

GEPHE SUMMARY

	Gephebase Gene		GepheID
AtGA20ox1 (=GA5=Sdt) (<a +atga20ox1(='GA5=Sdt)^#gephebase-summary-title"' href="https://www.gephebase.org/search-criteria?/and+GeneGephebase=">https://www.gephebase.org/search-criteria?/and+GeneGephebase="+AtGA20ox1(=GA5=Sdt)^#gephebase-summary-title)		GP00001685	
	Entry Status	Martin	Main curator
Published			

PHENOTYPIC CHANGE

	Trait Category		
Morphology (<a +morphology^#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+TraitCategory=">https://www.gephebase.org/search-criteria?/and+TraitCategory="+Morphology^#gephebase-summary-title)		Trait	
Plant size (dwarfism) (<a +plant="" href="https://www.gephebase.org/search-criteria?/and+Trait=" size(dwarfism)^#gephebase-summary-title"="">https://www.gephebase.org/search-criteria?/and+Trait="+Plant size(dwarfism)^#gephebase-summary-title)			
	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 (<a +domesticated^#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+TaxonomicStatus=">https://www.gephebase.org/search-criteria?/and+TaxonomicStatus="+Domesticated^#gephebase-summary-title)			
	Taxon A		Taxon B
	Latin Name		Latin Name
Arabidopsis thaliana (<a +arabidopsis="" href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=" thaliana^#gephebase-summary-title"="">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="+Arabidopsis thaliana^#gephebase-summary-title)		Arabidopsis thaliana (<a +arabidopsis="" href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=" thaliana^#gephebase-summary-title"="">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="+Arabidopsis thaliana^#gephebase-summary-title)	
	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>)

Mutation #1

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

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

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

Nonsynonymous

T259C

Linkage Mapping (<https://www.gephebase.org/search-criteria?/and+Experimental Evidence=^Linkage Mapping^#gephebase-summary-title>)

Presumptive Null

Molecular Type

Aberration Type

SNP Coding Change

Molecular Details of the Mutation

Experimental Evidence

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Thr	Cys	259

Main Reference

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>)

Authors

Barboza L; Effgen S; Alonso-Blanco C; Kooke R; Keurentjes JJ; Koornneef M; Alc  zar 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

Mutation #2

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

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

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

Nonsynonymous

C87R

Linkage Mapping (<https://www.gephebase.org/search-criteria?/and+Experimental Evidence=^Linkage Mapping^#gephebase-summary-title>)

Presumptive Null

Molecular Type

Aberration Type

SNP Coding Change

Molecular Details of the Mutation

Experimental Evidence

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Cys	Arg	87

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>)

Authors

Barboza L; Effgen S; Alonso-Blanco C; Kooke R; Keurentjes JJ; Koornneef M; Alc  zar 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)) (<https://www.gephebase.org/search-criteria?/or+Taxon ID=^3702^/and+Trait=Plant size/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

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](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))

EXTERNAL LINKS

COMMENTS