GEPHE SUMMARY

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

GepheID
GP00002562

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
Plutella xylostella

Trait State in Taxon B
Plutella xylostella - resistant lab strain

Ancestral State
Taxon A

Taxonomic Status
Experimental Evolution (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Experimental Evolution^#gephebase-summary-title)

Taxon A

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

Common Name
diamondback moth

Synonyms
diamondback moth; cabbage moth; Plutella xylostella (Linnaeus, 1758); Putella xylostella

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Amphiesmenoptera; Lepidoptera; Glossata; Neolepidoptera; Heteroneura; Ditrysia; Yponomeutoidea; Plutellidae; Plutella

Parent
Plutella () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 51654)

NCBI Taxonomy ID
51655 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 51655)

is Taxon A an Infraspecies?
No

Taxon B

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

Common Name
diamondback moth

Synonyms
diamondback moth; cabbage moth; Plutella xylostella (Linnaeus, 1758); Putella xylostella

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Amphiesmenoptera; Lepidoptera; Glossata; Neolepidoptera; Heteroneura; Ditrysia; Yponomeutoidea; Plutellidae; Plutella

Parent
Plutella () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 51654)

NCBI Taxonomy ID
51655 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 51655)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
Rdl

Synonyms
CG10537; CT29555; Dmel\CG10537; DmRdl; DmRDL; gaba; GABA; GABA-R; GABAr; GABA[[A]]; GABA[[A]] receptor; GABA[[A]]-R; GABA[[A]]R; LCCH1; Rd1; rdl; RDL

String
7227.FBpp0305970 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 7227.FBpp0305970)

Sequence Similarities
Belongs to the ligand-gated ion channel (TC 1.A.9) family. Gamma-aminobutyric acid receptor (TC 1.A.9.5) subfamily.

GO - Molecular Function
GO:0004890 : GABA-A receptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004890)
GO:0022851 : GABA-gated chloride ion channel activity (https://www.ebi.ac.uk/QuickGO/term/GO:0022851)
GO:0030594 : neurotransmitter receptor activity

UniProtKB Drosophila melanogaster
P25123 (http://www.uniprot.org/uniprot/P25123)

GenebankID or UniProtKB
()

(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:0034220 : ion transmembrane transport
(https://www.ebi.ac.uk/QuickGO/term/GO:0034220)
GO:0042493 : response to drug (https://www.ebi.ac.uk/QuickGO/term/GO:0042493)
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:0006811 : ion transport (https://www.ebi.ac.uk/QuickGO/term/GO:0006811)
GO:0042048 : olfactory behavior (https://www.ebi.ac.uk/QuickGO/term/GO:0042048)
GO:0030431 : sleep (https://www.ebi.ac.uk/QuickGO/term/GO:0030431)
GO:0009612 : response to mechanical stimulus
(https://www.ebi.ac.uk/QuickGO/term/GO:0009612)
GO:0002121 : inter-male aggressive behavior
(https://www.ebi.ac.uk/QuickGO/term/GO:0002121)
GO:0050805 : negative regulation of synaptic transmission
(https://www.ebi.ac.uk/QuickGO/term/GO:0050805)
GO:0042749 : regulation of circadian sleep/wake cycle
(https://www.ebi.ac.uk/QuickGO/term/GO:0042749)
GO:0090328 : regulation of olfactory learning
(https://www.ebi.ac.uk/QuickGO/term/GO:0090328)

GO - Cellular Component

GO:0016021 : integral component of membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0016021)
GO:0005886 : plasma membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0005886)
GO:0005887 : integral component of plasma membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0005887)
GO:0030054 : cell junction (https://www.ebi.ac.uk/QuickGO/term/GO:0030054)
GO:0030425 : dendrite (https://www.ebi.ac.uk/QuickGO/term/GO:0030425)
GO:0043005 : neuron projection (https://www.ebi.ac.uk/QuickGO/term/GO:0043005)
GO:0030424 : axon (https://www.ebi.ac.uk/QuickGO/term/GO:0030424)
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:0034707 : chloride channel complex
(https://www.ebi.ac.uk/QuickGO/term/GO:0034707)
GO:0032589 : neuron projection membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0032589)
GO:0032809 : neuronal cell body membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0032809)

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

A302(GGC)--> S302(TCC)

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	GCC	TCC	-
Amino-acid	Ala	Ser	302

Main Reference

Investigation of resistance mechanisms to fipronil in diamondback moth (Lepidoptera: Plutellidae). (2006) (https://pubmed.ncbi.nlm.nih.gov/16813330)

Authors

Li A; Yang Y; Wu S; Li C; Wu Y

Abstract

The SZ-F strain of Plutella xylostella (L.) (Lepidoptera: Plutellidae) was derived from a field-collected strain (SZ) by 20 generations of continuous selection with fipronil. The selection resulted in 300-fold increase in resistance to fipronil, and 3.5- and 6.5-fold cross-resistance to dieldrin and endosulfan, respectively, in the SZ-F strain compared with the unselected SZ strain. Analysis of detoxification enzyme activities and bioassay with synergists indicated that metabolic mechanisms are not important to fipronil resistance of the SZ-F strain and that the fipronil resistance is most likely attributed to target site insensitivity. The genomic DNA fragments flanking the second membrane-spanning region of Rdl gamma-aminobutyric acid (GABA) receptor gene from P. xylostella, PxRdl, were cloned and sequenced. A single allele of the PxRdl gene (encoding A302 or allele PxRdl-Ala) was found in both the Roth (susceptible) and SZ strains. In addition to the wild-type allele PxRdl-Ala, the resistant SZ-F strain carried a mutant PxRdl allele with the conserved amino acid replacement A302(GGC)--> S302(TCC) (allele PxRdl-Ser). The mutant PxRdl-Ser allele frequency in the SZ-F strain was 30%. After treatment of 20 mg/l fipronil on the SZ-F strain, the PxRdl-Ser allele frequency in the survivors increased to 57%. High frequency of the PxRdl-Ala allele remaining in the resistant SZ-F strain suggested that the A302S mutation in the PxRdl gene is partially associated with fipronil resistance and that other mutation(s) in the PxRdl gene or other Rdl-like subunit(s) may contribute to fipronil resistance.

Additional References

Genotype to phenotype, the molecular and physiological dimensions of resistance in arthropods. (2015) (https://pubmed.ncbi.nlm.nih.gov/26047113)

RELATED GEPHE

Related Genes

10 (ABCC2, Acetylcholinesterase (Ace-1), Chitin synthase 1 (CHS1), CYP6BG1, FMO2, glutamate-gated chloride channel (GluCl), MAP4K4, nAChR, para (kdr), RYR) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^51655^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS