GEPHE SUMMARY

Gephebase Gene

NRT1.1B (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^NRT1.1B^#gephebase-summary-title)

Entry Status

Published

GepheID

GP00001375

Main curator

Prigent

PHENOTYPIC CHANGE

Trait Category

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

Trait

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

Trait State in Taxon A

Rice ; O. s. japonica ; Nipponbare ; low nitrate absorption

Trait State in Taxon B

Rice- O. s. indica ; IR24 ; high nitrate absorption

Ancestral State

Taxon A

Taxonomic Status

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

Taxon A

Latin Name

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

Common Name

rice

Synonyms

rice; red rice; Oryza sativa L.

Rank

species

Lineage

cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; BOP clade; Oryzoideae; Oryzeae; Oryzinae; Oryza

Parent

Oryza () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4527)

NCBI Taxonomy ID

4530 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4530)

is Taxon A an Infraspecies?

Yes

Taxon A Description

Rice ; O. s. japonica ; Nipponbare ; low nitrate absorption

Taxon B

Latin Name

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

Common Name

rice

Synonyms

rice; red rice; Oryza sativa L.

Rank

species

Lineage

cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; BOP clade; Oryzoideae; Oryzeae; Oryzinae; Oryza

Parent

Oryza () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4527)

NCBI Taxonomy ID

4530 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4530)

is Taxon B an Infraspecies?

Yes

Taxon B Description

Rice- O. s. indica ; IR24 ; high nitrate absorption

GENOTYPIC CHANGE

Generic Gene Name

NPF6.3

Synonyms

ARABIDOPSIS THALIANA NITRATE TRANSPORTER 1; AtNPF6.3; ATNRT1; ATNRT1.1; B-1; CHL1; CHL1-1; CHLORATE/NITRATE TRANSPORTER; CHLORINA 1; F12F1.1; F12F1_1; NITRATE TRANSPORTER 1; nitrate transporter 1.1; NITRATE/CHLORATE TRANSPORTER; NPF6.3; NRT1; NRT1/ PTR family 6.3; NRT1.1; At1g12110; T28K15_13

String

3702.AT1G12110.1 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 3702.AT1G12110.1)

Sequence Similarities

Belongs to the PTR2/POT transporter (TC 2.A.17) family.

GO - Molecular Function

GO:0015293 : symporter activity (https://www.ebi.ac.uk/QuickGO/term/GO:0015293)
GO:0015112 : nitrate transmembrane transporter activity

UniProtKB Arabidopsis thaliana

Q05085 (http://www.uniprot.org/uniprot/Q05085)

GenebankID or UniProtKB

()

(https://www.ebi.ac.uk/QuickGO/term/GO:0015112)

GO - Biological Process

GO:0009734 : auxin-activated signaling pathway (https://www.ebi.ac.uk/QuickGO/term/GO:0009734)
GO:0009414 : response to water deprivation (https://www.ebi.ac.uk/QuickGO/term/GO:0009414)
GO:0006857 : oligopeptide transport (https://www.ebi.ac.uk/QuickGO/term/GO:0006857)
GO:0042128 : nitrate assimilation (https://www.ebi.ac.uk/QuickGO/term/GO:0042128)
GO:0015706 : nitrate transport (https://www.ebi.ac.uk/QuickGO/term/GO:0015706)
GO:0009635 : response to herbicide (https://www.ebi.ac.uk/QuickGO/term/GO:0009635)
GO:0010167 : response to nitrate (https://www.ebi.ac.uk/QuickGO/term/GO:0010167)

GO - Cellular Component

GO:0016021 : integral component of membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0016021)
GO:0005886 : plasma membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0005886)

Presumptive Null

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

Nonsynonymous

Molecular Details of the Mutation

c.980C>T p.Met327Thr

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

Variation in NRT1.1B contributes to nitrate-use divergence between rice subspecies. (2015) (https://pubmed.ncbi.nlm.nih.gov/26053497)

Authors

Hu B; Wang W; Ou S; Tang J; Li H; Che R; Zhang Z; Chai X; Wang H; Wang Y; Liang C; Liu L; Piao Z; Deng Q; Deng K; Xu C; Liang Y; Zhang L; Li L; Chu C

Abstract

Asian cultivated rice (Oryza sativa L.) consists of two main subspecies, indica and japonica. Indica has higher nitrate-absorption activity than japonica, but the molecular mechanisms underlying that activity remain elusive. Here we show that variation in a nitrate-transporter gene, NRT1.1B (OsNPF6.5), may contribute to this divergence in nitrate use. Phylogenetic analysis revealed that NRT1.1B diverges between indica and japonica. NRT1.1B-indica variation was associated with enhanced nitrate uptake and root-to-shoot transport and upregulated expression of nitrate-responsive genes. The selection signature of NRT1.1B-indica suggests that nitrate-use divergence occurred during rice domestication. Notably, field tests with near-isogenic and transgenic lines confirmed that the japonica variety carrying the NRT1.1B-indica allele had significantly improved grain yield and nitrogen-use efficiency (NUE) compared to the variety without that allele. Our results show that variation in NRT1.1B largely explains nitrate-use divergence between indica and japonica and that NRT1.1B-indica can potentially improve the NUE of japonica.

Additional References

RELATED GEPHE

Related Genes

1 (DEP1 (DENSE AND ERECT PANICLES 1)) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^4530^/and+Trait=Nitrogen use/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

Wild ancestors are O. rufipogon-I and O. rufipogon-III in which the SNP was polymorphic ; the variant of indica has probably been selected during domestication