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
GP00002604

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

Trait State in Taxon A
Tetranychus urticae - sensitive

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

Common Name
two-spotted spider mite

Synonyms
two-spotted spider mite; red spider mite; twospotted mite; Tetranychus urticae Koch, 1836

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Chelicerata; Arachnida; Acari; Acariformes; Trombidiformes; Prostigmata; Eleutherengona; Raphignathae; Tetranychoidea; Tetranychidae; Tetranychus

Parent
Tetranychus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 32263)

NCBI Taxonomy ID
32264 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 32264)

is Taxon A an Infraspecies?
No

Taxon B

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

Common Name
two-spotted spider mite

Synonyms
two-spotted spider mite; red spider mite; twospotted mite; Tetranychus urticae Koch, 1836

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Chelicerata; Arachnida; Acari; Acariformes; Trombidiformes; Prostigmata; Eleutherengona; Raphignathae; Tetranychoidea; Tetranychidae; Tetranychus

Parent
Tetranychus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 32263)

NCBI Taxonomy ID
32264 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 32264)

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

G323D in the highly conserved TM2 region of Tu_GluCl

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	Gly	Glu	326

Main Reference

A point mutation in a glutamate-gated chloride channel confers abamectin resistance in the two-spotted spider mite, Tetranychus urticae Koch. (2010) (https://pubmed.ncbi.nlm.nih.gov/20522121)

Authors

Kwon DH; Yoon KS; Clark JM; Lee SH

Abstract

The molecular mechanisms and genetics of abamectin resistance mediated by target site insensitivity in the two-spotted spider mite, Tetranychus urticae, were investigated by comparing two isogenic abamectin-susceptible (AbaS) and abamectin-resistant (AbaR) strains. Cloning and sequencing of full-length cDNA fragments of gamma-amino butyric acid (GABA)-gated chloride channel genes revealed no polymorphisms between the two strains. However, sequence comparison of the full-length cDNA fragment of a T. urticae glutamate-gated chloride channel gene (TuGluCl) identified a G323D point mutation as being tentatively related with abamectin resistance. In individual F(2) progenies obtained by backcrossing, the G323D genotype was confirmed to correlate with abamectin resistance. Bioassays using progeny from reciprocal crossings revealed that the abamectin resistance trait resulting from TuGluCl insensitivity is incompletely recessive.

Additional References

The cys-loop ligand-gated ion channel gene family of Tetranychus urticae: implications for acaricide toxicology and a novel mutation associated with abamectin resistance. (2012) (https://pubmed.ncbi.nlm.nih.gov/22465149)

RELATED GEPHE

Related Genes

8 (Acetylcholinesterase (Ace-1), Chitin synthase 1 (CHS1), CPR, CYP392A16, CYP392E8, cytochrome b, para (kdr), PSST) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^32264^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

1 (https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^glutamate-gated chloride channel (GluCl)^/and+Taxon ID=^32264^/or+Gene Gephebase=^glutamate-gated chloride channel (GluCl)^/and+Taxon ID=^32264^#gephebase-summary-title)

EXTERNAL LINKS

COMMENTS

There are six orthologous GluCl genes in the genome of T. urticae.