GEPHE SUMMARY

Gephebase Gene

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

GepheID

GP00002554

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

Trait State in Taxon A

Frankliniella occidentalis

Trait State in Taxon B

Frankliniella occidentalis - 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

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

Common Name

western flower thrips

Synonyms

Euthrips occidentalis; Frankliniella brunnescens; Frankliniella californica; Frankliniella occidentalis brunnescens; western flower thrips; Frankliniella occidentalis (Pergande, 1895); Frankliniella occidentalis brunnescens Priesner, 1932

Rank

species

Lineage

cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Paraneoptera; Thysanoptera; Terebrantia; Thripoidea; Thripidae; Thripinae; Frankliniella

Parent

Frankliniella () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 45059)

NCBI Taxonomy ID

133901 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 133901)

is Taxon A an Infraspecies?

No

Taxon B

Latin Name

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

Common Name

western flower thrips

Synonyms

Euthrips occidentalis; Frankliniella brunnescens; Frankliniella californica; Frankliniella occidentalis brunnescens; western flower thrips; Frankliniella occidentalis (Pergande, 1895); Frankliniella occidentalis brunnescens Priesner, 1932

Rank

species

Lineage

cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Paraneoptera; Thysanoptera; Terebrantia; Thripoidea; Thripidae; Thripinae; Frankliniella

Parent

Frankliniella () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 45059)

NCBI Taxonomy ID

133901 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 133901)

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

UniProtKB Drosophila melanogaster

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

GenebankID or UniProtKB

()

(https://www.ebi.ac.uk/QuickGO/term/GO:0004888)
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)

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

G275E in nAchR alpha 6 due to a single nucleotide change

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	-	-	-

Main Reference

A nicotinic acetylcholine receptor transmembrane point mutation (G275E) associated with resistance to spinosad in Frankliniella occidentalis. (2013) (https://pubmed.ncbi.nlm.nih.gov/23016960)

Authors

Puinean AM; Lansdell SJ; Collins T; Bielza P; Millar NS

Abstract

High levels of resistance to spinosad, a macrocyclic lactone insecticide, have been reported previously in western flower thrips, Frankliniella occidentalis, an economically important insect pest of vegetables, fruit and ornamental crops. We have cloned the nicotinic acetylcholine receptor (nAChR) Î±6 subunit from F. occidentalis (FoÎ±6) and compared the nucleotide sequence of FoÎ±6 from susceptible and spinosad-resistant insect populations (MLFOM and R1S respectively). A single nucleotide change has been identified in FoÎ±6, resulting in the replacement of a glycine (G) residue in susceptible insects with a glutamic acid (E) in resistant insects. The resistance-associated mutation (G275E) is predicted to lie at the top of the third Î±-helical transmembrane domain of FoÎ±6. Although there is no direct evidence identifying the location of the spinosad binding site, the analogous amino acid in the C. elegans glutamate-gated chloride channel lies in close proximity (4.4 Ã...) to the known binding site of ivermectin, another macrocyclic lactone pesticide. The functional consequences of the resistance-associated mutation have been examined in the human nAChR Î±7 subunit. Introduction of an analogous (A272E) mutation in Î±7 abolishes the modulatory effects of spinosad whilst having no significant effect upon activation by acetylcholine, consistent with spinosad having an allosteric mechanism of action.

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Additional References

Genotype to phenotype, the molecular and physiological dimensions of resistance in arthropods. (2015) (https://pubmed.ncbi.nlm.nih.gov/26047113)
Increasing Frequency of G275E Mutation in the Nicotinic Acetylcholine Receptor Î±6 Subunit Conferring Spinetoram Resistance in Invading Populations of Western Flower Thrips in China. (2022) (https://pubmed.ncbi.nlm.nih.gov/35447773)
A CRISPR/Cas9 mediated point mutation in the alpha 6 subunit of the nicotinic acetylcholine receptor confers resistance to spinosad in Drosophila melanogaster. (2016) (https://pubmed.ncbi.nlm.nih.gov/27117524)

RELATED GEPHE

Related Genes

2 (Chitin synthase 1 (CHS1), para (kdr)) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^133901^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS