GEPHE SUMMARY

Gephebase Gene
glutamate-gated chloride channel (GluCl) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^glutamate-gated chloride channel (GluCl)^#gephebase-summary-title)

GepheID
GP00002634

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

Trait State in Taxon A
Plutella xylostella - sensitive

Trait State in Taxon B
Plutella xylostella - 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
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
GluClalpha

Synonyms
BcDNA:HL07853; CG7535; CT23049; dGluCl-alpha; Dm-GluCl; Dmel\CG7535; DmGlu; DmGluClalpha; DrosGlu-Cl-alpha; DrosGluCl; DrosGluCl-alpha; DrosGluCl-alpha1; glc; glu; GluCl; GLUCL; GluCla; gluClalpha; GluClalpha1

String
7227.FBpp0099473 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 7227.FBpp0099473)

Sequence Similarities
Belongs to the ligand-gated ion channel (TC 1.A.9) family. Glutamate-gated chloride channel (TC 1.A.9.4) subfamily.

GO - Molecular Function
GO:0004888 : transmembrane signaling receptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004888)

UniProtKB Drosophila melanogaster
Q94900 (http://www.uniprot.org/uniprot/Q94900)

GenebankID or UniProtKB
()

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:0008068 : extracellularly glutamate-gated chloride channel activity (https://www.ebi.ac.uk/QuickGO/term/GO:0008068)
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: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:1902476 : chloride transmembrane transport (https://www.ebi.ac.uk/QuickGO/term/GO:1902476)
GO:0006821 : chloride transport (https://www.ebi.ac.uk/QuickGO/term/GO:0006821)

GO - Cellular Component

GO:0016021 : integral component of membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0016021)
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:0034707 : chloride channel complex (https://www.ebi.ac.uk/QuickGO/term/GO:0034707)
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

A309V

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 point mutation in the glutamate-gated chloride channel of Plutella xylostella is associated with resistance to abamectin. (2016) (https://pubmed.ncbi.nlm.nih.gov/26592158)

Authors

Wang X; Wang R; Yang Y; Wu S; O'Reilly AO; Wu Y

Abstract

The diamondback moth, Plutella xylostella, is a global pest of cruciferous vegetables. Abamectin resistance in a field population of P. xylostella was introgressed into the susceptible Roth strain. The resulting introgression strain Roth-Abm showed 11â€‰000-fold resistance to abamectin compared with Roth. An A309V substitution at the N-terminus of the third transmembrane helix (M3) of the glutamate-gated chloride channel of P. xylostella (PxGluCl) was identified in Roth-Abm. The frequency of the V309 allele of PxGluCl was 94.7% in Roth-Abm, whereas no such allele was detected in Roth. A subpopulation of Roth-Abm was kept without abamectin selection for 20 generations to produce a revertant strain, Roth-Abm-D. Abamectin resistance in Roth-Abm-D declined to 1150-fold compared with Roth, with the V309 allele frequency decreased to 9.6%. After treatment of the Roth-Abm-D strain with 80 mg/l abamectin the V309 allele frequency in the survivors increased to 55%. This demonstrates that the A309V mutation in PxGluCl is strongly associated with a 10-fold increase in abamectin resistance in Roth-Abm relative to Roth-Abm-D. Homology modelling and automated ligand docking results suggest that the A309V substitution allosterically modifies the abamectin-binding site, as opposed to directly eliminating a key binding contact. Other resistance mechanisms to abamectin in Roth-Abm are discussed besides the A309V mutation of PxGluCl.

Additional References

RELATED GEPHE

Related Genes

10 (ABCC2, Acetylcholinesterase (Ace-1), Chitin synthase 1 (CHS1), CYP6BG1, FMO2, MAP4K4, nAChR, para (kdr), resistance to dieldrin, 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

Homology modeling and automated ligand docking results suggest that this substitution allosterically modifies the abamectin-binding site.