GEPHE SUMMARY

Gephebase Gene
ABCC2 (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^ABCC2^#gephebase-summary-title)

GepheID
GP00000011

Entry Status
Published

Main curator
Martin

PHENOTYPIC CHANGE

Trait Category
Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category=^Physiology^#gephebase-summary-title)

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

Trait State in Taxon A
Bombyx mori - Bt susceptible strains

Trait State in Taxon B
Bombyx mori - Bt resistant strains

Ancestral State
Taxon A

Taxonomic Status
Domesticated (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Domesticated^#gephebase-summary-title)

Taxon A

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

Common Name
domestic silkworm

Synonyms
domestic silkworm; silk moth; silkworm; Bombyx mori Linnaeus, 1758

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; Obtectomera; Bombycoidea; Bombycidae; Bombycinae; Bombyx

Parent
Bombyx () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7090)

NCBI Taxonomy ID
7091 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7091)

is Taxon A an Infraspecies?
Yes

Taxon A Description
Bombyx mori - Bt susceptible strains

Taxon B

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

Common Name
domestic silkworm

Synonyms
domestic silkworm; silk moth; silkworm; Bombyx mori Linnaeus, 1758

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; Obtectomera; Bombycoidea; Bombycidae; Bombycinae; Bombyx

Parent
Bombyx () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7090)

NCBI Taxonomy ID
7091 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7091)

is Taxon B an Infraspecies?
Yes

Taxon B Description
Bombyx mori - Bt resistant strains

GENOTYPIC CHANGE

Generic Gene Name
ABCC2

Synonyms
-

String
-

Sequence Similarities
-

GO - Molecular Function
GO:0005524 : ATP binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005524)
GO:0042626 : ATPase activity, coupled to transmembrane movement of substances (https://www.ebi.ac.uk/QuickGO/term/GO:0042626)

GO - Biological Process
-

GO - Cellular Component

UniProtKB Plutella xylostella
A0A0E3ZDK3 (http://www.uniprot.org/uniprot/A0A0E3ZDK3)

GenebankID or UniProtKB
()

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

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

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

Insertion Size

1-9 bp

Molecular Details of the Mutation

1a.a. insertion at codon 234 (Tyr)

Experimental Evidence

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

Main Reference

Single amino acid mutation in an ATP-binding cassette transporter gene causes resistance to Bt toxin Cry1Ab in the silkworm, Bombyx mori. (2012)
(https://pubmed.ncbi.nlm.nih.gov/22635270)

Authors

Atsumi S; Miyamoto K; Yamamoto K; Narukawa J; Kawai S; Sezutsu H; Kobayashi I; Uchino K; Tamura T; Mita K; Kadono-Okuda K; Wada S; Kanda K; Goldsmith MR; Noda H

Abstract

Bt toxins derived from the arthropod bacterial pathogen Bacillus thuringiensis are widely used for insect control as insecticides or in transgenic crops. Bt resistance has been found in field populations of several lepidopteran pests and in laboratory strains selected with Bt toxin. Widespread planting of crops expressing Bt toxins has raised concerns about the potential increase of resistance mutations in targeted insects. By using Bombyx mori as a model, we identified a candidate gene for a recessive form of resistance to Cry1Ab toxin on chromosome 15 by positional cloning. BGIBMGA007792-93, which encodes an ATP-binding cassette transporter similar to human multidrug resistance protein 4 and orthologous to genes associated with recessive resistance to Cry1Ac in Heliothis virescens and two other lepidopteran species, was expressed in the midgut. Sequences of 10 susceptible and seven resistant silkworm strains revealed a common tyrosine insertion in an outer loop of the predicted transmembrane structure of resistant alleles. We confirmed the role of this ATP-binding cassette transporter gene in Bt resistance by converting a resistant silkworm strain into a susceptible one by using germline transformation. This study represents a direct demonstration of Bt resistance gene function in insects with the use of transgenesis.

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS