GEPHE SUMMARY

Gephebase Gene
D14 (KAI2 paralog) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^D14 (KAI2 paralog)^#gephebase-summary-title)

GepheID
GP00000213

Entry Status
Published

Main curator
Courtier

PHENOTYPIC CHANGE

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

Trait
Seed dormancy (strigolactone responsiveness) (https://www.gephebase.org/search-criteria?/and+Trait=^Seed dormancy (strigolactone responsiveness)^#gephebase-summary-title)

Trait State in Taxon A
Other spermatophytes

Trait State in Taxon B
Arabidopsis thaliana

Ancestral State
Taxon A

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

Taxon A

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

Common Name
-

Synonyms
seed plants

Rank
no rank

Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta

Parent
Euphyllophyta () - (Rank: no rank) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 78536)

NCBI Taxonomy ID
58024 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 58024)

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
D14

Synonyms
D14; D88; HTD2; Os03g0203200; LOC_Os03g10620

String
39947.LOC_Os03g10620.1 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=39947.LOC_Os03g10620.1)

Sequence Similarities
Belongs to the AB hydrolase superfamily.

GO - Molecular Function
GO:0016787 : hydrolase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0016787)

GO - Biological Process
GO:0010223 : secondary shoot formation (https://www.ebi.ac.uk/QuickGO/term/GO:0010223)
GO:1901601 : strigolactone biosynthetic process

UniProtKB Oryza sativa subsp. japonica
Q10QA5 (http://www.uniprot.org/uniprot/Q10QA5)

GenebankID or UniProtKB
()

(https://www.ebi.ac.uk/QuickGO/term/GO:1901601)

GO - Cellular Component

GO:0005737 : cytoplasm (https://www.ebi.ac.uk/QuickGO/term/GO:0005737)
GO:0005634 : nucleus (https://www.ebi.ac.uk/QuickGO/term/GO:0005634)

Presumptive Null

No (https://www.gephebase.org/search-criteria?/and+Presumptive Null=^No^#gephebase-summary-title)

Molecular Type

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

Aberration Type

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

Molecular Details of the Mutation

Ligand-binding pocket tuning

Experimental Evidence

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

Main Reference

PLANT EVOLUTION. Convergent evolution of strigolactone perception enabled host detection in parasitic plants. (2015) (https://pubmed.ncbi.nlm.nih.gov/26228149)

Authors

Conn CE; Bythell-Douglas R; Neumann D; Yoshida S; Whittington B; Westwood JH; Shirasu K; Bond CS; Dyer KA; Nelson DC

Abstract

Obligate parasitic plants in the Orobanchaceae germinate after sensing plant hormones, strigolactones, exuded from host roots. In Arabidopsis thaliana, the Î±/Î²-hydrolase D14 acts as a strigolactone receptor that controls shoot branching, whereas its ancestral paralog, KAI2, mediates karrikin-specific germination responses. We observed that KAI2, but not D14, is present at higher copy numbers in parasitic species than in nonparasitic relatives. KAI2 paralogs in parasites are distributed into three phylogenetic clades. The fastest-evolving clade, KAI2d, contains the majority of KAI2 paralogs. Homology models predict that the ligand-binding pockets of KAI2d resemble D14. KAI2d transgenes confer strigolactone-specific germination responses to Arabidopsis thaliana. Thus, the KAI2 paralogs D14 and KAI2d underwent convergent evolution of strigolactone recognition, respectively enabling developmental responses to strigolactones in angiosperms and host detection in parasites.

Additional References

RELATED GEPHE

Related Genes

5 (DOG1 (DELAY OF GERMINATION 1), RDO5 REDUCED DORMANCY5, KAI2 paralogs, NCED4, TaPHS1) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^58024^/and+Trait=Seed dormancy/or+Taxon ID=^3702^/and+Trait=Seed dormancy/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS