

## GEPHE SUMMARY

|                                                                                                                                                                                                                         |                |            |              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------|--------------|
| CYP6AY1 ( <a href="https://www.gephebase.org/search-criteria?/and+GeneGephebase=~CYP6AY1~#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+GeneGephebase=~CYP6AY1~#gephebase-summary-title</a> ) | Gephebase Gene | GP00002399 | GepheID      |
| Published                                                                                                                                                                                                               | Entry Status   | Courtier   | Main curator |

## PHENOTYPIC CHANGE

|                                                                                                                                                                                                                                                                                                                                    |                             |                                                                                                                                                                                                                                                                                                                           |                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Physiology ( <a href="https://www.gephebase.org/search-criteria?/and+Trait+Category=^Physiology^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait+Category=^Physiology^#gephebase-summary-title</a> )                                                                                                 |                             | Trait Category                                                                                                                                                                                                                                                                                                            |                             |
| Xenobiotic resistance (imidacloprid; buprofezin) ( <a href="https://www.gephebase.org/search-criteria?/and+Trait=^Xenobiotic resistance (imidacloprid; buprofezin)^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait=^Xenobiotic resistance (imidacloprid; buprofezin)^#gephebase-summary-title</a> ) |                             | Trait                                                                                                                                                                                                                                                                                                                     |                             |
| sensitive                                                                                                                                                                                                                                                                                                                          | Trait State in Taxon A      |                                                                                                                                                                                                                                                                                                                           |                             |
| resistant                                                                                                                                                                                                                                                                                                                          | Trait State in Taxon B      |                                                                                                                                                                                                                                                                                                                           |                             |
| Taxon A                                                                                                                                                                                                                                                                                                                            | Ancestral State             |                                                                                                                                                                                                                                                                                                                           |                             |
| Intraspecific ( <a href="https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=^Intraspecific^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=^Intraspecific^#gephebase-summary-title</a> )                                                                                    |                             | Taxonomic Status                                                                                                                                                                                                                                                                                                          |                             |
| Taxon A                                                                                                                                                                                                                                                                                                                            |                             | Taxon B                                                                                                                                                                                                                                                                                                                   |                             |
| Nilaparvata lugens<br>( <a href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Nilaparvata+lugens^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Nilaparvata+lugens^#gephebase-summary-title</a> )                                                              | Latin Name                  | Nilaparvata lugens<br>( <a href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Nilaparvata+lugens^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Nilaparvata+lugens^#gephebase-summary-title</a> )                                                     | Latin Name                  |
| brown planthopper                                                                                                                                                                                                                                                                                                                  | Common Name                 | brown planthopper                                                                                                                                                                                                                                                                                                         | Common Name                 |
| brown planthopper; Nilaparvata lugens (Stal, 1854); Nalaparvata lugens                                                                                                                                                                                                                                                             | Synonyms                    | brown planthopper; Nilaparvata lugens (Stal, 1854); Nalaparvata lugens                                                                                                                                                                                                                                                    | Synonyms                    |
| species                                                                                                                                                                                                                                                                                                                            | Rank                        | species                                                                                                                                                                                                                                                                                                                   | Rank                        |
| 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          | 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 | Lineage                     |
| Nilaparvata () - (Rank: genus)<br>( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=108930">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=108930</a> )                                                                                                                                          | Parent                      | Nilaparvata () - (Rank: genus)<br>( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=108930">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=108930</a> )                                                                                                                                 | Parent                      |
| 108931<br>( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=108931">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=108931</a> )                                                                                                                                                                  | NCBI Taxonomy ID            | 108931<br>( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=108931">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=108931</a> )                                                                                                                                                         | NCBI Taxonomy ID            |
| No                                                                                                                                                                                                                                                                                                                                 | is Taxon A an Intraspecies? | No                                                                                                                                                                                                                                                                                                                        | is Taxon B an Intraspecies? |

