GEPHE SUMMARY

Gephebase Gene
diacylglycerol acyltransferase 1-2 (DGAT1-2) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^diacylglycerol acyltransferase 1-2 (DGAT1-2)^#gephebase-summary-title)

GepheID
GP00000223

Entry Status
Published

Main curator
Martin

PHENOTYPIC CHANGE

Trait #1

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

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

Trait State in Taxon A
Zea mays ssp. parviglumis and mexicana (teosinthe)

Trait State in Taxon B
Zea mays ssp. Mays

Trait #2

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

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

Trait State in Taxon A
-

Trait State in Taxon B
-

Ancestral State
Taxon A

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?
Yes

Taxon A Description
Zea mays ssp. parviglumis and mexicana (teosinthe)

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?
Yes

Taxon B Description
Zea mays ssp. Mays

GENOTYPIC CHANGE

Generic Gene Name

DGAT1-2

UniProtKB Zea mays

B0LF77 (http://www.uniprot.org/uniprot/B0LF77)

Synonyms

GRMZM2G169089

GenebankID or UniProtKB

EU039830 (https://www.ncbi.nlm.nih.gov/nuccore/EU039830)

String

-

Sequence Similarities

Belongs to the membrane-bound acyltransferase family. Sterol o-acyltransferase subfamily.

GO - Molecular Function

GO:0004144 : diacylglycerol O-acyltransferase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004144)

GO - Biological Process

GO:0019432 : triglyceride biosynthetic process (https://www.ebi.ac.uk/QuickGO/term/GO:0019432)

GO - Cellular Component

GO:0016021 : integral component of membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0016021)
GO:0005789 : endoplasmic reticulum membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0005789)

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

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

Deletion Size

1-9 bp

Molecular Details of the Mutation

Deletion of amino acid F469

Experimental Evidence

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

Main Reference

A phenylalanine in DGAT is a key determinant of oil content and composition in maize. (2008) (https://pubmed.ncbi.nlm.nih.gov/18278045)

Authors

Zheng P; Allen WB; Roesler K; Williams ME; Zhang S; Li J; Glassman K; Ranch J; Nubel D; Solawetz W; Bhattramakki D; Llaca V; Deschamps S; Zhong GY; Tarczynski MC; Shen B

Abstract

Plant oil is an important renewable resource for biodiesel production and for dietary consumption by humans and livestock. Through genetic mapping of the oil trait in plants, studies have reported multiple quantitative trait loci (QTLs) with small effects, but the molecular basis of oil QTLs remains largely unknown. Here we show that a high-oil QTL (qHO6) affecting maize seed oil and oleic-acid contents encodes an acyl-CoA:diacylglycerol acyltransferase (DGAT1-2), which catalyzes the final step of oil synthesis. We further show that a phenylalanine insertion in DGAT1-2 at position 469 (F469) is responsible for the increased oil and oleic-acid contents. The DGAT1-2 allele with F469 is ancestral, whereas the allele without F469 is a more recent mutant selected by domestication or breeding. Ectopic expression of the high-oil DGAT1-2 allele increases oil and oleic-acid contents by up to 41% and 107%, respectively. This work provides insights into the molecular basis of natural variation of oil and oleic-acid contents in plants and highlights DGAT as a promising target for increasing oil and oleic-acid contents in other crops.

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS