

GEPHE SUMMARY

DEFICIENS (https://www.gephebase.org/search-criteria?/and+Gene+Gephebase~DEFICIENS~#gephebase-summary-title)	Gephebase Gene	GP00002100	GepheID
Published	Entry Status	Courtier	Main curator

PHENOTYPIC CHANGE

Morphology (https://www.gephebase.org/search-criteria?/and+Trait+Category~Morphology~#gephebase-summary-title)	Trait Category		
Fruit shape (https://www.gephebase.org/search-criteria?/and+Trait~Fruit+shape~#gephebase-summary-title)	Trait		
Elaeis guineensis; round fruit	Trait State in Taxon A		
Elaeis guineensis; mantled fruit - homeotic floral phenotype - staminodes of pistillate flowers and stamens of staminate flowers develop as pseudocarpels often resulting in sterile parthenocarpic flowers with abortive fruit and very low oil yields	Trait State in Taxon B		
Taxon A	Ancestral State		
Domesticated (https://www.gephebase.org/search-criteria?/and+Taxonomic+Status~Domesticated~#gephebase-summary-title)	Taxonomic Status		
	Taxon A		Taxon B
Elaeis guineensis (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms~Elaeis+guineensis~#gephebase-summary-title)	Latin Name	Elaeis guineensis (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms~Elaeis+guineensis~#gephebase-summary-title)	Latin Name
African oil palm	Common Name	African oil palm	Common Name
African oil palm; Elaeis guineensis Jacq.; Elaeis guineensis var. tenera (Oil palm); Elaeis guinensi; Elaeis guinensis; Elaeis guineensis; Eleais guineensis	Synonyms	African oil palm; Elaeis guineensis Jacq.; Elaeis guineensis var. tenera (Oil palm); Elaeis guinensi; Elaeis guinensis; Elaeis guineensis; Eleais guineensis	Synonyms
species	Rank	species	Rank
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Arecales; Areaceae; Arecoideae; Cocoseae; Elaeidinae; Elaeis	Lineage	cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Arecales; Areaceae; Arecoideae; Cocoseae; Elaeidinae; Elaeis	Lineage
Elaeis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=51953)	Parent	Elaeis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=51952)	Parent
51953 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=51953)	NCBI Taxonomy ID	51953 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=51953)	NCBI Taxonomy ID
No	is Taxon A an Intraspecies?	No	is Taxon B an Intraspecies?

GENOTYPIC CHANGE

AP3	Generic Gene Name	P35632 (http://www.uniprot.org/uniprot/P35632)	UniProtKB Arabidopsis thaliana
APETALA 3; ATAP3; FLORAL HOMEOTIC PROTEIN APETALA 3; At3g54340; T12E18_30	Synonyms	()	GenebankID or UniProtKB
3702.AT3G54340.1 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=3702.AT3G54340.1)	String		
-	Sequence Similarities		
GO:0046983 : protein dimerization activity (https://www.ebi.ac.uk/QuickGO/term/GO:0046983)	GO - Molecular Function		
GO:0003700 : DNA-binding transcription factor activity			

(<https://www.ebi.ac.uk/QuickGO/term/GO:0003700>)
GO:000977 : RNA polymerase II regulatory region sequence-specific DNA binding
(<https://www.ebi.ac.uk/QuickGO/term/GO:000977>)
GO:0043565 : sequence-specific DNA binding
(<https://www.ebi.ac.uk/QuickGO/term/GO:0043565>)
GO:0008134 : transcription factor binding
(<https://www.ebi.ac.uk/QuickGO/term/GO:0008134>)
GO:0044212 : transcription regulatory region DNA binding
(<https://www.ebi.ac.uk/QuickGO/term/GO:0044212>)

GO - Biological Process

GO:0007275 : multicellular organism development
(<https://www.ebi.ac.uk/QuickGO/term/GO:0007275>)
GO:0045944 : positive regulation of transcription by RNA polymerase II
(<https://www.ebi.ac.uk/QuickGO/term/GO:0045944>)
GO:0030154 : cell differentiation (<https://www.ebi.ac.uk/QuickGO/term/GO:0030154>)
GO:0010093 : specification of floral organ identity
(<https://www.ebi.ac.uk/QuickGO/term/GO:0010093>)

GO - Cellular Component

GO:0005634 : nucleus (<https://www.ebi.ac.uk/QuickGO/term/GO:0005634>)

Presumptive Null

No (<https://www.gephebase.org/search-criteria?/and+Presumptive Null=^No^ #gephebase-summary-title>)

Molecular Type

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

Aberration Type

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

Molecular Details of the Mutation

hypomethylation of the 3.2 kb oil palm Karma transposable element located within an intron of the DEFICIENS gene - this results in unmasking of a cryptic splice acceptor site and a premature termination signal and causes the mantled fruit phenotype- epigenetic derepression of a TE associated with a deleterious phenotype

Experimental Evidence

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

Main Reference

Loss of Karma transposon methylation underlies the mantled somaclonal variant of oil palm. (2015) (<https://pubmed.ncbi.nlm.nih.gov/26352475>)

Authors

Ong-Abdullah M; Ordway JM; Jiang N; Ooi SE; Kok SY; Sarpan N; Azimi N; Hashim AT; Ishak Z; Rosli SK; Malike FA; Bakar NA; Marjuni M; Abdullah N; Yaakub Z; Amiruddin MD; Nookiah R; Singh R; Low ET; Chan KL; Azizi N; Smith SW; Bacher B; Budiman MA; Van Brunt A; Wischmeyer C; Beil M; Hogan M; Lakey N; Lim CC; Arulandoo X; Wong CK; Choo CN; Wong WC; Kwan YY; Alwee SS; Sambanthamurthi R; Martienssen RA

Abstract

Somaclonal variation arises in plants and animals when differentiated somatic cells are induced into a pluripotent state, but the resulting clones differ from each other and from their parents. In agriculture, somaclonal variation has hindered the micropropagation of elite hybrids and genetically modified crops, but the mechanism responsible remains unknown. The oil palm fruit 'mantled' abnormality is a somaclonal variant arising from tissue culture that drastically reduces yield, and has largely halted efforts to clone elite hybrids for oil production. Widely regarded as an epigenetic phenomenon, 'mantling' has defied explanation, but here we identify the MANTLED locus using epigenome-wide association studies of the African oil palm *Elaeis guineensis*. DNA hypomethylation of a LINE retrotransposon related to rice Karma, in the intron of the homeotic gene DEFICIENS, is common to all mantled clones and is associated with alternative splicing and premature termination. Dense methylation near the Karma splice site (termed the Good Karma epiallele) predicts normal fruit set, whereas hypomethylation (the Bad Karma epiallele) predicts homeotic transformation, parthenocarpy and marked loss of yield. Loss of Karma methylation and of small RNA in tissue culture contributes to the origin of mantled, while restoration in spontaneous revertants accounts for non-Mendelian inheritance. The ability to predict and cull mantling at the plantlet stage will facilitate the introduction of higher performing clones and optimize environmentally sensitive land resources.

Additional References

RELATED GEPHE

No matches found.

Related Genes

No matches found.

Related Haplotypes

EXTERNAL LINKS

COMMENTS

@TE DEFICIENS is the oil palm ortholog of the B class MADS box transcription factor genes *Antirrhinum majus* DEFICIENS (DEF) and *Arabidopsis* APETALA3 (AP3)