## GENOTYPIC CHANGE

| Generic Gene Name                                                                                                                                                                                                                | UniProtKB Nilaparvata lugens                                                                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| CYP6AY1                                                                                                                                                                                                                          | A0A1L1VFS3 ( <a href="http://www.uniprot.org/uniprot/A0A1L1VFS3">http://www.uniprot.org/uniprot/A0A1L1VFS3</a> )             |
| Synonyms                                                                                                                                                                                                                         | GenebankID or UniProtKB Nilaparvata lugens                                                                                   |
| -                                                                                                                                                                                                                                |                                                                                                                              |
| String                                                                                                                                                                                                                           | A0A1L1VFS3 ( <a href="https://www.ncbi.nlm.nih.gov/nuccore/A0A1L1VFS3">https://www.ncbi.nlm.nih.gov/nuccore/A0A1L1VFS3</a> ) |
| -                                                                                                                                                                                                                                |                                                                                                                              |
| Sequence Similarities                                                                                                                                                                                                            |                                                                                                                              |
| Belongs to the cytochrome P450 family.                                                                                                                                                                                           |                                                                                                                              |
| GO - Molecular Function                                                                                                                                                                                                          |                                                                                                                              |
| GO:0020037 : heme binding ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0020037">https://www.ebi.ac.uk/QuickGO/term/GO:0020037</a> )                                                                                          |                                                                                                                              |
| GO:0005506 : iron ion binding ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0005506">https://www.ebi.ac.uk/QuickGO/term/GO:0005506</a> )                                                                                      |                                                                                                                              |
| GO:0004497 : monooxygenase activity ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0004497">https://www.ebi.ac.uk/QuickGO/term/GO:0004497</a> )                                                                                |                                                                                                                              |
| GO:0016705 : oxidoreductase activity, acting on paired donors, with incorporation or reduction of molecular oxygen ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0016705">https://www.ebi.ac.uk/QuickGO/term/GO:0016705</a> ) |                                                                                                                              |
| GO - Biological Process                                                                                                                                                                                                          |                                                                                                                              |
| -                                                                                                                                                                                                                                |                                                                                                                              |

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|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| No ( <a href="https://www.gephebase.org/search-criteria?/and+Presumptive Null=~No~#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Presumptive Null=~No~#gephebase-summary-title</a> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Presumptive Null                  |
| Cis-regulatory ( <a href="https://www.gephebase.org/search-criteria?/and+Molecular Type=~Cis-regulatory~#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Molecular Type=~Cis-regulatory~#gephebase-summary-title</a> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Molecular Type                    |
| Unknown ( <a href="https://www.gephebase.org/search-criteria?/and+Aberration Type=~Unknown~#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Aberration Type=~Unknown~#gephebase-summary-title</a> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Aberration Type                   |
| 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Molecular Details of the Mutation |
| Candidate Gene ( <a href="https://www.gephebase.org/search-criteria?/and+Experimental Evidence=~Candidate Gene~#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Experimental Evidence=~Candidate Gene~#gephebase-summary-title</a> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Experimental Evidence             |
| Identification of promoter polymorphisms in the cytochrome P450â€¦CYP6AY1 linked with insecticide resistance in the brown planthopper, Nilaparvata lugens. (2014) ( <a href="https://pubmed.ncbi.nlm.nih.gov/25124988">https://pubmed.ncbi.nlm.nih.gov/25124988</a> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Main Reference                    |
| Pang R; Li Y; Dong Y; Liang Z; Zhang Y; Zhang W                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Authors                           |
| 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. | Abstract                          |
| Â© 2014 The Royal Entomological Society.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Additional References             |

RELATED GEPHE

|                                                                                                                                                                                                                                                                                                                                                                                      |                    |
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| 4 (Acetylcholinesterase (Ace-1), CYP6ER1, esterase NI-EST1, GST) ( <a href="https://www.gephebase.org/search-criteria?/or+Taxon ID=~108931~/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title">https://www.gephebase.org/search-criteria?/or+Taxon ID=~108931~/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title</a> ) | Related Genes      |
| No matches found.                                                                                                                                                                                                                                                                                                                                                                    | Related Haplotypes |

EXTERNAL LINKS

COMMENTS