GEPHE SUMMARY

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

GepheID
GP00001048

Entry Status
Published

Main curator
Martin

PHENOTYPIC CHANGE

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

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

Trait State in Taxon A
Elaeis guineensis; thick shelled

Trait State in Taxon B
Elaeis guineensis; thin shelled (Congo)

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

Common Name
African oil palm

Synonyms
African oil palm; Elaeis guineensis Jacq.; Elaeis guineensis var. tenera (Oil palm); Elaeis guinensi; Elaeis guinensis; Elaeis gunieensis; Eleais guineensis

Rank
species

Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Arecales; Arecaceae; Arecoideae; Cocoseae; Elaeidinae; Elaeis

Parent
Elaeis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 51952)

NCBI Taxonomy ID
51953 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 51953)

is Taxon A an Infraspecies?
No

Taxon B

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

Common Name
African oil palm

Synonyms
African oil palm; Elaeis guineensis Jacq.; Elaeis guineensis var. tenera (Oil palm); Elaeis guinensi; Elaeis guinensis; Elaeis gunieensis; Eleais guineensis

Rank
species

Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Arecales; Arecaceae; Arecoideae; Cocoseae; Elaeidinae; Elaeis

Parent
Elaeis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 51952)

NCBI Taxonomy ID
51953 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 51953)

is Taxon B an Infraspecies?
Yes

Taxon B Description
Elaeis guineensis; thin shelled (Congo)

GENOTYPIC CHANGE

Generic Gene Name
AGL11

Synonyms
AGAMOUS-like 11; AGL11; SEEDSTICK; T5L19.90; T5L19_90; STK; At4g09960

String
3702.AT4G09960.3 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=3702.AT4G09960.3)

Sequence Similarities
-

GO - Molecular Function
GO:0046983 : protein dimerization activity (https://www.ebi.ac.uk/QuickGO/term/GO:0046983)
GO:0003700 : DNA-binding transcription factor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0003700)

UniProtKB Arabidopsis thaliana
Q38836 (http://www.uniprot.org/uniprot/Q38836)

GenebankID or UniProtKB
()

GO:0000977 : RNA polymerase II regulatory region sequence-specific DNA binding (https://www.ebi.ac.uk/QuickGO/term/GO:0000977)

GO - Biological Process

GO:0045944 : positive regulation of transcription by RNA polymerase II (https://www.ebi.ac.uk/QuickGO/term/GO:0045944)
GO:0048481 : plant ovule development (https://www.ebi.ac.uk/QuickGO/term/GO:0048481)

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

Coding (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)

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

1a.a substitution in DNA binding domain

Experimental Evidence

Candidate Gene (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 oil palm SHELL gene controls oil yield and encodes a homologue of SEEDSTICK. (2013) (https://pubmed.ncbi.nlm.nih.gov/23883930)

Authors

Singh R; Low ET; Ooi LC; Ong-Abdullah M; Ting NC; Nagappan J; Nookiah R; Amiruddin MD; Rosli R; Manaf MA; Chan KL; Halim MA; Azizi N; Lakey N; Smith SW; Budiman MA; Hogan M; Bacher B; Van Brunt A; Wang C; Ordway JM; Sambanthamurthi R; Martienssen RA

Abstract

A key event in the domestication and breeding of the oil palm Elaeis guineensis was loss of the thick coconut-like shell surrounding the kernel. Modern E. guineensis has three fruit forms, dura (thick-shelled), pisifera (shell-less) and tenera (thin-shelled), a hybrid between dura and pisifera. The pisifera palm is usually female-sterile. The tenera palm yields far more oil than dura, and is the basis for commercial palm oil production in all of southeast Asia. Here we describe the mapping and identification of the SHELL gene responsible for the different fruit forms. Using homozygosity mapping by sequencing, we found two independent mutations in the DNA-binding domain of a homologue of the MADS-box gene SEEDSTICK (STK, also known as AGAMOUS-LIKE 11), which controls ovule identity and seed development in Arabidopsis. The SHELL gene is responsible for the tenera phenotype in both cultivated and wild palms from sub-Saharan Africa, and our findings provide a genetic explanation for the single gene hybrid vigour (or heterosis) attributed to SHELL, via heterodimerization. This gene mutation explains the single most important economic trait in oil palm, and has implications for the competing interests of global edible oil production, biofuels and rainforest conservation.

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

1 (https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^SHELL^/and+Taxon ID=^51953^/or+Gene Gephebase=^SHELL^/and+Taxon ID=^51953^#gephebase-summary-title)

EXTERNAL LINKS

COMMENTS