

GEPHE SUMMARY

nAChR (https://www.gephebase.org/search-criteria?/and+GeneGephebase=~nAChR^#gephebase-summary-title)	Gephebase Gene	GP00002612	GepheID
Published	Entry Status	Courtier	Main curator

PHENOTYPIC CHANGE

Physiology (https://www.gephebase.org/search-criteria?/and+TraitCategory=~Physiology^#gephebase-summary-title)	Trait Category		
Xenobiotic resistance (insecticide) (https://www.gephebase.org/search-criteria?/and+Trait=~Xenobiotic resistance (insecticide)^#gephebase-summary-title)	Trait		
Myzus persicae	Trait State in Taxon A		
Myzus persicae - resistant	Trait State in Taxon B		
Taxon A	Ancestral State		
Intraspecific (https://www.gephebase.org/search-criteria?/and+TaxonomicStatus=~Intraspecific^#gephebase-summary-title)	Taxonomic Status		
	Taxon A		Taxon B
Myzus persicae (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=~Myzus persicae^#gephebase-summary-title)	Latin Name	Myzus persicae (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=~Myzus persicae^#gephebase-summary-title)	Latin Name
green peach aphid	Common Name	green peach aphid	Common Name
Myzus (Nectarosiphon) persicae; green peach aphid; peach-potato aphid; Myzus persicae (Sulzer, 1776); Myzus persiceae	Synonyms	Myzus (Nectarosiphon) persicae; green peach aphid; peach-potato aphid; Myzus persicae (Sulzer, 1776); Myzus persiceae	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; Sternorrhyncha; Aphidomorpha; Aphidoidea; Aphididae; Aphidinae; Macrosiphini; Myzus	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	Lineage
Myzus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=13163)	Parent	Myzus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=13163)	Parent
13164 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=13164)	NCBI Taxonomy ID	13164 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=13164)	NCBI Taxonomy ID
No	is Taxon A an Infrappecies?	No	is Taxon B an Infrappecies?

GENOTYPIC CHANGE

nAChRbeta1	Generic Gene Name	P04755 (http://www.uniprot.org/uniprot/P04755)	UniProtKB Drosophila melanogaster
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	Synonyms	()	GenebankID or UniProtKB
7227.FBpp0073155 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=7227.FBpp0073155)	String		
Belongs to the ligand-gated ion channel (TC 1.A.9) family. Acetylcholine receptor (TC 1.A.9.1) subfamily.	Sequence Similarities		
GO:0004888 : transmembrane signaling receptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004888)	GO - Molecular Function		
GO:0022848 : acetylcholine-gated cation-selective channel activity			

(<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>)

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

Presumptive Null

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

Molecular Type

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

Aberration Type

Nonsynonymous

SNP Coding Change

V101I

Molecular Details of the Mutation

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

Experimental Evidence

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

Main Reference

V101I and R81T mutations in the nicotinic acetylcholine receptor $\beta 21$ subunit are associated with neonicotinoid resistance in *Myzus persicae*. (2022)
 (<https://pubmed.ncbi.nlm.nih.gov/34962090>)

Authors

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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 $\beta 21$ 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. © 2021 Society of Chemical Industry.

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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>)

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.