GEPHE SUMMARY

Gephebase Gene
AtLURE1 (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^AtLURE1^#gephebase-summary-title)

GepheID
GP00000126

Entry Status
Published

Main curator
Martin

PHENOTYPIC CHANGE

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

Trait
Fertilization (pollen-tube attraction by egg) (https://www.gephebase.org/search-criteria?/and+Trait=^Fertilization (pollen-tube attraction by egg)^#gephebase-summary-title)

Trait State in Taxon A
Arabidopsis lyrata

Trait State in Taxon B
Arabidopsis thaliana

Ancestral State
Data not curated

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

Taxon A

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

Common Name
-

Synonyms
lyrate rockcress; Arabidopsis lyrata (L.) O'Kane & Al-Shehbaz; Arabidopsis_lyrata

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
59689 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 59689)

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
LURE1.1

Synonyms
AtLURE1.1; CRP810_1.1; LURE 1.1; At5g43285; MNL12

String
3702.AT5G43285.1 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 3702.AT5G43285.1)

Sequence Similarities
Belongs to the DEFL family.

GO - Molecular Function
-

GO - Biological Process
GO:0010183 : pollen tube guidance (https://www.ebi.ac.uk/QuickGO/term/GO:0010183)

GO - Cellular Component
GO:0005576 : extracellular region (https://www.ebi.ac.uk/QuickGO/term/GO:0005576)

UniProtKB Arabidopsis thaliana
Q4VP09 (http://www.uniprot.org/uniprot/Q4VP09)

GenebankID or UniProtKB
()

Presumptive Null

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

Molecular Type

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

Aberration Type

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

Molecular Details of the Mutation

Gene birth

Experimental Evidence

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

Main Reference

A species-specific cluster of defensin-like genes encodes diffusible pollen tube attractants in Arabidopsis. (2012) (https://pubmed.ncbi.nlm.nih.gov/23271953)

Authors

Takeuchi H; Higashiyama T

Abstract

Genes directly involved in male/female and host/parasite interactions are believed to be under positive selection. The flowering plant Arabidopsis thaliana has more than 300 defensin-like (DEFL) genes, which are likely to be involved in both natural immunity and cell-to-cell communication including pollen-pistil interactions. However, little is known of the relationship between the molecular evolution of DEFL genes and their functions. Here, we identified a recently evolved cluster of DEFL genes in A. thaliana and demonstrated that these DEFL (cysteine-rich peptide [CRP810_1]) peptides, named AtLURE1 peptides, are pollen tube attractants guiding pollen tubes to the ovular micropyle. The AtLURE1 genes formed the sole species-specific cluster among DEFL genes compared to its close relative, A. lyrata. No evidence for positive selection was detected in AtLURE1 genes and their orthologs, implying neutral evolution of AtLURE1 genes. AtLURE1 peptides were specifically expressed in egg-accompanying synergid cells and secreted toward the funicular surface through the micropyle. Genetic analyses showed that gametophytic mutants defective in micropylar guidance (myb98, magatama3, and central cell guidance) do not express AtLURE1 peptides. Downregulation of the expression of these peptides impaired precise pollen tube attraction to the micropylar opening of some populations of ovules. Recombinant AtLURE1 peptides attracted A. thaliana pollen tubes at a higher frequency compared to A. lyrata pollen tubes, suggesting that these peptides are species-preferential attractants in micropylar guidance. In support of this idea, the heterologous expression of a single AtLURE1 peptide in the synergid cell of Torenia fournieri was sufficient to guide A. thaliana pollen tubes to the T. fournieri embryo sac and to permit entry into it. Our results suggest the unique evolution of AtLURE1 genes, which are directly involved in male-female interaction among the DEFL multigene family, and furthermore suggest that these peptides are sufficient to overcome interspecific barriers in gametophytic attraction and penetration.

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

Cluster of small peptide-encoding genes