GEPHE SUMMARY

Gephebase Gene

Acetylcholinesterase (Ace-2) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^Acetylcholinesterase (Ace-2)^#gephebase-summary-title)

GepheID

GP00002576

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

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

Trait State in Taxon A

Bactrocera oleae - sensitive

Trait State in Taxon B

Bactrocera oleae - resistant

Ancestral State

Taxon A

Taxonomic Status

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

Taxon A

Latin Name

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

Common Name

olive fruit fly

Synonyms

Bactrocera (Daculus) oleae; Bactrocera (Dacus) oleae; Dacus oleae; olive fruit fly; olive fly; Bactrocera oleae (Rossi, 1790)

Rank

species

Lineage

cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Diptera; Brachycera; Muscomorpha; Eremoneura; Cyclorrhapha; Schizophora; Acalyptratae; Tephritoidea; Tephritidae; Dacinae; Dacini; Bactrocera; Daculus

Parent

Daculus () - (Rank: subgenus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 69624)

NCBI Taxonomy ID

104688 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 104688)

is Taxon A an Infraspecies?

No

Taxon B

Latin Name

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

Common Name

olive fruit fly

Synonyms

Bactrocera (Daculus) oleae; Bactrocera (Dacus) oleae; Dacus oleae; olive fruit fly; olive fly; Bactrocera oleae (Rossi, 1790)

Rank

species

Lineage

cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Diptera; Brachycera; Muscomorpha; Eremoneura; Cyclorrhapha; Schizophora; Acalyptratae; Tephritoidea; Tephritidae; Dacinae; Dacini; Bactrocera; Daculus

Parent

Daculus () - (Rank: subgenus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 69624)

NCBI Taxonomy ID

104688 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 104688)

is Taxon B an Infraspecies?

No

GENOTYPIC CHANGE

Generic Gene Name

Ace

Synonyms

AcChE; ace; ACE; ace-2; ache; AchE; AChE; CG17907; CHE; dAChE; dmAChE; DmAChE; Dmel\CG17907; Dm_ace; FBgn0000024; l(3)26; l(3)87Ed

String

7227.FBpp0289713 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 7227.FBpp0289713)

Sequence Similarities

Belongs to the type-B carboxylesterase/lipase family.

GO - Molecular Function

GO:0042803 : protein homodimerization activity (https://www.ebi.ac.uk/QuickGO/term/GO:0042803)
GO:0003990 : acetylcholinesterase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0003990)

UniProtKB Drosophila melanogaster

P07140 (http://www.uniprot.org/uniprot/P07140)

GenebankID or UniProtKB

()

GO:0004104 : cholinesterase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004104)
GO:0043199 : sulfate binding (https://www.ebi.ac.uk/QuickGO/term/GO:0043199)

GO - Biological Process

GO:0006581 : acetylcholine catabolic process
(https://www.ebi.ac.uk/QuickGO/term/GO:0006581)
GO:0001507 : acetylcholine catabolic process in synaptic cleft
(https://www.ebi.ac.uk/QuickGO/term/GO:0001507)
GO:0007268 : chemical synaptic transmission
(https://www.ebi.ac.uk/QuickGO/term/GO:0007268)
GO:0042426 : choline catabolic process
(https://www.ebi.ac.uk/QuickGO/term/GO:0042426)
GO:0042331 : phototaxis (https://www.ebi.ac.uk/QuickGO/term/GO:0042331)

GO - Cellular Component

GO:0005886 : plasma membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0005886)
GO:0005737 : cytoplasm (https://www.ebi.ac.uk/QuickGO/term/GO:0005737)
GO:0031225 : anchored component of membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0031225)
GO:0030054 : cell junction (https://www.ebi.ac.uk/QuickGO/term/GO:0030054)
GO:0043083 : synaptic cleft (https://www.ebi.ac.uk/QuickGO/term/GO:0043083)

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

I129V

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	Ile	Val	129

Main Reference

Resistance-associated point mutations of organophosphate insensitive acetylcholinesterase, in the olive fruit fly Bactrocera oleae. (2002) (https://pubmed.ncbi.nlm.nih.gov/12144698)

Authors

Vontas JG; Hejazi MJ; Hawkes NJ; Cosmidis N; Loukas M; Janes RW; Hemingway J

Abstract

A 2.2-kb full length cDNA containing an ORF encoding a putative acetylcholinesterase (AChE) precursor of 673 amino acid residues was obtained by a combined degenerate PCR and RACE strategy from an organophosphate-susceptible Bactrocera oleae strain. A comparison of cDNA sequences of individual insects from susceptible and resistant strains, coupled with an enzyme inhibition assay with omethoate, indicated a novel glycine-serine substitution (G488S), at an amino acid residue which is highly conserved across species (G396 of Torpedocalifornica AChE), as a likely cause of AChE insensitivity. This mutation was also associated with a 35-40% reduction in AChE catalytic efficiency. The I199V substitution, which confers low levels of resistance in Drosophila, was also present in B. oleae (I214V) and in combination with G488S produced up to a 16-fold decrease in insecticide sensitivity. This is the first agricultural pest where resistance has been associated with an alteration in AChE, which arises from point mutations located within the active site gorge of the enzyme.

Additional References

Genotype to phenotype, the molecular and physiological dimensions of resistance in arthropods. (2015) (https://pubmed.ncbi.nlm.nih.gov/26047113)

RELATED GEPHE

Related Genes

1 (Acetylcholinesterase (Ace)) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^104688^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS