

GEPHE SUMMARY

ZmVPP1 (https://www.gephebase.org/search-criteria/?and+Gene Gephebase=^ZmVPP1^#gephebase-summary-title)	Gephebase Gene	GP00001567	GepheID
Published	Entry Status	Prigent	Main curator

PHENOTYPIC CHANGE

	Trait Category		
Physiology (https://www.gephebase.org/search-criteria/?and+Trait Category=^Physiology^#gephebase-summary-title)	Trait		
Drought tolerance (https://www.gephebase.org/search-criteria/?and+Trait=^Drought tolerance^#gephebase-summary-title)	Trait State in Taxon A		
Drought-sensitive maize	Trait State in Taxon B		
Drought-tolerant maize	Ancestral State		
Unknown	Taxonomic Status		
Intraspecific (https://www.gephebase.org/search-criteria/?and+Taxonomic Status=^Intraspecific^#gephebase-summary-title)			
Taxon A		Taxon B	
Zea mays	Latin Name	Zea mays	Latin Name
(https://www.gephebase.org/search-criteria/?and+Taxon+and+Synonyms=^Zea mays^#gephebase-summary-title)		(https://www.gephebase.org/search-criteria/?and+Taxon+and+Synonyms=^Zea mays^#gephebase-summary-title)	
-	Common Name	-	Common Name
Zea mays var. japonica; maize; Zea mays L.; Zea mays mays	Synonyms	Zea mays var. japonica; maize; Zea mays L.; Zea mays mays	Synonyms
species	Rank	species	Rank
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; PACMAD clade; Panicoideae; Andropogonodae; Andropogoneae; Tripsacinae; Zea	Lineage	cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; PACMAD clade; Panicoideae; Andropogonodae; Andropogoneae; Tripsacinae; Zea	Lineage
Zea () - (Rank: genus)	Parent	Zea () - (Rank: genus)	Parent
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4575)	NCBI Taxonomy ID	(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4575)	NCBI Taxonomy ID
4577		4577	
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4577)	is Taxon A an Infraspecies?	(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4577)	is Taxon B an Infraspecies?
Yes		Yes	
B73 (genome) line and other drought-sensitive maize cultivars (GWAS)	Taxon A Description	CIMBL55 line and other drought-tolerant maize cultivars (GWAS)	Taxon B Description

GENOTYPIC CHANGE

GRMZM2G170927	Generic Gene Name	A0A172DSU8 (http://www.uniprot.org/uniprot/A0A172DSU8)	UniProtKB Zea mays subsp. mays
GRMZM2G170927	Synonyms		GenebankID or UniProtKB
-	String	0	
	Sequence Similarities		
	GO - Molecular Function		
GO:0009678 : hydrogen-translocating pyrophosphatase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0009678)			
GO:0004427 : inorganic diphosphatase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004427)			
GO:1902600 : proton transmembrane transport (https://www.ebi.ac.uk/QuickGO/term/GO:1902600)	GO - Biological Process		

GO - Cellular Component

GO:0016021 : integral component of membrane

(<https://www.ebi.ac.uk/QuickGO/term/GO:0016021>)

Presumptive Null

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

Molecular Type

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

Aberration Type

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

Insertion Size

100-999 bp

Molecular Details of the Mutation

A 366-bp insertion in the promoter containing 3 MYB cis elements confers drought-inducible expression of ZmVPP1 in drought-tolerant genotypes

Experimental Evidence

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

Main Reference

Genetic variation in ZmVPP1 contributes to drought tolerance in maize seedlings. (2016) (<https://pubmed.ncbi.nlm.nih.gov/27526320>)

Authors

Wang X; Wang H; Liu S; Ferjani A; Li J; Yan J; Yang X; Qin F

Abstract

Maize production is threatened by drought stress worldwide. Identification of the genetic components underlying drought tolerance in maize is of great importance. Here we report a genome-wide association study (GWAS) of maize drought tolerance at the seedling stage that identified 83 genetic variants, which were resolved to 42 candidate genes. The peak GWAS signal showed that the natural variation in ZmVPP1, encoding a vacuolar-type H⁺ pyrophosphatase, contributes most significantly to the trait. Further analysis showed that a 366-bp insertion in the promoter, containing three MYB cis elements, confers drought-inducible expression of ZmVPP1 in drought-tolerant genotypes. Transgenic maize with enhanced ZmVPP1 expression exhibits improved drought tolerance that is most likely due to enhanced photosynthetic efficiency and root development. Taken together, this information provides important genetic insights into the natural variation of maize drought tolerance. The identified loci or genes can serve as direct targets for both genetic engineering and selection for maize trait improvement.

Additional References

RELATED GEPHE

Related Genes

1 (ZmNAC111) (<https://www.gephebase.org/search-criteria?/or+Taxon+ID=^4577^/and+Trait=Drought+tolerance/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

Non-null mutation. The associated SNP contributes to 10% (the most significant) of the phenotypic variance