GEPHE SUMMARY

Gephebase Gene
S5 (ORF3-ORF4-ORF5 gene complex) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^S5 (ORF3-ORF4-ORF5 gene complex)^#gephebase-summary-title)

GepheID
GP00001021

Entry Status
Published

Main curator
Martin

PHENOTYPIC CHANGE

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

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

Trait State in Taxon A
Oryza sativa indica

Trait State in Taxon B
Oryza sativa japonica

Ancestral State
Data not curated

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
Oryza sativa indica

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
Oryza sativa japonica

GENOTYPIC CHANGE

Generic Gene Name
GRXS5

Synonyms
GRXS5; P0014E08.2; Os01g0667900; LOC_Os01g47760; OSJNBb0063G05.32

String
39947.LOC_Os01g47760.1 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=39947.LOC_Os01g47760.1)

Sequence Similarities
Belongs to the glutaredoxin family. CC-type subfamily.

GO - Molecular Function
GO:0046872 : metal ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0046872)
GO:0009055 : electron transfer activity (https://www.ebi.ac.uk/QuickGO/term/GO:0009055)
GO:0051537 : 2 iron, 2 sulfur cluster binding

UniProtKB Oryza sativa subsp. japonica
Q5QLR2 (http://www.uniprot.org/uniprot/Q5QLR2)

GenebankID or UniProtKB
ACG76111 (https://www.ncbi.nlm.nih.gov/nuccore/ACG76111)

(https://www.ebi.ac.uk/QuickGO/term/GO:0051537)
GO:0015035 : protein disulfide oxidoreductase activity
(https://www.ebi.ac.uk/QuickGO/term/GO:0015035)

GO - Biological Process

GO:0045454 : cell redox homeostasis
(https://www.ebi.ac.uk/QuickGO/term/GO:0045454)

GO - Cellular Component

GO:0005737 : cytoplasm (https://www.ebi.ac.uk/QuickGO/term/GO:0005737)
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

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

Aberration Type

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

Molecular Details of the Mutation

System of alleles at three linked genes resulting in killer-protector system (hybrid incompabilitites)

Experimental Evidence

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

Main Reference

A killer-protector system regulates both hybrid sterility and segregation distortion in rice. (2012) (https://pubmed.ncbi.nlm.nih.gov/22984070)

Authors

Yang J; Zhao X; Cheng K; Du H; Ouyang Y; Chen J; Qiu S; Huang J; Jiang Y; Jiang L; Ding J; Wang J; Xu C; Li X; Zhang Q

Abstract

Hybrid sterility is a major form of postzygotic reproductive isolation that restricts gene flow between populations. Cultivated rice (Oryza sativa L.) consists of two subspecies, indica and japonica; inter-subspecific hybrids are usually sterile. We show that a killer-protector system at the S5 locus encoded by three tightly linked genes [Open Reading Frame 3 (ORF3) to ORF5] regulates fertility in indica-japonica hybrids. During female sporogenesis, the action of ORF5+ (killer) and ORF4+ (partner) causes endoplasmic reticulum (ER) stress. ORF3+ (protector) prevents ER stress and produces normal gametes, but ORF3- cannot prevent ER stress, resulting in premature programmed cell death and leads to embryo-sac abortion. Preferential transmission of ORF3+ gametes results in segregation distortion in the progeny. These results add to our understanding of differences between indica and japonica rice and may aid in rice genetic improvement.

Additional References

RELATED GEPHE

Related Genes

2 (S5, SaM + SaF) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^4530^/and+Trait=Hybrid incompatibility/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS