GEPHE SUMMARY

Gephebase Gene

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

GepheID

GP00002612

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

Trait State in Taxon A

Myzus persicae

Trait State in Taxon B

Myzus persicae - 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

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

Common Name

green peach aphid

Synonyms

Myzus (Nectarosiphon) persicae; green peach aphid; peach-potato aphid; Myzus persicae (Sulzer, 1776); Myzus persiceae

Rank

species

Lineage

cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Paraneoptera; Hemiptera; Sternorrhyncha; Aphidomorpha; Aphidoidea; Aphididae; Aphidinae; Macrosiphini; Myzus

Parent

Myzus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 13163)

NCBI Taxonomy ID

13164 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 13164)

is Taxon A an Infraspecies?

No

Taxon B

Latin Name

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

Common Name

green peach aphid

Synonyms

Myzus (Nectarosiphon) persicae; green peach aphid; peach-potato aphid; Myzus persicae (Sulzer, 1776); Myzus persiceae

Rank

species

Lineage

cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Paraneoptera; Hemiptera; Sternorrhyncha; Aphidomorpha; Aphidoidea; Aphididae; Aphidinae; Macrosiphini; Myzus

Parent

Myzus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 13163)

NCBI Taxonomy ID

13164 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 13164)

is Taxon B an Infraspecies?

No

GENOTYPIC CHANGE

Generic Gene Name

nAChRbeta1

Synonyms

AChR; AchR64B; AChR64B; Acr64B; AcrD; ard; Ard; ARD; beta 64B; beta1 nAChR; CG11348; CG11348-PA; CG12606; Dbeta1; Dmel\CG11348; nAChR; nAChR-beta64B; nAcR64B; nAcRbeta-64B

String

7227.FBpp0073155 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 7227.FBpp0073155)

Sequence Similarities

Belongs to the ligand-gated ion channel (TC 1.A.9) family. Acetylcholine receptor (TC 1.A.9.1) subfamily.

GO - Molecular Function

GO:0004888 : transmembrane signaling receptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004888)
GO:0022848 : acetylcholine-gated cation-selective channel activity

UniProtKB Drosophila melanogaster

P04755 (http://www.uniprot.org/uniprot/P04755)

GenebankID or UniProtKB

()

(https://www.ebi.ac.uk/QuickGO/term/GO:0022848)
GO:1904315 : transmitter-gated ion channel activity involved in regulation of postsynaptic membrane potential (https://www.ebi.ac.uk/QuickGO/term/GO:1904315)
GO:0005231 : excitatory extracellular ligand-gated ion channel activity (https://www.ebi.ac.uk/QuickGO/term/GO:0005231)
GO:0030594 : neurotransmitter receptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0030594)

GO - Biological Process

GO:0007165 : signal transduction (https://www.ebi.ac.uk/QuickGO/term/GO:0007165)
GO:0007268 : chemical synaptic transmission (https://www.ebi.ac.uk/QuickGO/term/GO:0007268)
GO:0007271 : synaptic transmission, cholinergic (https://www.ebi.ac.uk/QuickGO/term/GO:0007271)
GO:0034220 : ion transmembrane transport (https://www.ebi.ac.uk/QuickGO/term/GO:0034220)
GO:0050877 : nervous system process (https://www.ebi.ac.uk/QuickGO/term/GO:0050877)
GO:0042391 : regulation of membrane potential (https://www.ebi.ac.uk/QuickGO/term/GO:0042391)

GO - Cellular Component

GO:0005887 : integral component of plasma membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0005887)
GO:0043005 : neuron projection (https://www.ebi.ac.uk/QuickGO/term/GO:0043005)
GO:0045211 : postsynaptic membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0045211)
GO:0045202 : synapse (https://www.ebi.ac.uk/QuickGO/term/GO:0045202)
GO:0070161 : anchoring junction (https://www.ebi.ac.uk/QuickGO/term/GO:0070161)

Presumptive Null

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

Molecular Type

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

Aberration Type

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

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

V101I

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Val	Ile	101

Main Reference

V101I and R81T mutations in the nicotinic acetylcholine receptor Î²1 subunit are associated with neonicotinoid resistance in Myzus persicae. (2022) (https://pubmed.ncbi.nlm.nih.gov/34962090)

Authors

Xu X; Ding Q; Wang X; Wang R; Ullah F; Gao X; Song D

Abstract

The peach-potato aphid, Myzus persicae (Sulzer) (Hemiptera: Aphididae), is a major pest worldwide. The intensive use of insecticides has led to the development of resistance against neonicotinoid insecticides. The R81T mutation in the nicotinic acetylcholine receptor (nAChR) beta1 subunit is considered a crucial mechanism adaptation to neonicotinoid resistance in M. persicae and Aphis gossypii.

Resistance-related mutations (R81T and V101I) were detected in the imidacloprid-resistant M. persicae AH19 population. The V101I mutation is reported for the first time. The V101I and R81T mutations existed separately, indicating that the two mutations evolved independently. Imidacloprid resistance in the AH19 population was stable without insecticide exposure. Four mutant strains were selected from the population with stable resistance. The resistance of the AH19-T, AH19-I, and AH19-TI strains to imidacloprid, thiamethoxam, and dinotefuran was significantly increased compared with the AH19-W strain. Synergism bioassays showed that the inhibition of three detoxification enzymes did not affect imidacloprid resistance in the AH19-T and AH19-I strains. Expression of nAChR Î²1 subunits in the AH19-W, AH19-T, and AH19-I strains remained unchanged.

The V101I mutation is associated with neonicotinoid resistance in M. persicae. The resistance of the AH19-T and AH19-I strains to neonicotinoids appears to be mainly due to the R81T and V101I mutations, whereas these mutations, together with changes in the cytochrome P450 monooxygenases and nAChR expression may be responsible for the development of neonicotinoid resistance in the AH19-TI strain. Â© 2021 Society of Chemical Industry.

Additional References

RELATED GEPHE

Related Genes

8 (acetyl-CoA carboxylase (ACC), Acetylcholinesterase (Ace-1), CYP6CY3, CYP6CY3-CYP6CY4, esterase E4, esterase FE4, para (kdr), resistance to dieldrin) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^13164^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

1 (https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^nAChR^/and+Taxon ID=^13164^/or+Gene Gephebase=^nAChR^/and+Taxon ID=^13164^#gephebase-summary-title)

EXTERNAL LINKS

COMMENTS

The V101I and R81T mutations exist separately indicating that the two mutations evolved independently.