

## GEPHE SUMMARY

	Gephebase Gene	GephelD
heavy metal atpase3 (HMA3) ( <a href="https://www.gephebase.org/search-criteria/?and+Gene">https://www.gephebase.org/search-criteria/?and+Gene</a> Gephebase=^heavy metal atpase3 (HMA3)^#gephebase-summary-title)	GP00000445	Main curator
Published	Entry Status	Martin

## PHENOTYPIC CHANGE

	Trait Category	
Physiology ( <a href="https://www.gephebase.org/search-criteria/?and+Trait">https://www.gephebase.org/search-criteria/?and+Trait</a> Category=^Physiology^#gephebase-summary-title)	Trait	
Metal tolerance ( <a href="https://www.gephebase.org/search-criteria/?and+Trait=^Metal">https://www.gephebase.org/search-criteria/?and+Trait=^Metal</a> tolerance^#gephebase-summary-title)	Trait State in Taxon A	
Oryza sativa var. Nipponbare	Trait State in Taxon B	
Oryza sativa var. Anjana Dhan (Cd-accumulating)	Ancestral State	
Data not curated	Taxonomic Status	
Domesticated ( <a href="https://www.gephebase.org/search-criteria/?and+Taxonomic">https://www.gephebase.org/search-criteria/?and+Taxonomic</a> Status=^Domesticated^#gephebase-summary-title)		
Taxon A		Taxon B
Oryza sativa	Latin Name	Latin Name
( <a href="https://www.gephebase.org/search-criteria/?and+Taxon+and+Synonyms=^Oryza">https://www.gephebase.org/search-criteria/?and+Taxon+and+Synonyms=^Oryza</a> sativa^#gephebase-summary-title)		
rice	Common Name	Common Name
rice; red rice; Oryza sativa L.	Synonyms	Synonyms
species	Rank	Rank
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; BOP clade; Oryzoideae; Oryzeae; Oryzinae; Oryza	Lineage	Lineage
Oryza () - (Rank: genus)	Parent	Parent
( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4527">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4527</a> )	NCBI Taxonomy ID	NCBI Taxonomy ID
4530		
( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4530">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4530</a> )		
Yes	is Taxon A an Infraspecies?	is Taxon B an Infraspecies?
Oryza sativa var. Nipponbare	Taxon A Description	Taxon B Description
	Oryza sativa var. Anjana Dhan (Cd-accumulating)	

## GENOTYPIC CHANGE

HMA3	Generic Gene Name	UniProtKB Arabidopsis thaliana
-	Synonyms	GenebankID or UniProtKB
-	String	0
	Sequence Similarities	
Belongs to the cation transport ATPase (P-type) (TC 3.A.3) family. Type IB subfamily.		
GO - Molecular Function		
GO:0005524 : ATP binding ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0005524">https://www.ebi.ac.uk/QuickGO/term/GO:0005524</a> )	PoCW78 ( <a href="http://www.uniprot.org/uniprot/PoCW78">http://www.uniprot.org/uniprot/PoCW78</a> )	
GO:0046872 : metal ion binding ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0046872">https://www.ebi.ac.uk/QuickGO/term/GO:0046872</a> )		
GO:0008551 : cadmium-exporting ATPase activity ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0008551">https://www.ebi.ac.uk/QuickGO/term/GO:0008551</a> )		
GO:0016463 : zinc-exporting ATPase activity ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0016463">https://www.ebi.ac.uk/QuickGO/term/GO:0016463</a> )		
	GO - Biological Process	

GO:0071585 : detoxification of cadmium ion

(<https://www.ebi.ac.uk/QuickGO/term/GO:0071585>)

#### GO - Cellular Component

GO:0016021 : integral component of membrane

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

GO:0005774 : vacuolar membrane (<https://www.ebi.ac.uk/QuickGO/term/GO:0005774>)

Presumptive Null

No (<https://www.gephebase.org/search-criteria?/and+Presumptive+Null=%22No%22#gephebase-summary-title>)

Molecular Type

Coding (<https://www.gephebase.org/search-criteria?/and+Molecular+Type=%22Coding%22#gephebase-summary-title>)

Aberration Type

SNP (<https://www.gephebase.org/search-criteria?/and+Aberration+Type=%22SNP%22#gephebase-summary-title>)

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

H80R

Experimental Evidence

Linkage Mapping (<https://www.gephebase.org/search-criteria?/and+Experimental+Evidence=%22Linkage+Mapping%22#gephebase-summary-title>)

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

Gene limiting cadmium accumulation in rice. (2010) (<https://pubmed.ncbi.nlm.nih.gov/20823253>)

Main Reference

Ueno D; Yamaji N; Kono I; Huang CF; Ando T; Yano M; Ma JF

Authors

Intake of toxic cadmium (Cd) from rice caused Itai-itai disease in the past and it is still a threat for human health. Therefore, control of the accumulation of Cd from soil is an important food-safety issue, but the molecular mechanism for the control is unknown. Herein, we report a gene (*OsHMA3*) responsible for low Cd accumulation in rice that was isolated from a mapping population derived from a cross between a high and low Cd-accumulating cultivar. The gene encodes a transporter belonging to the P(1B)-type ATPase family, but shares low similarity with other members. Heterologous expression in yeast showed that the transporter from the low-Cd cultivar is functional, but the transporter from the high-Cd cultivar had lost its function, probably because of the single amino acid mutation. The transporter is mainly expressed in the tonoplast of root cells at a similar level in both the low and high Cd-accumulating cultivars. Overexpression of the functional gene from the low Cd-accumulating cultivar selectively decreased accumulation of Cd, but not other micronutrients in the grain. Our results indicated that *OsHMA3* from the low Cd-accumulating cultivar limits translocation of Cd from the roots to the above-ground tissues by selectively sequestering Cd into the root vacuoles.

Additional References

## RELATED GEPHE

### Related Genes

1 (Nramp aluminum transporter1) (<https://www.gephebase.org/search-criteria?/or+Taxon+ID=%224530%22+and+Trait=Metal+tolerance+and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

No matches found.

## EXTERNAL LINKS

## COMMENTS