GEPHE SUMMARY

Gephebase Gene
Heading Date 1 (HD1) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^Heading Date 1 (HD1)^#gephebase-summary-title)

GepheID
GP00001409

Entry Status
Published

Main curator
Prigent

PHENOTYPIC CHANGE

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

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

Trait State in Taxon A
Sorghum others than from Australia

Trait State in Taxon B
wild sorghum W11 from Australia (Sorghum verticilliflorum)

Ancestral State
Taxon A

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

Taxon A

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

Common Name
-

Synonyms
Sorghum Moench, 1794

Rank
genus

Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; PACMAD clade; Panicoideae; Andropogonodae; Andropogoneae; Sorghinae

Parent
Sorghinae () - (Rank: subtribe) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 1648028)

NCBI Taxonomy ID
4557 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4557)

is Taxon A an Infraspecies?
No

Taxon B

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

Common Name
-

Synonyms
Sorghum Moench, 1794

Rank
genus

Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; PACMAD clade; Panicoideae; Andropogonodae; Andropogoneae; Sorghinae

Parent
Sorghinae () - (Rank: subtribe) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 1648028)

NCBI Taxonomy ID
4557 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4557)

is Taxon B an Infraspecies?
Yes

Taxon B Description
wild sorghum W11 from Australia (Sorghum verticilliflorum)

GENOTYPIC CHANGE

Generic Gene Name
CO

Synonyms
B-box domain protein 1; BBX1; CONSTANS; F14F8.220; F14F8_220; FG; At5g15840

String
3702.AT5G15840.1 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 3702.AT5G15840.1)

Sequence Similarities
Belongs to the CONSTANS family.

GO - Molecular Function
GO:0003700 : DNA-binding transcription factor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0003700)
GO:0008270 : zinc ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0008270)
GO:0003677 : DNA binding (https://www.ebi.ac.uk/QuickGO/term/GO:0003677)

GO - Biological Process

UniProtKB Arabidopsis thaliana
Q39057 (http://www.uniprot.org/uniprot/Q39057)

GenebankID or UniProtKB
()

GO:0030154 : cell differentiation (https://www.ebi.ac.uk/QuickGO/term/GO:0030154)
GO:0009908 : flower development (https://www.ebi.ac.uk/QuickGO/term/GO:0009908)
GO:0009909 : regulation of flower development
(https://www.ebi.ac.uk/QuickGO/term/GO:0009909)
GO:0010218 : response to far red light
(https://www.ebi.ac.uk/QuickGO/term/GO:0010218)
GO:0010018 : far-red light signaling pathway
(https://www.ebi.ac.uk/QuickGO/term/GO:0010018)

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

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

Deletion Size

10-99 bp

Molecular Details of the Mutation

80bp deletion in first exon leading to gene frameshift

Experimental Evidence

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

Main Reference

Parallel Domestication of the Heading Date 1 Gene in Cereals. (2015) (https://pubmed.ncbi.nlm.nih.gov/26116860)

Authors

Liu H; Liu H; Zhou L; Zhang Z; Zhang X; Wang M; Li H; Lin Z

Abstract

Flowering time is one of the key determinants of crop adaptation to local environments during domestication. However, the genetic basis underlying flowering time is yet to be elucidated in most cereals. Although staple cereals, such as rice, maize, wheat, barley, and sorghum, have spread and adapted to a wide range of ecological environments during domestication, it is yet to be determined whether they have a common genetic basis for flowering time. In this study, we show, through map-based cloning, that flowering time in sorghum is controlled by a major quantitative trait locus (QTL) Heading Date 1 (HD1), located on chromosome 10. The causal gene encodes the CONSTANS gene family which contains a CCT domain. A 5-bp deletion of a minor allele present in the coding sequence leads to a gene frameshift that delays flowering in sorghum. In contrast, in foxtail millet, association mapping of HD1 showed a common causal site with a splicing variant from "GT" to "AT" that was highly correlated with flowering time. In addition, the rice HD1 gene is known to harbor several causal variants controlling flowering time. These data indicate that the major flowering time QTL HD1 was under parallel domestication in sorghum, foxtail millet, and rice. The pattern of common mixed minor, or even rare, causal alleles in HD1 across different species may be representative of the genetic basis of the domestication syndrome. Furthermore, large DNA sequence analysis of HD1 revealed multiple origins for domesticated sorghum and a single origin for domesticated foxtail millet.

Additional References

RELATED GEPHE

Related Genes

1 (PRR37 pseudoresponse regulator protein 37) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^4557^/and+Trait=Flowering time/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

1 (https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^Heading Date 1 (HD1)^/and+Taxon ID=^4557^/or+Gene Gephebase=^Heading Date 1 (HD1)^/and+Taxon ID=^4557^#gephebase-summary-title)

EXTERNAL LINKS

COMMENTS