

GEPHE SUMMARY

	Gephebase Gene		GepheID
Acetylcholinesterase (Ace-1) (https://www.gephebase.org/search-criteria?/and+Gene)		GP00002573	
Gephebase= [^] Acetylcholinesterase (Ace-1) [^] #gephebase-summary-title			Main curator
Published	Entry Status	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)			
criteria= [^] Xenobiotic resistance (insecticide) [^] #gephebase-summary-title	Trait State in Taxon A		
Tetranychus urticae - sensitive			
	Trait State in Taxon B		
Tetranychus urticae - resistant			
	Ancestral State		
Taxon A			
	Taxonomic Status		
Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic)			
Status= [^] Intraspecific [^] #gephebase-summary-title			
	Taxon A	Taxon B	
	Latin Name		Latin Name
Tetranychus urticae		Tetranychus urticae	
(https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms= [^] Tetranychus urticae [^] #gephebase-summary-title)		(https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms= [^] Tetranychus urticae [^] #gephebase-summary-title)	
	Common Name		Common Name
two-spotted spider mite		two-spotted spider mite	
	Synonyms		Synonyms
two-spotted spider mite; red spider mite; twospotted mite; Tetranychus urticae Koch, 1836		two-spotted spider mite; red spider mite; twospotted mite; Tetranychus urticae Koch, 1836	
	Rank		Rank
species		species	
	Lineage		Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Chelicerata; Arachnida; Acari; Acariformes; Trombidiformes; Prostigmata; Eleutherengona; Raphignathae; Tetranychoidae; Tetranychidae; Tetranychus		cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Chelicerata; Arachnida; Acari; Acariformes; Trombidiformes; Prostigmata; Eleutherengona; Raphignathae; Tetranychoidae; Tetranychidae; Tetranychus	
	Parent		Parent
Tetranychus () - (Rank: genus)		Tetranychus () - (Rank: genus)	
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32263)		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32263)	
	NCBI Taxonomy ID		NCBI Taxonomy ID
32264		32264	
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32264)		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32264)	
	is Taxon A an Intraspecies?		is Taxon B an Intraspecies?
No		No	

GENOTYPIC CHANGE

	Generic Gene Name		UniProtKB Drosophila melanogaster
Ace		P07140 (http://www.uniprot.org/uniprot/P07140)	
	Synonyms		GenebankID or UniProtKB
AcChE; ace; ACE; ace-2; ache; AchE; AchE; CG17907; CHE; dAcChE; dmAcChE; DmAcChE; 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)			
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: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 ([#gpepbase-summary-title](https://www.gephebase.org/search-criteria?/and+Presumptive+Null+No))

Molecular Type

Coding ([#gpepbase-summary-title](https://www.gephebase.org/search-criteria?/and+Molecular+Type+Coding))

Aberration Type

SNP ([#gpepbase-summary-title](https://www.gephebase.org/search-criteria?/and+Aberration+Type+SNP))

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

F331W

Experimental Evidence

Candidate Gene ([#gpepbase-summary-title](https://www.gephebase.org/search-criteria?/and+Experimental+Evidence+Candidate+Gene))

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	-	-	-

Main Reference

Acetylcholinesterase point mutations in European strains of *Tetranychus urticae* (Acari: Tetranychidae) resistant to organophosphates. (2010) (<https://pubmed.ncbi.nlm.nih.gov/19894225>)

Authors

Khajehali J; Van Leeuwen T; Grispuu M; Morou E; Alout H; Weill M; Tirry L; Vontas J; Tsagkarakou A

Abstract

In *Tetranychus urticae* Koch, acetylcholinesterase insensitivity is often involved in organophosphate (OP) and carbamate (CARB) resistance. By combining toxicological, biochemical and molecular data from three reference laboratory and three OP selected strains (OP strains), the AChE1 mutations associated with resistance in *T. urticae* were characterised.

The resistance ratios of the OP strains varied from 9 to 43 for pirimiphos-methyl, from 78 to 586 for chlorpyrifos, from 8 to 333 for methomyl and from 137 to 4164 for dimethoate. The insecticide concentration needed to inhibit 50% of the AChE1 activity was, in the OP strains, at least 2.7, 55, 58 and 31 times higher for the OP pirimiphos-methyl, chlorpyrifos oxon, paraoxon and omethoate respectively, and 87 times higher for the CARB carbaryl. By comparing the AChE1 sequence, four amino acid substitutions were detected in the OP strains: (1) F331W (Torpedo numbering) in all the three OP strains; (2) T280A found in the three OP strains but not in all clones; (3) G328A, found in two OP strains; (4) A201S found in only one OP strain.

Four AChE1 mutations were found in resistant strains of *T. urticae*, and three of them, F331W, G328A and A201S, are possibly involved in resistance to OP and CARB insecticides. Among them, F331W is probably the most important and the most common in *T. urticae*. It can be easily detected by the diagnostic PCR-RLFP assay developed in this study.

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

8 (Chitin synthase 1 (CHS1), CPR, CYP392A16, CYP392E8, cytochrome b, glutamate-gated chloride channel (GluCl), para (kdr), PSST) (<https://www.gephebase.org/search-criteria?/or+Taxon+ID+32264+and+Trait=Xenobiotic+resistance+and+groupHaplotypes=true#gpepbase-summary-title>)

Related Haplotypes

5 ([https://www.gephebase.org/search-criteria?/or+Gene+Gephebase+Acetylcholinesterase+\(Ace-1\)+and+Taxon+ID+32264+or+Gene+Gephebase+Acetylcholinesterase+\(Ace-1\)+and+Taxon+ID+32264#gpepbase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene+Gephebase+Acetylcholinesterase+(Ace-1)+and+Taxon+ID+32264+or+Gene+Gephebase+Acetylcholinesterase+(Ace-1)+and+Taxon+ID+32264#gpepbase-summary-title))

EXTERNAL LINKS

COMMENTS

