 3718)	Parent
81985 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 81985)	NCBI Taxonomy ID	264402 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 264402)	NCBI Taxonomy ID
	is Taxon A an Infraspecies?		is Taxon B an Infraspecies?
No		No	

GENOTYPIC CHANGE

RCO	Generic Gene Name	UniProtKB Cardamine hirsuta
-	Synonyms	GenebankID or UniProtKB
-	String	0
-	Sequence Similarities	
GO:0003700 : DNA-binding transcription factor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0003700)	GO - Molecular Function	
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=%5EUnknown%5E#gephebase-summary-title>)

Molecular Type

Cis-regulatory (<https://www.gephebase.org/search-criteria?/and+Molecular+Type=%5ECis-regulatory%5E#gephebase-summary-title>)

Aberration Type

Unknown (<https://www.gephebase.org/search-criteria?/and+Aberration+Type=%5EUnknown%5E#gephebase-summary-title>)

Molecular Details of the Mutation

Complex haplotype

Experimental Evidence

Linkage Mapping (<https://www.gephebase.org/search-criteria?/and+Experimental+Evidence=%5ELinkage+Mapping%5E#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

Related Genes

No matches found.

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

@GxE Gene Loss / Trait Loss