

GEPHE SUMMARY

Chalk5 (https://www.gephebase.org/search-criteria?/and+Gene)	Gephebase Gene	GP00001309	GepheID
Gephebase="Chalk5" #gephebase-summary-title)			Main curator
Published	Entry Status	Courtier	

PHENOTYPIC CHANGE

Trait #1	Trait Category
Morphology (https://www.gephebase.org/search-criteria?/and+Trait)	Trait
Category="Morphology" #gephebase-summary-title)	
Grain chalkiness (https://www.gephebase.org/search-criteria?/and+Trait)	Trait State in Taxon A
chalkiness" #gephebase-summary-title)	Trait State in Taxon B
Oryza sativa - H94	
Oryza sativa - Zhenshan 97	

Trait #2	Trait Category
Physiology (https://www.gephebase.org/search-criteria?/and+Trait)	Trait
Category="Physiology" #gephebase-summary-title)	
Amylose content (https://www.gephebase.org/search-criteria?/and+Trait)	Trait State in Taxon A
content" #gephebase-summary-title)	Trait State in Taxon B
Oryza sativa - H94	
Oryza sativa - Zhenshan 97	

Trait #3	Trait Category
Physiology (https://www.gephebase.org/search-criteria?/and+Trait)	Trait
Category="Physiology" #gephebase-summary-title)	
Grain yield (https://www.gephebase.org/search-criteria?/and+Trait)	Trait State in Taxon A
yield" #gephebase-summary-title)	Trait State in Taxon B
Oryza sativa - H94	
Oryza sativa - Zhenshan 97	

Data not curated	Ancestral State
Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic)	Taxonomic Status
Status="Intraspecific" #gephebase-summary-title)	

Taxon A	Latin Name	Taxon B	Latin Name
Oryza sativa	Oryza sativa	Oryza sativa	Oryza sativa
(https://www.gephebase.org/search-criteria?/and+Taxon)	(https://www.gephebase.org/search-criteria?/and+Taxon)	(https://www.gephebase.org/search-criteria?/and+Taxon)	(https://www.gephebase.org/search-criteria?/and+Taxon)
and Synonyms="Oryza sativa" #gephebase-summary-title)	and Synonyms="Oryza sativa" #gephebase-summary-title)	and Synonyms="Oryza sativa" #gephebase-summary-title)	and Synonyms="Oryza sativa" #gephebase-summary-title)
rice	Common Name	rice	Common Name
rice; red rice; Oryza sativa L.	Synonyms	rice; red rice; Oryza sativa L.	Synonyms
species	Rank	species	Rank
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta;	Lineage	cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta;	Lineage
Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae;		Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae;	
Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; BOP clade; Oryzoideae; Oryzaceae;		Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; BOP clade; Oryzoideae; Oryzaceae;	
Oryzinae; Oryza		Oryzinae; Oryza	

	Parent		Parent
Oryza () - (Rank: genus)		Oryza () - (Rank: genus)	
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4527)		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4527)	
	NCBI Taxonomy ID		NCBI Taxonomy ID
4530		4530	
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4530)		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4530)	
	is Taxon A an Intraspecies?		is Taxon B an Intraspecies?
Yes		Yes	
	Taxon A Description		Taxon B Description
Oryza sativa - H94		Oryza sativa - Zhenshan 97	

GENOTYPIC CHANGE

	Generic Gene Name	UniProtKB	Oryza sativa subsp. indica
Chalk5		A2Y0L3 (http://www.uniprot.org/uniprot/A2Y0L3)	
	Synonyms		GenebankID or UniProtKB
OsL18536		AK107275.1 (https://www.ncbi.nlm.nih.gov/nuccore/AK107275.1)	
	String		
39946.BGIOSGA018774-PA			
(http://string-db.org/newstring.cgi/show_network_section.pl?identifier=39946.BGIOSGA018774-PA)			
	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 - Biological Process		
GO:1902600 : proton transmembrane transport			
(https://www.ebi.ac.uk/QuickGO/term/GO:1902600)			
	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
SNP (https://www.gephebase.org/search-criteria?/and+Aberration Type=^SNP^#gephebase-summary-title)			
			Molecular Details of the Mutation
Two candidate SNPs at positions -721 and -485 in promoter region			
			Experimental Evidence
Linkage Mapping (https://www.gephebase.org/search-criteria?/and+Experimental Evidence=^Linkage Mapping^#gephebase-summary-title)			
			Main Reference
Chalk5 encodes a vacuolar H(+)-translocating pyrophosphatase influencing grain chalkiness in rice. (2014) (https://pubmed.ncbi.nlm.nih.gov/24633159)			
			Authors
Li Y; Fan C; Xing Y; Yun P; Luo L; Yan B; Peng B; Xie W; Wang G; Li X; Xiao J; Xu C; He Y			
			Abstract
Grain chalkiness is a highly undesirable quality trait in the marketing and consumption of rice grain. However, the molecular basis of this trait is poorly understood. Here we show that a major quantitative trait locus (QTL), Chalk5, influences grain chalkiness, which also affects head rice yield and many other quality traits. Chalk5 encodes a vacuolar H(+)-translocating pyrophosphatase (V-PPase) with inorganic pyrophosphate (PPi) hydrolysis and H(+)-translocation activity. Elevated expression of Chalk5 increases the chalkiness of the endosperm, putatively by disturbing the pH homeostasis of the endomembrane trafficking system in developing seeds, which affects the biogenesis of protein bodies and is coupled with a great increase in small vesicle-like structures, thus forming air spaces among endosperm storage substances and resulting in chalky grain. Our results indicate that two consensus nucleotide polymorphisms in the Chalk5 promoter in rice varieties might partly account for the differences in Chalk5 mRNA levels that contribute to natural variation in grain chalkiness.			
			Additional References

RELATED GEPHE

	Related Genes
5 (DEP1, OsCKX2=Gn1a, OsSPL14 / WFP, THOUSAND-GRAIN WEIGHT 6 (TGW6), Waxy /GBSS) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^4530^/and+Trait=Grain chalkiness/or+Taxon ID=^4530^/and+Trait=Amylose content/or+Taxon ID=^4530^/and+Trait=Grain yield/and+groupHaplotypes=true#gephebase-summary-title)	
No matches found.	Related Haplotypes

EXTERNAL LINKS

COMMENTS

@Pleiotropy Several affected traits: 80.5% lower grain chalkiness rate; leading to a 37.9% increase in head rice yield (Fig. 2c); a 2.7% decrease in amylose content; a decrease of 4.1 mm in gel length and an increase of 11.4 mg/g in total protein content ; non-null