

GEPHE SUMMARY

Gephebase Gene
AtGA20ox1 (=GA5=5d1)

Entry Status
Published

GepheID
GP00000106

Main curator
Martin

PHENOTYPIC CHANGE

Trait Category
Morphology

Trait
Plant size (dwarfism)

Trait State in Taxon A
Arabidopsis thaliana - Col

Trait State in Taxon B
Arabidopsis thaliana - dwarf accession (see manuscript)

Ancestral State
Data not curated

Taxonomic Status
Domesticated

Taxon A

Latin Name
Arabidopsis thaliana

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)

NCBI Taxonomy ID
3702

is Taxon A an Intraspecies?
Yes

Taxon A Description
Arabidopsis thaliana - Col

Taxon B

Latin Name
Arabidopsis thaliana

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

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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)

NCBI Taxonomy ID
3702

is Taxon B an Intraspecies?
Yes

Taxon B Description
Arabidopsis thaliana - dwarf accession (see manuscript)

GENOTYPIC CHANGE

Generic Gene Name
GA20OX1

Synonyms
ARABIDOPSIS THALIANA GIBBERELLIN 20-OXIDASE 1; AT2301; ATGA20OX1; GA REQUIRING 5; GA5; GIBBERELLIN 20-OXIDASE; T30C3.90; T30C3_90; 20ox1; At2301; At4g25420

String
3702.AT4G25420.1

Sequence Similarities
Belongs to the iron/ascorbate-dependent oxidoreductase family. GA20OX subfamily.

GO - Molecular Function
GO:0046872 : metal ion binding
GO:0051213 : dioxygenase activity
GO:0045544 : gibberellin 20-oxidase activity

GO - Biological Process
GO:0009908 : flower development

UniProtKB Arabidopsis thaliana
Q39110

GenebankID or UniProtKB
U20872

GO:0009740 : gibberellic acid mediated signaling pathway
GO:0009686 : gibberellin biosynthetic process
GO:0048366 : leaf development
GO:0009739 : response to gibberellin
GO:0048575 : short-day photoperiodism, flowering
GO:0009826 : unidimensional cell growth

GO - Cellular Component
GO:0005737 : cytoplasm

Presumptive Null

Yes

Molecular Type

Gene Loss

Aberration Type

Complex Change

Molecular Details of the Mutation

Whole gene deletion

Experimental Evidence

Linkage Mapping

Main Reference

[Arabidopsis semidwarfs evolved from independent mutations in GA20ox1, ortholog to green revolution dwarf alleles in rice and barley. \(2013\)](#)

Authors

Barboza L; Effgen S; Alonso-Blanco C; Kooke R; Keurentjes JJ; Koornneef M; Alcázar R

Abstract

Understanding the genetic bases of natural variation for developmental and stress-related traits is a major goal of current plant biology. Variation in plant hormone levels and signaling might underlie such phenotypic variation occurring even within the same species. Here we report the genetic and molecular basis of semidwarf individuals found in natural *Arabidopsis thaliana* populations. Allelism tests demonstrate that independent loss-of-function mutations at GA locus 5 (GA5), which encodes gibberellin 20-oxidase 1 (GA20ox1) involved in the last steps of gibberellin biosynthesis, are found in different populations from southern, western, and northern Europe; central Asia; and Japan. Sequencing of GA5 identified 21 different loss-of-function alleles causing semidwarfness without any obvious general tradeoff affecting plant performance traits. GA5 shows signatures of purifying selection, whereas GA5 loss-of-function alleles can also exhibit patterns of positive selection in specific populations as shown by Fay and Wu's H statistics. These results suggest that antagonistic pleiotropy might underlie the occurrence of GA5 loss-of-function mutations in nature. Furthermore, because GA5 is the ortholog of rice SD1 and barley Sdw1/Denso green revolution genes, this study illustrates the occurrence of conserved adaptive evolution between wild *A.thaliana* and domesticated plants.

Additional References

RELATED GEPHE

Related Genes

2 (ACD6 = ACCELERATED CELL DEATH 6, phytochrome D (PHYD))

Related Haplotypes

19

COMMENTS