GEPHE SUMMARY

Gephebase Gene

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

GepheID

GP00001439

Entry Status

Published

Main curator

Prigent

PHENOTYPIC CHANGE

Trait Category

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

Trait

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

Trait State in Taxon A

Spodoptera exigua (FRA) from France susceptible

Trait State in Taxon B

Spodoptera exigua (Xen-R) highly 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

Spodoptera exigua (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Spodoptera exigua^#gephebase-summary-title)

Common Name

beet armyworm

Synonyms

beet armyworm; pigweed caterpillar; small mottled willow caterpillar; Spodoptera exigua (Hubner, 1808)

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; Noctuoidea; Noctuidae; Amphipyrinae; Spodoptera

Parent

Spodoptera () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7106)

NCBI Taxonomy ID

7107 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7107)

is Taxon A an Infraspecies?

No

Taxon B

Latin Name

Spodoptera exigua (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Spodoptera exigua^#gephebase-summary-title)

Common Name

beet armyworm

Synonyms

beet armyworm; pigweed caterpillar; small mottled willow caterpillar; Spodoptera exigua (Hubner, 1808)

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; Noctuoidea; Noctuidae; Amphipyrinae; Spodoptera

Parent

Spodoptera () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7106)

NCBI Taxonomy ID

7107 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7107)

is Taxon B an Infraspecies?

No

GENOTYPIC CHANGE

Generic Gene Name

-

Synonyms

-

String

-

Sequence Similarities

-

GO - Molecular Function

-

GO - Biological Process

-

GO - Cellular Component

-

UniProtKB

GenebankID or UniProtKB

KF926100 (https://www.ncbi.nlm.nih.gov/nuccore/KF926100)

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

100-999 bp

Molecular Details of the Mutation

About 500 nt genomic deletion over 2 exons involving 246 nt coding 82aa

Experimental Evidence

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

Main Reference

ABCC transporters mediate insect resistance to multiple Bt toxins revealed by bulk segregant analysis. (2014) (https://pubmed.ncbi.nlm.nih.gov/24912445)

Authors

Park Y; GonzÃ¡lez-MartÃnez RM; Navarro-Cerrillo G; Chakroun M; Kim Y; Ziarsolo P; Blanca J; CaÃ±izares J; FerrÃ© J; Herrero S

Abstract

Relatively recent evidence indicates that ABCC2 transporters play a main role in the mode of action of Bacillus thuringiensis (Bt) Cry1A-type proteins. Mapping of major Cry1A resistance genes has linked resistance to the ABCC2 locus in Heliothis virescens, Plutella xylostella, Trichoplusia ni and Bombyx mori, and mutations in this gene have been found in three of these Bt-resistant strains.

We have used a colony of Spodoptera exigua (Xen-R) highly resistant to a Bt commercial bioinsecticide to identify regions in the S. exigua genome containing loci for major resistance genes by using bulk segregant analysis (BSA). Results reveal a region containing three genes from the ABCC family (ABBC1, ABBC2 and ABBC3) and a mutation in one of them (ABBC2) as responsible for the resistance of S. exigua to the Bt commercial product and to its key Spodoptera-active ingredients, Cry1Ca. In contrast to all previously described mutations in ABCC2 genes that directly or indirectly affect the extracellular domains of the membrane protein, the ABCC2 mutation found in S. exigua affects an intracellular domain involved in ATP binding. Functional analyses of ABBC2 and ABBC3 support the role of both proteins in the mode of action of Bt toxins in S. exigua. Partial silencing of these genes with dsRNA decreased the susceptibility of wild type larvae to both Cry1Ac and Cry1Ca. In addition, reduction of ABBC2 and ABBC3 expression negatively affected some fitness components and induced up-regulation of arylphorin and repat5, genes that respond to Bt intoxication and that are found constitutively up-regulated in the Xen-R strain.

The current results show the involvement of different members of the ABCC family in the mode of action of B. thuringiensis proteins and expand the role of the ABCC2 transporter in B. thuringiensis resistance beyond the Cry1A family of proteins to include Cry1Ca.

Additional References

RELATED GEPHE

Related Genes

4 (CYP321A8, CYP9A186, GSTe, RYR) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^7107^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS