GEPHE SUMMARY

Gephebase Gene
CYP6CM1 (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^CYP6CM1^#gephebase-summary-title)

GepheID
GP00002608

Entry Status
Published

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; imidacloprid) (https://www.gephebase.org/search-criteria?/and+Trait=^Xenobiotic resistance (insecticide; imidacloprid)^#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
-

Synonyms
-

String
-

Sequence Similarities
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)

UniProtKB Bemisia tabaci
A0A6C0PTH9 (http://www.uniprot.org/uniprot/A0A6C0PTH9)

GenebankID or UniProtKB Bemisia tabaci
A0A6C0PTH9 (https://www.ncbi.nlm.nih.gov/nuccore/A0A6C0PTH9)

Presumptive Null

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

Molecular Type

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

Aberration Type

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

Molecular Details of the Mutation

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

Experimental Evidence

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

Main Reference

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)

Authors

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

Abstract

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.

Additional References

RELATED GEPHE

Related Genes

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 Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS