

GEPHE SUMMARY

|                                                                                                                                                                                                                   |                |            |              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------|--------------|
| BADH2 ( <a href="https://www.gephebase.org/search-criteria?/and+GeneGephebase=~BADH2~#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+GeneGephebase=~BADH2~#gephebase-summary-title</a> ) | Gephebase Gene | GP00001777 | GepheID      |
|                                                                                                                                                                                                                   | Entry Status   | Courtier   | Main curator |
|                                                                                                                                                                                                                   | Published      |            |              |

PHENOTYPIC CHANGE

|                                                                                                                                                                                                                                                                               |  |                                                                                                                                                                                                                                                                               |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Physiology ( <a href="https://www.gephebase.org/search-criteria?/and+TraitCategory=~Physiology~#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+TraitCategory=~Physiology~#gephebase-summary-title</a> )                                              |  | Trait Category                                                                                                                                                                                                                                                                |  |
| Fragrance ( <a href="https://www.gephebase.org/search-criteria?/and+Trait=~Fragrance~#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait=~Fragrance~#gephebase-summary-title</a> )                                                                 |  | Trait                                                                                                                                                                                                                                                                         |  |
| Oryza sativa - non-fragrant                                                                                                                                                                                                                                                   |  | Trait State in Taxon A                                                                                                                                                                                                                                                        |  |
| Oryza sativa - fragrant - variety from Taiwan and Japan                                                                                                                                                                                                                       |  | Trait State in Taxon B                                                                                                                                                                                                                                                        |  |
| Taxon A                                                                                                                                                                                                                                                                       |  | Ancestral State                                                                                                                                                                                                                                                               |  |
| Domesticated ( <a href="https://www.gephebase.org/search-criteria?/and+TaxonomicStatus=~Domesticated~#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+TaxonomicStatus=~Domesticated~#gephebase-summary-title</a> )                                    |  | Taxonomic Status                                                                                                                                                                                                                                                              |  |
| Taxon A                                                                                                                                                                                                                                                                       |  | Taxon B                                                                                                                                                                                                                                                                       |  |
| Oryza sativa<br>( <a href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=~Oryza+sativa~#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=~Oryza+sativa~#gephebase-summary-title</a> )                           |  | Oryza sativa<br>( <a href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=~Oryza+sativa~#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=~Oryza+sativa~#gephebase-summary-title</a> )                           |  |
| rice                                                                                                                                                                                                                                                                          |  | rice                                                                                                                                                                                                                                                                          |  |
| rice; red rice; Oryza sativa L.                                                                                                                                                                                                                                               |  | rice; red rice; Oryza sativa L.                                                                                                                                                                                                                                               |  |
| species                                                                                                                                                                                                                                                                       |  | species                                                                                                                                                                                                                                                                       |  |
| cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; BOP clade; Oryzoideae; Oryzeae; Oryzinae; Oryza |  | cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; BOP clade; Oryzoideae; Oryzeae; Oryzinae; Oryza |  |
| Oryza () - (Rank: genus)<br>( <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> )                                                                                               |  | Oryza () - (Rank: genus)<br>( <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> )                                                                                               |  |
| 4530<br>( <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> )                                                                                                                   |  | 4530<br>( <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> )                                                                                                                   |  |
| No                                                                                                                                                                                                                                                                            |  | Yes                                                                                                                                                                                                                                                                           |  |
|                                                                                                                                                                                                                                                                               |  | Taxon B Description                                                                                                                                                                                                                                                           |  |
|                                                                                                                                                                                                                                                                               |  | Tainung 72; Shiratama                                                                                                                                                                                                                                                         |  |

GENOTYPIC CHANGE

|                                                                                                                                                                                                                                       |  |                                                                                                                        |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------|--|
| BADH2                                                                                                                                                                                                                                 |  | UniProtKB Oryza sativa subsp. japonica                                                                                 |  |
| fgr; BADH2; OsBADH2; OsJ_27367; LOC_Os08g32870; Os08g0424500; OSJNBa0056L09.30; P0456B03.101                                                                                                                                          |  | Q84LK3 ( <a href="http://www.uniprot.org/uniprot/Q84LK3">http://www.uniprot.org/uniprot/Q84LK3</a> )                   |  |
|                                                                                                                                                                                                                                       |  | GenebankID or UniProtKB                                                                                                |  |
|                                                                                                                                                                                                                                       |  | ALZ42021 ( <a href="https://www.ncbi.nlm.nih.gov/nuccore/ALZ42021">https://www.ncbi.nlm.nih.gov/nuccore/ALZ42021</a> ) |  |
| 39947.LOC_Os08g32870.1<br>( <a href="http://string-db.org/newstring.cgi/show_network_section.pl?identifier=39947.LOC_Os08g32870.1">http://string-db.org/newstring.cgi/show_network_section.pl?identifier=39947.LOC_Os08g32870.1</a> ) |  | String                                                                                                                 |  |
| Belongs to the aldehyde dehydrogenase family.                                                                                                                                                                                         |  | Sequence Similarities                                                                                                  |  |
| GO:0008802 : betaine-aldehyde dehydrogenase activity<br>( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0008802">https://www.ebi.ac.uk/QuickGO/term/GO:0008802</a> )                                                                 |  | GO - Molecular Function                                                                                                |  |
| GO:0071454 : cellular response to anoxia                                                                                                                                                                                              |  | GO - Biological Process                                                                                                |  |

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

SNP Coding Change

Unknown

Molecular Details of the Mutation

C>T substitution in exon 13 - need to check the sequence to check if this mutation is nonsense or nonsynonymous

Experimental Evidence

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

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

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](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