GEPHE SUMMARY

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

GepheID
GP00002654

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

Trait State in Taxon A
Rhyzopertha dominica - sensitive

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

Common Name
lesser grain borer

Synonyms
lesser grain borer; Rhyzopertha dominica (Fabricius, 1792); Rhizopertha dominica

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Endopterygota; Coleoptera; Polyphaga; Bostrichiformia; Bostrichoidea; Bostrichidae; Dinoderinae; Rhyzopertha

Parent
Rhyzopertha () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 92691)

NCBI Taxonomy ID
92692 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 92692)

is Taxon A an Infraspecies?
No

Taxon B

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

Common Name
lesser grain borer

Synonyms
lesser grain borer; Rhyzopertha dominica (Fabricius, 1792); Rhizopertha dominica

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Endopterygota; Coleoptera; Polyphaga; Bostrichiformia; Bostrichoidea; Bostrichidae; Dinoderinae; Rhyzopertha

Parent
Rhyzopertha () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 92691)

NCBI Taxonomy ID
92692 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 92692)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
CHRNA6

Synonyms
CHNRA6

String
9606.ENSP00000276410 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=9606.ENSP00000276410)

Sequence Similarities
Belongs to the ligand-gated ion channel (TC 1.A.9) family. Acetylcholine receptor (TC 1.A.9.1) subfamily. Alpha-6/CHRNA6 sub-subfamily.

GO - Molecular Function
GO:0015464 : acetylcholine receptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0015464)
GO:0022848 : acetylcholine-gated cation-selective channel activity (https://www.ebi.ac.uk/QuickGO/term/GO:0022848)
GO:1904315 : transmitter-gated ion channel activity involved in regulation of postsynaptic

UniProtKB Homo sapiens
Q15825 (http://www.uniprot.org/uniprot/Q15825)

GenebankID or UniProtKB
()

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: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:0014059 : regulation of dopamine secretion
(https://www.ebi.ac.uk/QuickGO/term/GO:0014059)
GO:0051899 : membrane depolarization
(https://www.ebi.ac.uk/QuickGO/term/GO:0051899)
GO:2000300 : regulation of synaptic vesicle exocytosis
(https://www.ebi.ac.uk/QuickGO/term/GO:2000300)

GO - Cellular Component

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:0043005 : neuron projection (https://www.ebi.ac.uk/QuickGO/term/GO:0043005)
GO:0045202 : synapse (https://www.ebi.ac.uk/QuickGO/term/GO:0045202)
GO:0005892 : acetylcholine-gated channel complex
(https://www.ebi.ac.uk/QuickGO/term/GO:0005892)
GO:0099055 : integral component of postsynaptic membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0099055)
GO:0099056 : integral component of presynaptic membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0099056)
GO:0070161 : anchoring junction (https://www.ebi.ac.uk/QuickGO/term/GO:0070161)
GO:0098691 : dopaminergic synapse (https://www.ebi.ac.uk/QuickGO/term/GO:0098691)

Presumptive Null

Yes (https://www.gephebase.org/search-criteria?/and+Presumptive Null=^Yes^#gephebase-summary-title)

Molecular Type

Coding (https://www.gephebase.org/search-criteria?/and+Molecular Type=^Coding^#gephebase-summary-title)

Aberration Type

Deletion (https://www.gephebase.org/search-criteria?/and+Aberration Type=^Deletion^#gephebase-summary-title)

Deletion Size

unknown

Molecular Details of the Mutation

Three mutations were found in the resistant strain compared with the susceptible one: (1) a 181-bp fragment truncated at the N-terminus resulting in the appearance of a premature stop codon - (2) one missing bp at the position 997 causing a frame-shift mutation and (3) an 87-bp fragment truncated in the TM2 region.

Experimental Evidence

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

Main Reference

Nicotinic acetylcholine receptor subunit Î±6 associated with spinosad resistance in Rhyzopertha dominica (Coleoptera: Bostrichidae). (2018) (https://pubmed.ncbi.nlm.nih.gov/29891379)

Authors

Wang HT; Tsai CL; Chen ME

Abstract

The lesser grain borer, Rhyzopertha dominica, which is a primary pest of stored products, breaks up whole grains and makes them susceptible to secondary infestation by other pests. Insecticide application is the main control measure against this borer. A resistant strain of R. dominica against the insecticide, spinosad, was selected in the laboratory. The full-length cDNA of the target site of spinosad, nicotinic acetylcholine receptor subunit Î±6, from R. dominica (RdÎ±6) was cloned and analyzed using reverse transcription PCR and rapid amplification of cDNA ends. The complete 2133-bp cDNA contains the open reading frame of 1497â€¯bp encoding a 498-amino-acid protein. There are four predicted transmembrane (TM) regions, and six extracellular ligand-binding sites at the N-terminus, upstream from the first TM in RdÎ±6. Three mutations have been found in the resistant strain compared with the susceptible one: (1) a 181-bp fragment truncated at the N-terminus, resulting in the appearance of a premature stop codon, (2) one missing bp at the position 997, causing a frame-shift mutation, and (3) an 87-bp fragment truncated in the TM2 region. In addition, real-time quantitative PCR was applied to detect the transcriptional expression of RdÎ±6 in both the susceptible and resistant strains. The results indicated that the expression of RdÎ±6 was significantly lower in then resistant strain than in susceptible one. In conclusion, mutation of RdÎ±6 may cause R. dominica resistant to spinosad due to target site insensitivity.

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS