

GEPHE SUMMARY

	Gephebase Gene		GepheID
Acetylcholinesterase (Ace-1) (https://www.gephebase.org/search-criteria?/and+Gene)		GP00002512	
Gephebase= [^] Acetylcholinesterase (Ace-1) [^] #gephebase-summary-title			Main curator
	Entry Status	Courtier	
Published			

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	
Bemisia tabaci - sensitive		
	Trait State in Taxon B	
Bemisia tabaci - 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	Taxon B	Latin Name
Bemisia tabaci		Bemisia tabaci	
(https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms= [^] Bemisia tabaci [^] #gephebase-summary-title)		(https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms= [^] Bemisia tabaci [^] #gephebase-summary-title)	
	Common Name		Common Name
-		-	
	Synonyms		Synonyms
Aleyrodes tabaci; sweet potato whitefly; Bemisia tabaci (Gennadius, 1889)		Aleyrodes tabaci; sweet potato whitefly; Bemisia tabaci (Gennadius, 1889)	
	Rank		Rank
species		species	
	Lineage		Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Paraneoptera; Hemiptera; Sternorrhyncha; Aleyrodoidea; Aleyrodidae; Aleyrodinae; Bemisia		cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Paraneoptera; Hemiptera; Sternorrhyncha; Aleyrodoidea; Aleyrodidae; Aleyrodinae; Bemisia	
	Parent		Parent
Bemisia () - (Rank: genus)		Bemisia () - (Rank: genus)	
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7037)		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7037)	
	NCBI Taxonomy ID		NCBI Taxonomy ID
7038		7038	
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7038)		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7038)	
	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 (<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

F331W

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	Phe	Trp	331

Main Reference

Next-generation molecular diagnostics (TaqMan qPCR and ddPCR) for monitoring insecticide resistance in *Bemisia tabaci*. (2022) (<https://pubmed.ncbi.nlm.nih.gov/36054028>)

Authors

Mavridis K; Papapostolou KM; Ilias A; Michaelidou K; Stavrakaki M; Roditakis E; Tsagarakou A; Bass C; Vontas J

Abstract

Insecticide resistance has developed in several populations of the whitefly *Bemisia tabaci* worldwide and threatens to compromise the efficacy of chemical control. The molecular mechanisms underpinning resistance have been characterized and markers associated with the trait have been identified, allowing the development of diagnostics for individual insects.

TaqMan and Droplet Digital PCR (ddPCR) assays were developed and validated, in individual and pooled whitefly samples, respectively, for the following target-site mutations: the acetylcholinesterase (*ace1*) F331W mutation conferring organophosphate-resistance; the voltage-gated sodium channel (*vgsc*) mutations L925I and T929V conferring pyrethroid-resistance; and the acetyl-CoA carboxylase (*acc*) A2083V mutation conferring ketoenol-resistance. The ddPCR's limit of detection (LoD) was <0.2% (i.e. detection of one heterozygote whitefly in a pool of 249 wild-type individuals). The assays were applied in 11 *B. tabaci* field populations from four locations in Crete, Greece. The F331W mutation was detected to be fixed or close to fixation in eight of 11 *B. tabaci* populations, and at lower frequency in the remaining ones. The pyrethroid-resistance mutations were detected at very high frequencies. The A2083V spiromesifen resistance mutation was detected in eight of 11 populations (frequencies = 6.16-89.56%). Spiromesifen phenotypic resistance monitoring showed that the populations tested had variable levels of resistance, ranging from full susceptibility to high resistance. A strong spiromesifen-resistance phenotype-genotype (A2083V) correlation ($r = -0.839$, $P = 0.002$) was observed confirming the ddPCR diagnostic value.

The ddPCR diagnostics developed in this study are a valuable tool to support evidence-based rational use of insecticides and resistance management strategies. © 2022 Society of Chemical Industry.

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Additional References

RELATED GEPHE

Related Genes

5 (acetyl-CoA carboxylase (ACC), Acetylcholinesterase (Ace-2), CYP6CM1, para (*ldr*), resistance to dieldrin) (<https://www.gephebase.org/search-criteria?/or+Taxon ID=^7038^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

No matches found.

EXTERNAL LINKS

