GEPHE SUMMARY

Gephebase Gene
GL7 (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^GL7^#gephebase-summary-title)

GepheID
GP00001541

Entry Status
Published

Main curator
Prigent

PHENOTYPIC CHANGE

Trait #1

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

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

Trait State in Taxon A
Nipponbare japonica (NPB) cultivar

Trait State in Taxon B
Ping13 (P13) indica variety with superior grain length and appearance quality (decreased chalkiness & larger starch granules)

Trait #2

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

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

Trait State in Taxon A
-

Trait State in Taxon B
-

Ancestral State
Unknown

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
Nipponbare japonica (NPB) cultivar

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
Ping13 (P13) indica variety with superior grain length and appearance quality (decreased chalkiness & larger starch granules)

GENOTYPIC CHANGE

Generic Gene Name

LNG1

UniProtKB Arabidopsis thaliana

Q9LF24 (http://www.uniprot.org/uniprot/Q9LF24)

Synonyms

LONGIFOLIA1; T20K14.190; T20K14_190; TON1 Recruiting Motif 2; TRM2; At5g15580

GenebankID or UniProtKB

KP899557 (https://www.ncbi.nlm.nih.gov/nuccore/KP899557)

String

3702.AT5G15580.1
(http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 3702.AT5G15580.1
)

Sequence Similarities

-

GO - Molecular Function

-

GO - Biological Process

GO:0051513 : regulation of monopolar cell growth
(https://www.ebi.ac.uk/QuickGO/term/GO:0051513)

GO - Cellular Component

GO:0005829 : cytosol (https://www.ebi.ac.uk/QuickGO/term/GO:0005829)
GO:0005634 : nucleus (https://www.ebi.ac.uk/QuickGO/term/GO:0005634)

Presumptive Null

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

Molecular Type

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

Aberration Type

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

Indel Size

10-100 kb

Molecular Details of the Mutation

tandem duplication of a 17.1 kb segment containing GL7. Both copies encode exactly the same polypeptide and exhibit similar transcript levels leading to upregulation

Experimental Evidence

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

Main Reference

Copy number variation at the GL7 locus contributes to grain size diversity in rice. (2015) (https://pubmed.ncbi.nlm.nih.gov/26147619)

Authors

Wang Y; Xiong G; Hu J; Jiang L; Yu H; Xu J; Fang Y; Zeng L; Xu E; Xu J; Ye W; Meng X; Liu R; Chen H; Jing Y; Wang Y; Zhu X; Li J; Qian Q

Abstract

Copy number variants (CNVs) are associated with changes in gene expression levels and contribute to various adaptive traits. Here we show that a CNV at the Grain Length on Chromosome 7 (GL7) locus contributes to grain size diversity in rice (Oryza sativa L.). GL7 encodes a protein homologous to Arabidopsis thaliana LONGIFOLIA proteins, which regulate longitudinal cell elongation. Tandem duplication of a 17.1-kb segment at the GL7 locus leads to upregulation of GL7 and downregulation of its nearby negative regulator, resulting in an increase in grain length and improvement of grain appearance quality. Sequence analysis indicates that allelic variants of GL7 and its negative regulator are associated with grain size diversity and that the CNV at the GL7 locus was selected for and used in breeding. Our work suggests that pyramiding beneficial alleles of GL7 and other yield- and quality-related genes may improve the breeding of elite rice varieties.

Additional References

RELATED GEPHE

Related Genes

10 (GL3.1, GS3, GS5, GW2, OsPPKL1/qGL3, qSW5, OsSPL13, Os07g0603400, GW7, OsSPL16) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^4530^/and+Trait=Grain size/or+Taxon ID=^4530^/and+Trait=Grain quality/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

Increase in grain length is correlated with the expression level of GL7 in transgenic plants. Overexpression of GL7 promotes the formation of densely and regularly packed starch granules.