GEPHE SUMMARY

Gephebase Gene
RCO-A/B (Reduced Complexity) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^RCO-A/B (Reduced Complexity)^#gephebase-summary-title)

GepheID
GP00000962

Entry Status
Published

Main curator
Martin

PHENOTYPIC CHANGE

Trait Category
Morphology (https://www.gephebase.org/search-criteria?/and+Trait Category=^Morphology^#gephebase-summary-title)

Trait
Leaf shape (simplification) (https://www.gephebase.org/search-criteria?/and+Trait=^Leaf shape (simplification)^#gephebase-summary-title)

Trait State in Taxon A
Cardamine hirsuta ; other Arabidopsis

Trait State in Taxon B
Arabidopsis thaliana

Ancestral State
Taxon A

Taxonomic Status
Interspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Interspecific^#gephebase-summary-title)

Taxon A

Latin Name
Arabidopsis (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Arabidopsis^#gephebase-summary-title)

Common Name
-

Synonyms
Cardaminopsis; Arabidopsis (DC.) Heynh., 1842; Cardaminopsis Hayek

Rank
genus

Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; rosids; malvids; Brassicales; Brassicaceae; Camelineae

Parent
Camelineae () - (Rank: tribe) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 980083)

NCBI Taxonomy ID
3701 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 3701)

is Taxon A an Infraspecies?
No

Taxon B

Latin Name
Arabidopsis thaliana (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Arabidopsis thaliana^#gephebase-summary-title)

Common Name
thale cress

Synonyms
thale cress; mouse-ear cress; thale-cress; Arabidopsis thaliana (L.) Heynh.; Arabidopsis thaliana (thale cress); Arabidopsis_thaliana; Arbisopsis thaliana; thale kress

Rank
species

Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; rosids; malvids; Brassicales; Brassicaceae; Camelineae; Arabidopsis

Parent
Arabidopsis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 3701)

NCBI Taxonomy ID
3702 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 3702)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
RCO

Synonyms
-

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)

UniProtKB Cardamine hirsuta
A0A023NDU4 (http://www.uniprot.org/uniprot/A0A023NDU4)

GenebankID or UniProtKB
()

Presumptive Null

Yes (https://www.gephebase.org/search-criteria?/and+Presumptive Null=^Yes^#gephebase-summary-title)

Molecular Type

Gene Loss (https://www.gephebase.org/search-criteria?/and+Molecular Type=^Gene Loss^#gephebase-summary-title)

Aberration Type

Deletion (https://www.gephebase.org/search-criteria?/and+Aberration Type=^Deletion^#gephebase-summary-title)

Deletion Size

unknown

Molecular Details of the Mutation

Gene deletion

Experimental Evidence

Candidate Gene (https://www.gephebase.org/search-criteria?/and+Experimental Evidence=^Candidate Gene^#gephebase-summary-title)

Main Reference

Leaf shape evolution through duplication, regulatory diversification, and loss of a homeobox gene. (2014) (https://pubmed.ncbi.nlm.nih.gov/24531971)

Authors

Vlad D; Kierzkowski D; Rast MI; Vuolo F; Dello Ioio R; Galinha C; Gan X; Hajheidari M; Hay A; Smith RS; Huijser P; Bailey CD; Tsiantis M

Abstract

In this work, we investigate morphological differences between Arabidopsis thaliana, which has simple leaves, and its relative Cardamine hirsuta, which has dissected leaves comprising distinct leaflets. With the use of genetics, interspecific gene transfers, and time-lapse imaging, we show that leaflet development requires the REDUCED COMPLEXITY (RCO) homeodomain protein. RCO functions specifically in leaves, where it sculpts developing leaflets by repressing growth at their flanks. RCO evolved in the Brassicaceae family through gene duplication and was lost in A. thaliana, contributing to leaf simplification in this species. Species-specific RCO action with respect to its paralog results from its distinct gene expression pattern in the leaf base. Thus, regulatory evolution coupled with gene duplication and loss generated leaf shape diversity by modifying local growth patterns during organogenesis.

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

Gene Loss / Trait Loss