

GEPHE SUMMARY

	Gephebase Gene		GepheID
AtGA20ox1 (=GA5=Sdt) (<a +atga20ox1+"ga5='Sdt")"' href="https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=">#gephebase-summary-title)		GP00000116	
	Entry Status	Martin	Main curator
Published			

PHENOTYPIC CHANGE

	Trait Category		
Morphology (<a +morphology+"#gephebase-summary-title<="" a="" href="https://www.gephebase.org/search-criteria?/and+Trait+Category=">)		Trait	
Plant size (dwarfism) (<a +plant+size+(dwarfism)+"#gephebase-summary-title<="" a="" href="https://www.gephebase.org/search-criteria?/and+Trait=">)			
	Trait State in Taxon A		
Arabidopsis thaliana - Col		Trait State in Taxon B	
Arabidopsis thaliana - dwarf accession (see manuscript)			
	Ancestral State		
Taxon A		Taxonomic Status	
Domesticated (<a +domesticated+"#gephebase-summary-title<="" a="" href="https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=">)			
	Taxon A		Taxon B
	Latin Name		Latin Name
Arabidopsis thaliana (<a +arabidopsis+thaliana+"#gephebase-summary-title<="" a="" href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=">)		Arabidopsis thaliana (<a +arabidopsis+thaliana+"#gephebase-summary-title<="" a="" href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=">)	
	Common Name		Common Name
thale cress		thale cress	
	Synonyms		Synonyms
thale cress; mouse-ear cress; thale-cress; Arabidopsis thaliana (L.) Heynh.; Arabidopsis thaliana (thale cress); Arabidopsis_thaliana; Arbisopsis thaliana; thale kress		thale cress; mouse-ear cress; thale-cress; Arabidopsis thaliana (L.) Heynh.; Arabidopsis thaliana (thale cress); Arabidopsis_thaliana; Arbisopsis thaliana; thale kress	
	Rank		Rank
species		species	
	Lineage		Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetales; rosids; malvids; Brassicales; Brassicaceae; Camelineae; Arabidopsis		cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetales; rosids; malvids; Brassicales; Brassicaceae; Camelineae; Arabidopsis	
	Parent		Parent
Arabidopsis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3701)		Arabidopsis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3701)	
	NCBI Taxonomy ID		NCBI Taxonomy ID
3702 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3702)		3702 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3702)	
	is Taxon A an Intraspecies?		is Taxon B an Intraspecies?
Yes		Yes	
	Taxon A Description		Taxon B Description
Arabidopsis thaliana - Col		Arabidopsis thaliana - dwarf accession (see manuscript)	

GENOTYPIC CHANGE

	Generic Gene Name		UniProtKB Arabidopsis thaliana
GA20OX1		Q39110 (http://www.uniprot.org/uniprot/Q39110)	
	Synonyms		GenebankID or UniProtKB
ARABIDOPSIS THALIANA GIBBERELLIN 20-OXIDASE 1; AT2301; ATGA20OX1; GA REQUIRING 5; GA5; GIBBERELLIN 20-OXIDASE; T30C3.90; T30C3_90; 20ox1; AT2301; At4g25420		U20872 (https://www.ncbi.nlm.nih.gov/nuccore/U20872)	
	String		
3702.AT4G25420.1 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=3702.AT4G25420.1)			
	Sequence Similarities		
Belongs to the iron/ascorbate-dependent oxidoreductase family. GA20OX subfamily.			
	GO - Molecular Function		
GO:0046872 : metal ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0046872)			
GO:0051213 : dioxygenase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0051213)			

GO:0045544 : gibberellin 20-oxidase activity
(<https://www.ebi.ac.uk/QuickGO/term/GO:0045544>)

GO - Biological Process

GO:0009908 : flower development (<https://www.ebi.ac.uk/QuickGO/term/GO:0009908>)
GO:0009740 : gibberellic acid mediated signaling pathway
(<https://www.ebi.ac.uk/QuickGO/term/GO:0009740>)
GO:0009686 : gibberellin biosynthetic process
(<https://www.ebi.ac.uk/QuickGO/term/GO:0009686>)
GO:0048366 : leaf development (<https://www.ebi.ac.uk/QuickGO/term/GO:0048366>)
GO:0009739 : response to gibberellin
(<https://www.ebi.ac.uk/QuickGO/term/GO:0009739>)
GO:0048575 : short-day photoperiodism, flowering
(<https://www.ebi.ac.uk/QuickGO/term/GO:0048575>)
GO:0009826 : unidimensional cell growth
(<https://www.ebi.ac.uk/QuickGO/term/GO:0009826>)

GO - Cellular Component

GO:0005737 : cytoplasm (<https://www.ebi.ac.uk/QuickGO/term/GO:0005737>)

Yes (https://www.gephebase.org/search-criteria?/and+Presumptive Null=~Yes~#gephebase-summary-title)	Presumptive Null
Coding (https://www.gephebase.org/search-criteria?/and+Molecular Type=~Coding~#gephebase-summary-title)	Molecular Type
Insertion (https://www.gephebase.org/search-criteria?/and+Aberration Type=~Insertion~#gephebase-summary-title)	Aberration Type
1-10 kb	Insertion Size
Transposon insertion at +1355	Molecular Details of the Mutation
Linkage Mapping (https://www.gephebase.org/search-criteria?/and+Experimental Evidence=~Linkage Mapping~#gephebase-summary-title)	Experimental Evidence

Arabidopsis semidwarfs evolved from independent mutations in GA20ox1, ortholog to green revolution dwarf alleles in rice and barley. (2013) (https://pubmed.ncbi.nlm.nih.gov/24023067)	Main Reference
Barboza L; Effgen S; Alonso-Blanco C; Kooke R; Keurentjes JJ; Koornneef M; Alc��azar R	Authors

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.	Abstract
	Additional References

RELATED GEPHE

2 (ACD6 = ACCELERATED CELL DEATH 6, phytochrome D (PHYD)) (https://www.gephebase.org/search-criteria?/or+Taxon ID=~3702~/and+Trait=Plant size/and+groupHaplotypes=true#gephebase-summary-title)	Related Genes
19 (https://www.gephebase.org/search-criteria?/or+Gene Gephebase=~AtGA20ox1 (=GA5=Sd1)~/and+Taxon ID=~3702~/or+Gene Gephebase=~AtGA20ox1 (=GA5=Sd1)~/and+Taxon ID=~3702~#gephebase-summary-title)	Related Haplotypes

EXTERNAL LINKS

COMMENTS

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