GEPHE SUMMARY

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

GepheID
GP00002426

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
Pheromone production (cuticular hydrocarbons ; beta-ocimene) (https://www.gephebase.org/search-criteria?/and+Trait=^Pheromone production (cuticular hydrocarbons ; beta-ocimene)^#gephebase-summary-title)

Trait State in Taxon A
Heliconius melpomene - production of beta-ocimene by male abdomen

Trait State in Taxon B
Heliconius cydno - no production of beta-ocimene by male abdomen

Ancestral State
Taxon A

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

Taxon A

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

Common Name
postman butterfly

Synonyms
postman butterfly; common postman; Heliconius melpomene (Linnaeus, 1758)

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Amphiesmenoptera; Lepidoptera; Glossata; Neolepidoptera; Heteroneura; Ditrysia; Obtectomera; Papilionoidea; Nymphalidae; Heliconiinae; Heliconiini; Heliconius

Parent
Heliconius () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 33416)

NCBI Taxonomy ID
34740 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 34740)

is Taxon A an Infraspecies?
No

Taxon B

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

Common Name
-

Synonyms
Heliconius cydno Doubleday, 1847

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Amphiesmenoptera; Lepidoptera; Glossata; Neolepidoptera; Heteroneura; Ditrysia; Obtectomera; Papilionoidea; Nymphalidae; Heliconiinae; Heliconiini; Heliconius

Parent
Heliconius () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 33416)

NCBI Taxonomy ID
33424 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 33424)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
TPS

Synonyms
-

String
-

Sequence Similarities
Belongs to the FPP/GGPP synthase family.

GO - Molecular Function
GO:0046872 : metal ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0046872)
GO:0016787 : hydrolase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0016787)

GO - Biological Process
GO:0008299 : isoprenoid biosynthetic process (https://www.ebi.ac.uk/QuickGO/term/GO:0008299)

GO - Cellular Component
-

UniProtKB Matsumurasca onukii
A0A7D0AGU9 (http://www.uniprot.org/uniprot/A0A7D0AGU9)

GenebankID or UniProtKB
()

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

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

Molecular Details of the Mutation

gain of expression - in vitro assay of the protein activity in E. coli - several amino acid changes between the 2 species

Experimental Evidence

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

Main Reference

A novel terpene synthase controls differences in anti-aphrodisiac pheromone production between closely related Heliconius butterflies. (2021) (https://pubmed.ncbi.nlm.nih.gov/33465061)

Authors

Darragh K; Orteu A; Black D; Byers KJRP; Szczerbowski D; Warren IA; Rastas P; Pinharanda A; Davey JW; Fernanda Garza S; Abondano Almeida D; Merrill RM; McMillan WO; Schulz S; Jiggins CD

Abstract

Plants and insects often use the same compounds for chemical communication, but not much is known about the genetics of convergent evolution of chemical signals. The terpene (E)-Î²-ocimene is a common component of floral scent and is also used by the butterfly Heliconius melpomene as an anti-aphrodisiac pheromone. While the biosynthesis of terpenes has been described in plants and microorganisms, few terpene synthases (TPSs) have been identified in insects. Here, we study the recent divergence of 2 species, H. melpomene and Heliconius cydno, which differ in the presence of (E)-Î²-ocimene; combining linkage mapping, gene expression, and functional analyses, we identify 2 novel TPSs. Furthermore, we demonstrate that one, HmelOS, is able to synthesise (E)-Î²-ocimene in vitro. We find no evidence for TPS activity in HcydOS (HmelOS ortholog of H. cydno), suggesting that the loss of (E)-Î²-ocimene in this species is the result of coding, not regulatory, differences. The TPS enzymes we discovered are unrelated to previously described plant and insect TPSs, demonstrating that chemical convergence has independent evolutionary origins.

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

@SexualTrait