GEPHE SUMMARY

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

GepheID
GP00000875

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

Trait State in Taxon A
Zea mays - white

Trait State in Taxon B
Zea mays - yellow orange

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

Common Name
-

Synonyms
Zea mays var. japonica; maize; Zea mays L.; Zea mays mays

Rank
species

Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; PACMAD clade; Panicoideae; Andropogonodae; Andropogoneae; Tripsacinae; Zea

Parent
Zea () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4575)

NCBI Taxonomy ID
4577 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4577)

is Taxon A an Infraspecies?
No

Taxon B

Latin Name
Zea mays (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Zea mays^#gephebase-summary-title)

Common Name
-

Synonyms
Zea mays var. japonica; maize; Zea mays L.; Zea mays mays

Rank
species

Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; PACMAD clade; Panicoideae; Andropogonodae; Andropogoneae; Tripsacinae; Zea

Parent
Zea () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4575)

NCBI Taxonomy ID
4577 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4577)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
PSY1

Synonyms
pb1; PSY1; ZmPSY1; GRMZM2G300348; Y1; ZEAMMB73_Zm00001d036345

String
4577.GRMZM2G300348_P02 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=4577.GRMZM2G300348_P02)

Sequence Similarities
Belongs to the phytoene/squalene synthase family.

GO - Molecular Function
GO:0004310 : farnesyl-diphosphate farnesyltransferase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004310)
GO:0016767 : geranylgeranyl-diphosphate geranylgeranyltransferase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0016767)
GO:0046905 : phytoene synthase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0046905)
GO:0051996 : squalene synthase activity

UniProtKB Zea mays
P49085 (http://www.uniprot.org/uniprot/P49085)

GenebankID or UniProtKB
U32636 (https://www.ncbi.nlm.nih.gov/nuccore/U32636)

(https://www.ebi.ac.uk/QuickGO/term/GO:0051996)

GO - Biological Process

GO:0006696 : ergosterol biosynthetic process
(https://www.ebi.ac.uk/QuickGO/term/GO:0006696)
GO:0016117 : carotenoid biosynthetic process
(https://www.ebi.ac.uk/QuickGO/term/GO:0016117)

GO - Cellular Component

GO:0010287 : plastoglobule (https://www.ebi.ac.uk/QuickGO/term/GO:0010287)

Presumptive Null

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

Molecular Type

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

Aberration Type

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

Molecular Details of the Mutation

Not identified

Experimental Evidence

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

Main Reference

Contrasting effects of selection on sequence diversity and linkage disequilibrium at two phytoene synthase loci. (2003) (https://pubmed.ncbi.nlm.nih.gov/12897253)

Authors

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Abstract

We investigated the effects of human selection for yellow endosperm color, representing increased carotenoid content, on two maize genes, the Y1 phytoene synthase and PSY2, a putative second phytoene synthase. Multiple polymorphic sites were identified at Y1 and PSY2 in 75 white and yellow maize inbred lines. Many polymorphic sites showed strong association with the endosperm color phenotype at Y1, but no detectable association was found at PSY2. Nucleotide diversity was equivalent for whites and yellows at PSY2 but was 19-fold less in yellows than in whites at Y1, consistent with the white ancestral state of the gene. The strong sequence haplotype conservation within yellows at Y1 and a significant, negative Tajima's D both verified positive selection for yellow endosperm. We propose that two independent gain-of-function events associated with insertions into the promoter of the Y1 gene and upregulation of expression in endosperm have been incorporated into yellow maize.

Additional References

The y1 gene of maize codes for phytoene synthase. (1996) (https://pubmed.ncbi.nlm.nih.gov/8722797)

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS