GEPHE SUMMARY

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

GepheID
GP00002527

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
Sitobion avenae

Trait State in Taxon B
Sitobion avenae - 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
Sitobion avenae (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Sitobion avenae^#gephebase-summary-title)

Common Name
English grain aphid

Synonyms
Sitobion (Sitobion) avenae; Sitobion (Sitobium) avenae; Sitobium avenae; English grain aphid; grain aphid; Sitobion avenae (Fabricius, 1775); Sitibion avenae

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; Sitobion

Parent
Sitobion () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 44662)

NCBI Taxonomy ID
44664 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 44664)

is Taxon A an Infraspecies?
No

Taxon B

Latin Name
Sitobion avenae (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Sitobion avenae^#gephebase-summary-title)

Common Name
English grain aphid

Synonyms
Sitobion (Sitobion) avenae; Sitobion (Sitobium) avenae; Sitobium avenae; English grain aphid; grain aphid; Sitobion avenae (Fabricius, 1775); Sitibion avenae

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; Sitobion

Parent
Sitobion () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 44662)

NCBI Taxonomy ID
44664 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 44664)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
para

Synonyms
bas; bss; CG9907; Dmel\CG9907; DmNav; DmNav1; DmNa[[v]]; DmNa[[V]]; DmNa[[v]]1; l(1)14Da; l(1)ESHS48; lincRNA.S9469; Nav1; Ocd; olfD; par; sbl; sbl-1; Shu; Shudderer

String
7227.FBpp0303597 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 7227.FBpp0303597)

Sequence Similarities
Belongs to the sodium channel (TC 1.A.1.10) family. Para subfamily.

GO - Molecular Function
GO:0005509 : calcium ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005509)
GO:0005244 : voltage-gated ion channel activity (https://www.ebi.ac.uk/QuickGO/term/GO:0005244)
GO:0005248 : voltage-gated sodium channel activity (https://www.ebi.ac.uk/QuickGO/term/GO:0005248)

UniProtKB Drosophila melanogaster
P35500 (http://www.uniprot.org/uniprot/P35500)

GenebankID or UniProtKB
()

GO:0005272 : sodium channel activity
(https://www.ebi.ac.uk/QuickGO/term/GO:0005272)

GO - Biological Process

GO:0045433 : male courtship behavior, veined wing generated song production
(https://www.ebi.ac.uk/QuickGO/term/GO:0045433)
GO:0001666 : response to hypoxia (https://www.ebi.ac.uk/QuickGO/term/GO:0001666)
GO:0009612 : response to mechanical stimulus
(https://www.ebi.ac.uk/QuickGO/term/GO:0009612)
GO:0034765 : regulation of ion transmembrane transport
(https://www.ebi.ac.uk/QuickGO/term/GO:0034765)
GO:0035725 : sodium ion transmembrane transport
(https://www.ebi.ac.uk/QuickGO/term/GO:0035725)
GO:0007638 : mechanosensory behavior
(https://www.ebi.ac.uk/QuickGO/term/GO:0007638)
GO:0060078 : regulation of postsynaptic membrane potential
(https://www.ebi.ac.uk/QuickGO/term/GO:0060078)

GO - Cellular Component

GO:0005887 : integral component of plasma membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0005887)
GO:0001518 : voltage-gated sodium channel complex
(https://www.ebi.ac.uk/QuickGO/term/GO:0001518)

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

L1014F

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 mutation (L1014F) in the voltage-gated sodium channel of the grain aphid, Sitobion avenae, is associated with resistance toÂ pyrethroid insecticides. (2014)
(https://pubmed.ncbi.nlm.nih.gov/24227679)

Authors

Foster SP; Paul VL; Slater R; Warren A; Denholm I; Field LM; Williamson MS

Abstract

The grain aphid, Sitobion avenae Fabricius (Hemiptera: Aphididae), is an important pest of cereal crops. Pesticides are the main method for control but carry the risk of selecting for resistance. In response to reports of reduced efficacy of pyrethroid sprays applied to S. avenae, field samples were collected and screened for mutations in the voltage-gated sodium channel, the primary target site for pyrethroids. Aphid mobility and mortality to lambda-cyhalothrin were measured in coated glass vial bioassays.

A single amino acid substitution (L1014F) was identified in the domain IIS6 segment of the sodium channel from the S. avenae samples exhibiting reduced pyrethroid efficacy. Bioassays on aphids heterozygous for the kdr mutation (SR) or homozygous for the wild-type allele (SS) showed that those carrying the mutation had significantly lower susceptibility to lambda-cyhalothrin.

The L1014F (kdr) mutation, known to confer pyrethroid resistance in many insect pests, has been identified for the first time in S. avenae. Clonal lines heterozygous for the mutation showed 35-40-fold resistance to lambda-cyhalothrin in laboratory bioassays, consistent with the reported effect of this mutation on pyrethroid sensitivity in other aphid species.

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Additional References

Molecular biology of insect sodium channels and pyrethroid resistance. (2014) (https://pubmed.ncbi.nlm.nih.gov/24704279)

RELATED GEPHE

Related Genes

2 (Acetylcholinesterase (Ace-1), Acetylcholinesterase (Ace-2)) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^44664^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS