

GEPHE SUMMARY

Gephebase Gene
Acetylcholinesterase (Ace)

Entry Status
Published

GepheID
GP00000037

Main curator
Martin

PHENOTYPIC CHANGE

Trait Category
Physiology

Trait
Xenobiotic resistance (insecticide)

Trait State in Taxon A
Bactrocera oleae- sensitive

Trait State in Taxon B
Bactrocera oleae - resistant

Ancestral State
Taxon A

Taxonomic Status
Intraspecific

Taxon A

Latin Name
Bactrocera oleae

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; Acalypratae; Tephritoidea; Tephritidae; Dacinae; Dacini; Bactrocera; Daculus

Parent
Daculus () - (Rank: subgenus)

NCBI Taxonomy ID
104688

is Taxon A an Intraspecies?
No

Taxon B

Latin Name
Bactrocera oleae

Common Name
olive fruit fly

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

Rank
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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; Acalypratae; Tephritoidea; Tephritidae; Dacinae; Dacini; Bactrocera; Daculus

Parent
Daculus () - (Rank: subgenus)

NCBI Taxonomy ID
104688

is Taxon B an Intraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
Ace

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

String
7227.FBpp0289713

Sequence Similarities
Belongs to the type-B carboxylesterase/lipase family.

GO - Molecular Function
GO:0042803 : protein homodimerization activity
GO:0003990 : acetylcholinesterase activity
GO:0004104 : cholinesterase activity
GO:0043199 : sulfate binding

GO - Biological Process
GO:0006581 : acetylcholine catabolic process
GO:0001507 : acetylcholine catabolic process in synaptic cleft

UniProtKB Drosophila melanogaster
P07140

GenebankID or UniProtKB
ABF55414

GO:0007268 : chemical synaptic transmission
GO:0042426 : choline catabolic process
GO:0042331 : phototaxis

GO - Cellular Component

GO:0005886 : plasma membrane
GO:0005737 : cytoplasm
GO:0031225 : anchored component of membrane
GO:0030054 : cell junction
GO:0043083 : synaptic cleft

Mutation #1

Presumptive Null

No

Molecular Type

Coding

Aberration Type

SNP

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

I214V

Experimental Evidence

Candidate Gene

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Ile	Val	214

Main Reference

Resistance-associated point mutations of organophosphate insensitive acetylcholinesterase, in the olive fruit fly *Bactrocera oleae*. (2002)

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

Mutation #2

Presumptive Null

No

Molecular Type

Coding

Aberration Type

SNP

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

G488S

Experimental Evidence

Candidate Gene

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Gly	Ser	488

Main Reference

Resistance-associated point mutations of organophosphate insensitive acetylcholinesterase, in the olive fruit fly *Bactrocera oleae*. (2002)

Authors

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

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EXTERNAL LINKS

COMMENTS

@SeveralMutationsWithEffect