GEPHE SUMMARY

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

GepheID
GP00002605

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

Trait State in Taxon A
Plutella xylostella - susceptible

Trait State in Taxon B
Plutella xylostella - resistant individuals from Yunnan in China

Ancestral State
Taxon A

Taxonomic Status
Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Intraspecific^#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
RyR

Synonyms
Ryr; CG10844; D-RyR; Dmel\CG10844; DmRyR; DRR; dry; DRY; dRyr; dRyR; dya; l(2)k00424; l(2)k04913; Rya-44F; Rya-r4; rya-r44F; Rya-r44F; Rya-R44F; Rya-r76CD; ryr; RYR; RyRs

String
7227.FBpp0293114 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 7227.FBpp0293114)

Sequence Similarities
Belongs to the ryanodine receptor (TC 1.A.3.1) family.

GO - Molecular Function
GO:0005509 : calcium ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005509)
GO:0048763 : calcium-induced calcium release activity (https://www.ebi.ac.uk/QuickGO/term/GO:0048763)
GO:0005219 : ryanodine-sensitive calcium-release channel activity

UniProtKB Drosophila melanogaster
Q24498 (http://www.uniprot.org/uniprot/Q24498)

GenebankID or UniProtKB
()

(https://www.ebi.ac.uk/QuickGO/term/GO:0005219)

GO - Biological Process

GO:0006874 : cellular calcium ion homeostasis
(https://www.ebi.ac.uk/QuickGO/term/GO:0006874)
GO:0035206 : regulation of hemocyte proliferation
(https://www.ebi.ac.uk/QuickGO/term/GO:0035206)
GO:0006936 : muscle contraction (https://www.ebi.ac.uk/QuickGO/term/GO:0006936)
GO:0006816 : calcium ion transport (https://www.ebi.ac.uk/QuickGO/term/GO:0006816)
GO:0060047 : heart contraction (https://www.ebi.ac.uk/QuickGO/term/GO:0060047)
GO:0072347 : response to anesthetic (https://www.ebi.ac.uk/QuickGO/term/GO:0072347)

GO - Cellular Component

GO:0016021 : integral component of membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0016021)
GO:0030659 : cytoplasmic vesicle membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0030659)
GO:0030018 : Z disc (https://www.ebi.ac.uk/QuickGO/term/GO:0030018)
GO:0042383 : sarcolemma (https://www.ebi.ac.uk/QuickGO/term/GO:0042383)
GO:0033017 : sarcoplasmic reticulum membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0033017)
GO:0005790 : smooth endoplasmic reticulum
(https://www.ebi.ac.uk/QuickGO/term/GO:0005790)

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

E1338D Q4594L I4790M)in highly conserved regions of RyR.

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

Novel mutations and mutation combinations of ryanodine receptor in a chlorantraniliprole resistant population of Plutella xylostella (L.). (2014) (https://pubmed.ncbi.nlm.nih.gov/25377064)

Authors

Guo L; Liang P; Zhou X; Gao X

Abstract

A previous study documented a glycine to glutamic acid mutation (G4946E) in ryanodine receptor (RyR) was highly correlated to diamide insecticide resistance in field populations of Plutella xylostella (Lepidoptera: Plutellidae). In this study, a field population collected in Yunnan province, China, exhibited a 2128-fold resistance to chlorantraniliprole. Sequence comparison between resistant and susceptible P. xylostella revealed three novel mutations including a glutamic acid to valine substitution (E1338D), a glutamine to leucine substitution (Q4594L) and an isoleucine to methionine substitution (I4790M) in highly conserved regions of RyR. Frequency analysis of all four mutations in this field population showed that the three new mutations showed a high frequency of 100%, while the G4946E had a frequency of 20%. Furthermore, the florescent ligand binding assay revealed that the RyR containing multiple mutations displayed a significantly lower affinity to the chlorantraniliprole. The combined results suggested that the co-existence of different combinations of the four mutations was involved in the chlorantraniliprole resistance. An allele-specific PCR based method was developed for the diagnosis of the four mutations in the field populations of P. xylostella.

Additional References

RELATED GEPHE

Related Genes

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

Related Haplotypes

3 (https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^RYR^/and+Taxon ID=^51655^/or+Gene Gephebase=^RYR^/and+Taxon ID=^51655^#gephebase-summary-title)

EXTERNAL LINKS

COMMENTS