GEPHE SUMMARY

Gephebase Gene

Acetylcholinesterase (Ace-1) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^Acetylcholinesterase (Ace-1)^#gephebase-summary-title)

Entry Status

Published

GepheID

GP00002512

Main curator

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

Bemisia tabaci (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Bemisia tabaci^#gephebase-summary-title)

Common Name

-

Synonyms

Aleyrodes tabaci; sweet potato whitefly; Bemisia tabaci (Gennadius, 1889)

Rank

species

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

Parent

Bemisia () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7037)

NCBI Taxonomy ID

7038 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7038)

is Taxon A an Infraspecies?

No

Taxon B

Latin Name

Bemisia tabaci (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Bemisia tabaci^#gephebase-summary-title)

Common Name

-

Synonyms

Aleyrodes tabaci; sweet potato whitefly; Bemisia tabaci (Gennadius, 1889)

Rank

species

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

Parent

Bemisia () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7037)

NCBI Taxonomy ID

7038 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7038)

is Taxon B an Infraspecies?

No

GENOTYPIC CHANGE

Generic Gene Name

Ace

Synonyms

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

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)

UniProtKB Drosophila melanogaster

P07140 (http://www.uniprot.org/uniprot/P07140)

GenebankID or UniProtKB

()

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 (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; 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.Â 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.Â 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 (frequenciesÂ =Â 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 Â =Â -0.839, PÂ =Â 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. Â© 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 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

COMMENTS