GEPHE SUMMARY

Gephebase Gene

CYP6FU1 (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^CYP6FU1^#gephebase-summary-title)

Entry Status

Published

GepheID

GP00002117

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

Trait State in Taxon A

rice pest Laodelphax striatellus - susceptible

Trait State in Taxon B

rice pest Laodelphax striatellus - 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

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

Common Name

small brown planthopper

Synonyms

Laodelphax striatella; small brown planthopper; Laodelphax striatella (Fallen, 1826); Laodelphax striatellus (Fallen, 1826)

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; Criomorphinae; Laodelphax

Parent

Laodelphax () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 195882)

NCBI Taxonomy ID

195883 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 195883)

is Taxon A an Infraspecies?

No

Taxon B

Latin Name

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

Common Name

small brown planthopper

Synonyms

Laodelphax striatella; small brown planthopper; Laodelphax striatella (Fallen, 1826); Laodelphax striatellus (Fallen, 1826)

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; Criomorphinae; Laodelphax

Parent

Laodelphax () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 195882)

NCBI Taxonomy ID

195883 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 195883)

is Taxon B an Infraspecies?

No

GENOTYPIC CHANGE

Generic Gene Name

CYP6FU1

Synonyms

-

String

-

Sequence Similarities

-

GO - Molecular Function

-

GO - Biological Process

-

GO - Cellular Component

GO:0016021 : integral component of membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0016021)

UniProtKB Laodelphax striatellus

A0A1S5R631 (http://www.uniprot.org/uniprot/A0A1S5R631)

GenebankID or UniProtKB

()

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

Four cis-acting elements were identified whose influence on up-regulation was much more pronounced in combination than when present singly.

Experimental Evidence

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

Main Reference

Multiple cis-acting elements involved in up-regulation of a cytochrome P450 gene conferring resistance to deltamethrin inÂ smalÂ brown planthopper, Laodelphax striatellus (FallÃ©n). (2016) (https://pubmed.ncbi.nlm.nih.gov/27590347)

Authors

Pu J; Sun H; Wang J; Wu M; Wang K; Denholm I; Han Z

Abstract

As well as arising from single point mutations in binding sites or detoxifying enzymes, it is likely that insecticide resistance mechanisms are frequently controlled by multiple genetic factors, resulting in resistance being inherited as a quantitative trait. However, empirical evidence for this is still rare. Here we analyse the causes of up-regulation of CYP6FU1, a monoxygenase implicated in resistance to deltamethrin in the rice pest Laodelphax striatellus. The 5′-flanking region of this gene was cloned and sequenced from individuals of a susceptible and a resistant strain. A luminescent reporter assay was used to evaluate different 5′-flanking regions and their fragments for promoter activity. Mutations enhancing promoter activity in various fragments were characterized, singly and in combination, by site mutation recovery. Nucleotide diversity in flanking sequences was greatly reduced in deltamethrin-resistant insects compared to susceptible ones. Phylogenetic sequence analysis found that CYP6FU1 had five different types of 5′-flanking region. All five types were present in a susceptible strain but only a single type showing the highest promoter activity was present in a resistant strain. Four cis-acting elements were identified whose influence on up-regulation was much more pronounced in combination than when present singly. Of these, two were new transcription factor (TF) binding sites produced by mutations, another one was also a new TF binding site alternated from an existing one, and the fourth was a unique transcription start site. These results demonstrate that multiple cis-acting elements are involved in up-regulating CYP6FU1 to generate a resistance phenotype.

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Additional References

RELATED GEPHE

Related Genes

2 (Acetylcholinesterase (Ace-1), resistance to dieldrin) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^195883^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS