GEPHE SUMMARY

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

GepheID
GP00002505

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
Sitophilus zeamais

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

Common Name
maize weevil

Synonyms
Sitophilus oryzae zeamais; maize weevil; Sitophilus zeamais Motschulsky, 1855

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Endopterygota; Coleoptera; Polyphaga; Cucujiformia; Curculionoidea; Curculionidae; Dryophthorinae; Sitophilus

Parent
Sitophilus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7045)

NCBI Taxonomy ID
7047 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7047)

is Taxon A an Infraspecies?
No

Taxon B

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

Common Name
maize weevil

Synonyms
Sitophilus oryzae zeamais; maize weevil; Sitophilus zeamais Motschulsky, 1855

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Endopterygota; Coleoptera; Polyphaga; Cucujiformia; Curculionoidea; Curculionidae; Dryophthorinae; Sitophilus

Parent
Sitophilus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7045)

NCBI Taxonomy ID
7047 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7047)

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)
GO:0005272 : sodium channel activity

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

GenebankID or UniProtKB
()

(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

T929I

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	Thr	Ile	929

Main Reference

Pyrethroid resistance in Sitophilus zeamais is associated with a mutation (T929I) in the voltage-gated sodium channel. (2011) (https://pubmed.ncbi.nlm.nih.gov/21496128)

Authors

AraÃºjo RA; Williamson MS; Bass C; Field LM; Duce IR

Abstract

The maize weevil, Sitophilus zeamais, is the most important pest affecting stored grain in Brazil and its control relies heavily on the use of insecticides. The intensive use of compounds such as the pyrethroids has led to the emergence of resistance, and previous studies have suggested that resistance to both pyrethroids and 1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane (DDT) may result from reduced sensitivity of the insecticide target, the voltage-gated sodium channel. To identify the molecular mechanisms underlying pyrethroid resistance in S. zeamais, the domain II region of the voltage-gated sodium channel (para-orthologue) gene was amplified by PCR and sequenced from susceptible and resistant laboratory S. zeamais strains that were selected with a discriminating dose of DDT. A single point mutation, T929I, was found in the para gene of the resistant S. zeamais populations and its presence in individual weevils was strongly associated with survival after DDT exposure. This is the first identification of a target-site resistance mutation in S. zeamais and unusually it is a super-kdr type mutation occurring in the absence of the more common kdr (L1014F) substitution. A high-throughput assay based on TaqMan single nucleotide polymorphism genotyping was developed for sensitive detection of the mutation and used to screen field-collected strains of S. zeamais. This showed that the mutation is present at low frequency in field populations and is a useful tool for informing control strategies.

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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

No matches found.

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

It is a super-kdr type mutation occurring in the absence of the more common L1014F substitution.