

GEPHE SUMMARY

Gephebase Gene GepheID

Reduced height-D1 (RhtD1) (<https://www.gephebase.org/search-criteria?/and+Gene>) GP00000966

Gephebase="Reduced height-D1 (RhtD1)"#gephebase-summary-title Main curator

Entry Status Martin

Published

PHENOTYPIC CHANGE

Trait Category

Morphology (<https://www.gephebase.org/search-criteria?/and+Trait>)  
Category="Morphology"#gephebase-summary-title

Trait

Plant size (dwarfism) ([https://www.gephebase.org/search-criteria?/and+Trait="Plant size](https://www.gephebase.org/search-criteria?/and+Trait=))  
(dwarfism)"#gephebase-summary-title

Trait State in Taxon A

Triticum aestivum

Trait State in Taxon B

Triticum aestivum -dwarf

Ancestral State

Data not curated

Taxonomic Status

Domesticated (<https://www.gephebase.org/search-criteria?/and+Taxonomic>)  
Status="Domesticated"#gephebase-summary-title

Taxon A	Taxon B
Latin Name	Latin Name
Triticum aestivum ( <a href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=" triticum"="">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="Triticum</a> ) aestivum"#gephebase-summary-title	Triticum aestivum ( <a href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=" triticum"="">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="Triticum</a> ) aestivum"#gephebase-summary-title
Common Name	Common Name
bread wheat	bread wheat
Synonyms	Synonyms
Triticum aestivum subsp. aestivum; Triticum vulgare; bread wheat; Canadian hard winter wheat; common wheat; wheat; Triticum aestivum L.; Triticum vulgare L.; Triticum vulgare Vill., nom. illeg.; Tricum aestivum; Triticum aestivum; Triticum aestivum8	Triticum aestivum subsp. aestivum; Triticum vulgare; bread wheat; Canadian hard winter wheat; common wheat; wheat; Triticum aestivum L.; Triticum vulgare L.; Triticum vulgare Vill., nom. illeg.; Tricum aestivum; Triticum aestivum; Triticum aestivum8
Rank	Rank
species	species
Lineage	Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; BOP clade; Pooideae; Triticoeae; Triticeae; Triticinae; Triticum	cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; BOP clade; Pooideae; Triticoeae; Triticeae; Triticinae; Triticum
Parent	Parent
Triticum () - (Rank: genus) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4564">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4564</a> )	Triticum () - (Rank: genus) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4564">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4564</a> )
NCBI Taxonomy ID	NCBI Taxonomy ID
4565 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4565">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4565</a> )	4565 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4565">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4565</a> )
is Taxon A an Intraspecies?	is Taxon B an Intraspecies?
No	Yes
	Taxon B Description
	Triticum aestivum -dwarf

GENOTYPIC CHANGE

Generic Gene Name UniProtKB Zea mays

D8 Q9ST48 (<http://www.uniprot.org/uniprot/Q9ST48>)

Synonyms GenebankID or UniProtKB

- 0

String

4577.GRMZM2G144744\_P01  
([http://string-db.org/newstring.cgi/show\\_network\\_section.pl?identifier=4577.GRMZM2G144744\\_P01](http://string-db.org/newstring.cgi/show_network_section.pl?identifier=4577.GRMZM2G144744_P01))

Sequence Similarities

Belongs to the GRAS family, DELLA subfamily.

GO - Molecular Function

GO:0003700 : DNA-binding transcription factor activity  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0003700>)

GO:0043565 : sequence-specific DNA binding

(<https://www.ebi.ac.uk/QuickGO/term/GO:0043565>)  
 GO:0003712 : transcription coregulator activity  
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0003712>)

GO - Biological Process

GO:0009740 : gibberellic acid mediated signaling pathway  
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0009740>)  
 GO:2000377 : regulation of reactive oxygen species metabolic process  
 (<https://www.ebi.ac.uk/QuickGO/term/GO:2000377>)  
 GO:0009737 : response to abscisic acid  
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0009737>)  
 GO:2000033 : regulation of seed dormancy process  
 (<https://www.ebi.ac.uk/QuickGO/term/GO:2000033>)  
 GO:0042538 : hyperosmotic salinity response  
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0042538>)  
 GO:0009867 : jasmonic acid mediated signaling pathway  
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0009867>)  
 GO:0009938 : negative regulation of gibberellic acid mediated signaling pathway  
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0009938>)  
 GO:0010187 : negative regulation of seed germination  
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0010187>)  
 GO:0009723 : response to ethylene (<https://www.ebi.ac.uk/QuickGO/term/GO:0009723>)  
 GO:0009863 : salicylic acid mediated signaling pathway  
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0009863>)

GO - Cellular Component

GO:0005634 : nucleus (<https://www.ebi.ac.uk/QuickGO/term/GO:0005634>)

Presumptive Null

Yes (<https://www.gephebase.org/search-criteria?/and+Presumptive+Null=~Yes^#gephebase-summary-title>)

Molecular Type

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

Aberration Type

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

SNP Coding Change

Nonsense

Molecular Details of the Mutation

E61\*; GGA>TGA

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	-	-	-

Main Reference

'Green revolution' genes encode mutant gibberellin response modulators. (1999) (<https://pubmed.ncbi.nlm.nih.gov/10421366>)

Authors

Peng J; Richards DE; Hartley NM; Murphy GP; Devos KM; Flintham JE; Beales J; Fish LJ; Worland AJ; Pelica F; Sudhakar D; Christou P; Snape JW; Gale MD; Harberd NP

Abstract

World wheat grain yields increased substantially in the 1960s and 1970s because farmers rapidly adopted the new varieties and cultivation methods of the so-called 'green revolution'. The new varieties are shorter, increase grain yield at the expense of straw biomass, and are more resistant to damage by wind and rain. These wheats are short because they respond abnormally to the plant growth hormone gibberellin. This reduced response to gibberellin is conferred by mutant dwarfing alleles at one of two Reduced height-1 (Rht-B1 and Rht-D1) loci. Here we show that Rht-B1/Rht-D1 and maize dwarf-8 (d8) are orthologues of the Arabidopsis Gibberellin Insensitive (GAI) gene. These genes encode proteins that resemble nuclear transcription factors and contain an SH2-like domain, indicating that phosphotyrosine may participate in gibberellin signalling. Six different orthologous dwarfing mutant alleles encode proteins that are altered in a conserved amino-terminal gibberellin signalling domain. Transgenic rice plants containing a mutant GAI allele give reduced responses to gibberellin and are dwarfed, indicating that mutant GAI orthologues could be used to increase yield in a wide range of crop species.

Additional References

RELATED GEPHE

Related Genes

1 (Reduced height-B1 (RhtB1)) (<https://www.gephebase.org/search-criteria?/or+Taxon+ID=~4565^/and+Trait=Plant+size/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

No matches found.

EXTERNAL LINKS

## COMMENTS

Various mutant alleles (gai in Arabidopsis; D8 in maize, and Rht1 in sunflowers) resembles the phenotypic effect of Rht1 described here: they act in a genetically dominant fashion and encode active (altered function) mutant products that decrease GA response and thus confer reduced height.