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
GP00002601

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
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

G326E inTu_GluCl3

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

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)

Authors

Dermauw W; Ilias A; Riga M; Tsagkarakou A; GrbiÄ‡ M; Tirry L; Van Leeuwen T; Vontas J

Abstract

The cys-loop ligand-gated ion channel (cysLGIC) super family of Tetranychus urticae, the two-spotted spider mite, represents the largest arthropod cysLGIC super family described to date and the first characterised one within the group of chelicerates. Genome annotation, phylogenetic analysis and comparison of the cysLGIC subunits with their counterparts in insects reveals that the T. urticae genome encodes for a high number of glutamate- and histamine-gated chloride channel genes (GluCl and HisCl) compared to insects. Three orthologues of the insect Î³-aminobutyric acid (GABA)-gated chloride channel gene Rdl were detected. Other cysLGIC groups, such as the nAChR subunits, are more conserved and have clear insect orthologues. Members of cysLGIC family mediate endogenous chemical neurotransmission and they are prime targets of insecticides. Implications for toxicology associated with the identity and specific features of T. urticae family members are discussed. We further reveal the accumulation of known and novel mutations in different GluCl channel subunits (Tu_GluCl1 and Tu_GluCl3) associated with abamectin resistance in T. urticae, and provide genetic evidence for their causality. Our study provides useful toxicological insights for the exploration of the T. urticae cysLGIC subunits as putative molecular targets for current and future chemical control strategies.

Copyright Â© 2012 Elsevier Ltd. All rights reserved.

Additional References

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.