

GEPHE SUMMARY

	Gephebase Gene	GepheID
Acetylcholinesterase (Ace-1) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^Acetylcholinesterase (Ace-1)^#gephebase-summary-title)	GP00002512	
	Entry Status	Main curator
Published	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	
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
Bemisia tabaci (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Bemisia+tabaci^#gephebase-summary-title)		Bemisia tabaci (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Bemisia+tabaci^#gephebase-summary-title)
-	Common Name	-
Aleyrodes tabaci; sweet potato whitefly; Bemisia tabaci (Gennadius, 1889)	Synonyms	-
species	Rank	
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	Lineage	
Bemisia () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7037)	Parent	
7038 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7038)	NCBI Taxonomy ID	
No	is Taxon A an Infraspecies?	is Taxon B an Infraspecies?

GENOTYPIC CHANGE

	Generic Gene Name		
Ace	Synonyms	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	String	P07140 (http://www.uniprot.org/uniprot/P07140)	GenebankID or UniProtKB
7227.FBpp0289713 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 7227.FBpp0289713)	Sequence Similarities	0	
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 - 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 ([#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Presumptive+Null=^No))

Molecular Type

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

Aberration Type

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

	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; Tsagkarakou 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 (kdr), resistance to diazinon) (<https://www.gephebase.org/search-criteria?/or+Taxon+ID=^7038#/gephebase-summary-title>)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS