

GEPHE SUMMARY

CYP6CM1 (https://www.gephebase.org/search-criteria?/and+GeneGephebase=CYP6CM1#gephebase-summary-title)	Gephebase Gene	GP00002608	GepheID
Published	Entry Status	Courtier	Main curator

PHENOTYPIC CHANGE

Physiology (https://www.gephebase.org/search-criteria?/and+TraitCategory=Physiology#gephebase-summary-title)	Trait Category		
Xenobiotic resistance (insecticide; imidacloprid) (https://www.gephebase.org/search-criteria?/and+Trait=Xenobiotic+resistance+(insecticide;+imidacloprid)#gephebase-summary-title)	Trait		
Bemisia tabaci - sensitive	Trait State in Taxon A		
Bemisia tabaci - resistant	Trait State in Taxon B		
Taxon A	Ancestral State		
Intraspecific (https://www.gephebase.org/search-criteria?/and+TaxonomicStatus=Intraspecific#gephebase-summary-title)	Taxonomic Status		
		Taxon A	Taxon B
	Latin Name		Latin Name
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	-	Common Name
	Synonyms		Synonyms
Aleyrodes tabaci; sweet potato whitefly; Bemisia tabaci (Gennadius, 1889)		Aleyrodes tabaci; sweet potato whitefly; Bemisia tabaci (Gennadius, 1889)	
species	Rank	species	Rank
	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) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7037)		Bemisia () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7037)	
7038	NCBI Taxonomy ID	7038	NCBI Taxonomy ID
(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 Bemisia tabaci
-	Synonyms	A0A6C0PTH9 (http://www.uniprot.org/uniprot/A0A6C0PTH9)
-	String	GenebankID or UniProtKB Bemisia tabaci
-	Sequence Similarities	A0A6C0PTH9 (https://www.ncbi.nlm.nih.gov/nuccore/A0A6C0PTH9)
Belongs to the cytochrome P450 family.		
	GO - Molecular Function	
GO:0020037 : heme binding (https://www.ebi.ac.uk/QuickGO/term/GO:0020037)		
GO:0005506 : iron ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005506)		
GO:0070330 : aromatase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0070330)		
	GO - Biological Process	
-		
	GO - Cellular Component	
GO:0016021 : integral component of membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0016021)		

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

Presumptive Null

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

Molecular Type

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

Aberration Type

three single-nucleotide polymorphic (SNP) markers in the intron region of CYP6CM1 that discriminate between the resistant and susceptible CYP6CM1 alleles

Molecular Details of the Mutation

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

Experimental Evidence

Over-expression of cytochrome P450 CYP6CM1 is associated with high resistance to imidacloprid in the B and Q biotypes of Bemisia tabaci (Hemiptera: Aleyrodidae). (2008) (<https://pubmed.ncbi.nlm.nih.gov/18510975>)

Main Reference

Karunker I; Benting J; Lueke B; Ponge T; Nauen R; Roditakis E; Vontas J; Gorman K; Denholm I; Morin S

Authors

The two most damaging biotypes of Bemisia tabaci, B and Q, have both evolved strong resistance to the neonicotinoid insecticide imidacloprid. The major mechanism in all samples investigated so far appeared to be enhanced detoxification by cytochrome P450s monooxygenases (P450s). In this study, a polymerase chain reaction (PCR) technology using degenerate primers based on conserved P450 helix I and heme-binding regions was employed to identify P450 cDNA sequences in B. tabaci that might be involved in imidacloprid resistance. Eleven distinct P450 cDNA sequences were isolated and classified as members of the CYP4 or CYP6 families. The mRNA expression levels of all 11 genes were compared by real-time quantitative RT-PCR across nine B and Q field-derived strains of B. tabaci showing strong resistance, moderate resistance or susceptibility to imidacloprid. We found that constitutive over-expression (up to approximately 17-fold) of a single P450 gene, CYP6CM1, was tightly related to imidacloprid resistance in both the B and Q biotypes. Next, we identified three single-nucleotide polymorphic (SNP) markers in the intron region of CYP6CM1 that discriminate between the resistant and susceptible Q-biotype CYP6CM1 alleles (r-Q and s-Q, respectively), and used a heterogeneous strain to test for association between r-Q and resistance. While survivors of a low imidacloprid dose carried both the r-Q and s-Q alleles, approximately 95% of the survivors of a high imidacloprid dose carried only the r-Q allele. Together with previous evidence, the results reported here identify enhanced activity of P450s as the major mechanism of imidacloprid resistance in B. tabaci, and the CYP6CM1 gene as a leading target for DNA-based screening for resistance to imidacloprid and possibly other neonicotinoids in field populations.

Abstract

Additional References

RELATED GEPHE

5 (acetyl-CoA carboxylase (ACC), Acetylcholinesterase (Ace-1), Acetylcholinesterase (Ace-2), 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 Genes

No matches found.

Related Haplotypes

EXTERNAL LINKS

COMMENTS