

## GEPHE SUMMARY

	Gephebase Gene		GepheID
Acetylcholinesterase (Ace-1) ( <a href="https://www.gephebase.org/search-criteria?/and+Gene">https://www.gephebase.org/search-criteria?/and+Gene</a> )		GP00002587	
Gephebase="Acetylcholinesterase (Ace-1)"#gephebase-summary-title)			Main curator
Published	Entry Status	Courtier	

## PHENOTYPIC CHANGE

	Trait Category	
Physiology ( <a href="https://www.gephebase.org/search-criteria?/and+Trait">https://www.gephebase.org/search-criteria?/and+Trait</a> )		
Category="Physiology"#gephebase-summary-title)	Trait	
Xenobiotic resistance (insecticide) ( <a (insecticide)"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Trait=" resistance="" xenobiotic="">https://www.gephebase.org/search-criteria?/and+Trait="Xenobiotic resistance (insecticide)"#gephebase-summary-title</a> )		
Rhopalosiphum padi - sensitive	Trait State in Taxon A	
Rhopalosiphum padi- resistant	Trait State in Taxon B	
Taxon A	Ancestral State	
Intraspecific ( <a href="https://www.gephebase.org/search-criteria?/and+Taxonomic">https://www.gephebase.org/search-criteria?/and+Taxonomic</a> )	Taxonomic Status	
Status="Intraspecific"#gephebase-summary-title)		

Taxon A	Latin Name	Taxon B	Latin Name
Rhopalosiphum padi ( <a href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=" padi"#gephebase-summary-title"="" rhopalosiphum="">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="Rhopalosiphum padi"#gephebase-summary-title</a> )		Rhopalosiphum padi ( <a href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=" padi"#gephebase-summary-title"="" rhopalosiphum="">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="Rhopalosiphum padi"#gephebase-summary-title</a> )	
bird cherry-oat aphid	Common Name	bird cherry-oat aphid	Common Name
bird cherry-oat aphid; Rhopalosiphum padi (Linnaeus, 1758)	Synonyms	bird cherry-oat aphid; Rhopalosiphum padi (Linnaeus, 1758)	Synonyms
species	Rank	species	Rank
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Paraneoptera; Hemiptera; Sternorrhyncha; Aphidomorpha; Aphidoidea; Aphididae; Aphidinae; Aphidini; Rhopalosiphum; Rhopalosiphum padi complex	Lineage	cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Paraneoptera; Hemiptera; Sternorrhyncha; Aphidomorpha; Aphidoidea; Aphididae; Aphidinae; Aphidini; Rhopalosiphum; Rhopalosiphum padi complex	Lineage
Rhopalosiphum padi complex () - (Rank: no rank) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 202396">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 202396</a> )	Parent	Rhopalosiphum padi complex () - (Rank: no rank) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 202396">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 202396</a> )	Parent
40932 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 40932">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 40932</a> )	NCBI Taxonomy ID	40932 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 40932">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 40932</a> )	NCBI Taxonomy ID
No	is Taxon A an Intraspecies?	No	is Taxon B an Intraspecies?

## GENOTYPIC CHANGE

Ace	Generic Gene Name	UniProtKB Drosophila melanogaster
AcChE; ace; ACE; ace-2; ache; AchE; AChE; CG17907; CHE; dAChE; dmAChE; DmAChE; Dmel\CG17907; Dm_ace; FBgn0000024; l(3)26; l(3)87Ed	Synonyms	GenebankID or UniProtKB
7227.FBpp0289713 ( <a href="http://string-db.org/newstring.cgi/show_network_section.pl?identifier= 7227.FBpp0289713">http://string-db.org/newstring.cgi/show_network_section.pl?identifier= 7227.FBpp0289713</a> )	String	
Belongs to the type-B carboxylesterase/lipase family.	Sequence Similarities	
GO:0042803 : protein homodimerization activity ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0042803">https://www.ebi.ac.uk/QuickGO/term/GO:0042803</a> )	GO - Molecular Function	
GO:0003990 : acetylcholinesterase activity ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0003990">https://www.ebi.ac.uk/QuickGO/term/GO:0003990</a> )		
GO:0004104 : cholinesterase activity ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0004104">https://www.ebi.ac.uk/QuickGO/term/GO:0004104</a> )		
GO:0043199 : sulfate binding ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0043199">https://www.ebi.ac.uk/QuickGO/term/GO:0043199</a> )		

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>)

No (<https://www.gephebase.org/search-criteria?/and+Presumptive Null=^No^#gephebase-summary-title>) Presumptive Null

Coding (<https://www.gephebase.org/search-criteria?/and+Molecular Type=^Coding^#gephebase-summary-title>) Molecular Type

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

Nonsynonymous SNP Coding Change

S329(228)P Molecular Details of the Mutation

Candidate Gene (<https://www.gephebase.org/search-criteria?/and+Experimental Evidence=^Candidate Gene^#gephebase-summary-title>) Experimental Evidence

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Ser	Pro	228

Mutations in acetylcholinesterase genes of *Rhopalosiphum padi* resistant to organophosphate and carbamate insecticides. (2007) (<https://pubmed.ncbi.nlm.nih.gov/17546082>) Main Reference

Chen MH; Han ZJ; Qiao XF; Qu MJ Authors

Apple grain aphid, *Rhopalosiphum padi* (Linnaeus), is an important wheat pest. In China, it has been reported that *R. padi* has developed high resistance to carbamate and organophosphate insecticides. Previous work cloned from this aphid 2 different genes encoding acetylcholinesterase (AChE), which is the target enzyme for carbamate and organophosphate insecticides, and its insensitive alteration has been proven to be an important mechanism for insecticide resistance in other insects. In this study, both resistant and susceptible strains of *R. padi* were developed, and their AChEs were compared to determine whether resistance resulted from this mechanism and whether these 2 genes both play a role in resistance. Bioassays showed that the resistant strain used was highly or moderately resistant to pirimicarb, omethoate, and monocrotophos (resistance ratio, 263.8, 53.8, and 17.5, respectively), and showed little resistance to deltamethrin or thiodicarb (resistance ratio, 5.2 and 3.4, respectively). Correspondingly, biochemistry analysis found that AChE from resistant aphids was very insensitive to the first 3 insecticides (I50 increased 43.0-, 15.2-, and 8.8-fold, respectively), but not to thiodicarb (I50 increased 1.1-fold). Enzyme kinetics tests showed that resistant and susceptible strains had different AChEs. Sequence analysis of the 2 AChE genes cloned from resistant and susceptible aphids revealed that 2 mutations in Ace2 and 1 in Ace1 were consistently associated with resistance. Mutation F368(290)L in Ace2 localized at the same position as a previously proven resistance mutation site in other insects. The other 2 mutations, S329(228)P in Ace1 and V435(356)A in Ace2, were also found to affect the enzyme structure. These findings indicate that resistance in this aphid is mainly the result of insensitive AChE alteration, that the 3 mutations found might contribute to resistance, and that the AChEs encoded by both genes could serve as targets of insecticides. Abstract

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

RELATED GEPHE

1 (Acetylcholinesterase (Ace-2)) (<https://www.gephebase.org/search-criteria?/or+Taxon ID=^40932^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title>) Related Genes

No matches found. Related Haplotypes

EXTERNAL LINKS

COMMENTS

