## GEPHE SUMMARY

Gephebase Gene
BADH2 (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^BADH2^#gephebase-summary-title)

GepheID
GP00001778

Entry Status
Published

Main curator
Courtier

## PHENOTYPIC CHANGE

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

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

Trait State in Taxon A
Oryza sativa - non-fragrant

Trait State in Taxon B
Oryza sativa - fragrant - variety from Malaysia

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?
No

### 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
Padi Wangi

## GENOTYPIC CHANGE

Generic Gene Name
BADH2

Synonyms
fgr; BADH2; OsBADH2; OsJ_27367; LOC_Os08g32870; Os08g0424500; OSJNBa0056L09.30; P0456B03.101

String
39947.LOC_Os08g32870.1 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=39947.LOC_Os08g32870.1 )

Sequence Similarities
Belongs to the aldehyde dehydrogenase family.

GO - Molecular Function
GO:0008802 : betaine-aldehyde dehydrogenase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0008802)

GO - Biological Process
GO:0071454 : cellular response to anoxia

UniProtKB Oryza sativa subsp. japonica
Q84LK3 (http://www.uniprot.org/uniprot/Q84LK3)

GenebankID or UniProtKB
ALZ42021 (https://www.ncbi.nlm.nih.gov/nuccore/ALZ42021)

(https://www.ebi.ac.uk/QuickGO/term/GO:0071454)
GO:0019285 : glycine betaine biosynthetic process from choline
(https://www.ebi.ac.uk/QuickGO/term/GO:0019285)

GO - Cellular Component

GO:0005737 : cytoplasm (https://www.ebi.ac.uk/QuickGO/term/GO:0005737)
GO:0005777 : peroxisome (https://www.ebi.ac.uk/QuickGO/term/GO:0005777)

Presumptive Null

Yes (https://www.gephebase.org/search-criteria?/and+Presumptive Null=^Yes^#gephebase-summary-title)

Molecular Type

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

Aberration Type

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

Deletion Size

1-9 bp

Molecular Details of the Mutation

1-bp deletion in exon 10 - causes a frameshift

Experimental Evidence

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

Main Reference

The origin and evolution of fragrance in rice (Oryza sativa L.). (2009) (https://pubmed.ncbi.nlm.nih.gov/19706531)

Authors

Kovach MJ; Calingacion MN; Fitzgerald MA; McCouch SR

Abstract

Fragrance in the grain is one of the most highly valued grain quality traits in rice, yet the origin and evolution of the betaine aldehyde dehydrogenase gene (BADH2) underlying this trait remains unclear. In this study, we identify eight putatively nonfunctional alleles of the BADH2 gene and show that these alleles have distinct geographic and genetic origins. Despite multiple origins of the fragrance trait, a single allele, badh2.1, is the predominant allele in virtually all fragrant rice varieties today, including the widely recognized Basmati and Jasmine types. Haplotype analysis allowed us to establish a single origin of the badh2.1 allele within the Japonica varietal group and demonstrate the introgression of this allele from Japonica to Indica. Basmati-like accessions were nearly identical to the ancestral Japonica haplotype across a 5.3-Mb region flanking BADH2 regardless of their fragrance phenotype, demonstrating a close evolutionary relationship between Basmati varieties and the Japonica gene pool. These results clarify the relationships among fragrant rice varieties and challenge the traditional assumption that the fragrance trait arose in the Indica varietal group.

Additional References

## RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

9 (https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^BADH2^/and+Taxon ID=^4530^/or+Gene Gephebase=^BADH2^/and+Taxon ID=^4530^#gephebase-summary-title)

## EXTERNAL LINKS

## COMMENTS

@Parallelism