GEPHE SUMMARY

Gephebase Gene
CYP6AY1 (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^CYP6AY1^#gephebase-summary-title)

GepheID
GP00002399

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

Trait State in Taxon A
sensitive

Trait State in Taxon B
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
Nilaparvata lugens (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Nilaparvata lugens^#gephebase-summary-title)

Common Name
brown planthopper

Synonyms
brown planthopper; Nilaparvata lugens (Stal, 1854); Nalaparvata lugens

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Paraneoptera; Hemiptera; Auchenorrhyncha; Fulgoromorpha; Fulgoroidea; Delphacidae; Delphacinae; Nilaparvata

Parent
Nilaparvata () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 108930)

NCBI Taxonomy ID
108931 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 108931)

is Taxon A an Infraspecies?
No

Taxon B

Latin Name
Nilaparvata lugens (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Nilaparvata lugens^#gephebase-summary-title)

Common Name
brown planthopper

Synonyms
brown planthopper; Nilaparvata lugens (Stal, 1854); Nalaparvata lugens

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Paraneoptera; Hemiptera; Auchenorrhyncha; Fulgoromorpha; Fulgoroidea; Delphacidae; Delphacinae; Nilaparvata

Parent
Nilaparvata () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 108930)

NCBI Taxonomy ID
108931 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 108931)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
CYP6AY1

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:0004497 : monooxygenase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004497)
GO:0016705 : oxidoreductase activity, acting on paired donors, with incorporation or reduction of molecular oxygen (https://www.ebi.ac.uk/QuickGO/term/GO:0016705)

GO - Biological Process
-

UniProtKB Nilaparvata lugens
A0A1L1VFS3 (http://www.uniprot.org/uniprot/A0A1L1VFS3)

GenebankID or UniProtKB Nilaparvata lugens
A0A1L1VFS3 (https://www.ncbi.nlm.nih.gov/nuccore/A0A1L1VFS3)

GO - Cellular Component

-

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

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

Molecular Details of the Mutation

CYP6AY1 is expressed at a higher level in a field-collected BPH strain that is highly resistant to both imidacloprid and buprofezin. Polymorphism in the promoter region associated with various levels of resistance.

Experimental Evidence

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

Main Reference

Identification of promoter polymorphisms in the cytochrome P450â€…CYP6AY1 linked with insecticide resistance in the brown planthopper, Nilaparvata lugens. (2014) (https://pubmed.ncbi.nlm.nih.gov/25124988)

Authors

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Abstract

Imidacloprid resistance in the brown planthopper, Nilaparvata lugens, is primarily the result of the over-expression of cytochrome P450 monooxygenases. Here, a field-collected strain of N.â€‰lugens was shown to be highly resistant to both imidacloprid and buprofezin. Insecticide exposure and quantitative real-time PCR revealed that its resistance was mainly associated with a cytochrome P450 gene, CYP6AY1. CYP6AY1 is known to metabolize imidacloprid but its effect on buprofezin is unclear. In the 5′-untranslated region of CYP6AY1, a novel alternative splicing was detected. After a 1990-bp promoter region was cloned, its basal luciferase activity was assessed. Furthermore, genotyping studies identified 12 variations in the promoter region that discriminated between the field-collected and control strain. Finally, survival bioassays revealed a single nucleotide polymorphism and an insertion-deletion polymorphism linked to buprofezin and imidacloprid resistance. Mutagenesis of these sites enhanced the promoter activity of CYP6AY1. These results suggest that promoter polymorphisms may affect P450-mediated multiple insecticide resistance of pests.

Additional References

RELATED GEPHE

Related Genes

4 (Acetylcholinesterase (Ace-1), CYP6ER1, esterase NI-EST1, GST) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^108931^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS