GEPHE SUMMARY

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

GepheID
GP00001719

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

Trait State in Taxon A
red flesh

Trait State in Taxon B
yellow flesh

Ancestral State
Taxon A

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

Taxon A

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

Common Name
tomato

Synonyms
Lycopersicon esculentum var. esculentum; Solanum esculentum; Solanum lycopersicum var. humboldtii; tomato; Lycopersicon esculentum Mill.; Solanum esculentum Dunal; Solanum lycopersicum L.; Lycopersicon lycopersicum; Lycopersicum esculentum; Solanum lycopersicon

Rank
species

Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; asterids; lamiids; Solanales; Solanaceae; Solanoideae; Solaneae; Solanum; Lycopersicon

Parent
Lycopersicon () - (Rank: subgenus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 49274)

NCBI Taxonomy ID
4081 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4081)

is Taxon A an Infraspecies?
No

Taxon B

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

Common Name
tomato

Synonyms
Lycopersicon esculentum var. esculentum; Solanum esculentum; Solanum lycopersicum var. humboldtii; tomato; Lycopersicon esculentum Mill.; Solanum esculentum Dunal; Solanum lycopersicum L.; Lycopersicon lycopersicum; Lycopersicum esculentum; Solanum lycopersicon

Rank
species

Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; asterids; lamiids; Solanales; Solanaceae; Solanoideae; Solaneae; Solanum; Lycopersicon

Parent
Lycopersicon () - (Rank: subgenus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 49274)

NCBI Taxonomy ID
4081 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4081)

is Taxon B an Infraspecies?
Yes

Taxon B Description
yellow flesh - r mutant

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)

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

GenebankID or UniProtKB
()

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 (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

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

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

Indel Size

100-999 bp

Molecular Details of the Mutation

r y cDNA was found to be mutated at its 3′ end, lacking the last 237 bases of PSY1 coding sequence and containing 185 nucleotides of an unrelated sequence in its place

Experimental Evidence

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

Main Reference

Identification and genetic analysis of normal and mutant phytoene synthase genes of tomato by sequencing, complementation and co-suppression. (1993) (https://pubmed.ncbi.nlm.nih.gov/8343597)

Authors

Fray RG; Grierson D

Abstract

A tomato phytoene synthase gene, Psy1, has recently been isolated as the clone GTOM5 and shown by sequence identity to be the gene from which the major fruit-ripening cDNA clone TOM5 was derived. Sequence analysis of transcripts from two allelic yellow-fruited tomato mutants, mapped to chromosome 3, has shown the lack of carotenoids in fruit of these mutants to be due to the production of aberrant TOM5 transcripts which are unlikely to encode a functional phytoene synthase enzyme. In one mutant (yellow flesh) the aberrant transcript contained a sequence that, by its strong hybridization to a wide size range of genomic fragments, appeared to be repeated many times within the genome. Southern and PCR analysis of the phytoene synthase genes in the mutant revealed restriction fragment length polymorphisms, suggesting that the production of altered mRNAs was associated with specific genomic rearrangements. Constitutive over-expression of a TOM5 cDNA clone in transgenic mutant plants restored synthesis of the carotenoid lycopene in ripening fruit and also led to unscheduled pigment production in other cell types. In some mutant plants transformed with the TOM5 cDNA construct, inhibition of carotenoid production in immature green fruit, leaves and flowers was observed, due to the phenomenon of co-suppression, indicating that different insertion events with the same gene construct can lead to overexpression or co-suppression in transgenic plants. Green organs of these plants were susceptible to photobleaching, due to the lack of carotenoids. These results suggest the existence of separate Psy genes for carotenoid synthesis in green organs.

Additional References

Horizontal acquisition of transposable elements and viral sequences: patterns and consequences. (2018) (https://pubmed.ncbi.nlm.nih.gov/29505963)

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

1 (https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^phytoene synthase^/and+Taxon ID=^4081^/or+Gene Gephebase=^phytoene synthase^/and+Taxon ID=^4081^#gephebase-summary-title)

EXTERNAL LINKS

COMMENTS