GEPHE SUMMARY

Gephebase Gene

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

GepheID

GP00000433

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; Bt Cry1Ac toxin) (https://www.gephebase.org/search-criteria?/and+Trait=^Xenobiotic resistance (insecticide; Bt Cry1Ac toxin)^#gephebase-summary-title)

Trait State in Taxon A

Helicoverpa armigera - Bt-Cry1Ac susceptible

Trait State in Taxon B

Helicoverpa armigera - Bt-Cry1Ac 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

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

Common Name

cotton bollworm

Synonyms

Heliothis (Helicoverpa) armigera; Heliothis armigera; cotton bollworm; American bollworm; corn ear worm; scarce bordered straw; tobacco budworm; Helicoverpa armigera (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; Heliothinae; Helicoverpa

Parent

Helicoverpa () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7112)

NCBI Taxonomy ID

29058 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 29058)

is Taxon A an Infraspecies?

No

Taxon B

Latin Name

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

Common Name

cotton bollworm

Synonyms

Heliothis (Helicoverpa) armigera; Heliothis armigera; cotton bollworm; American bollworm; corn ear worm; scarce bordered straw; tobacco budworm; Helicoverpa armigera (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; Heliothinae; Helicoverpa

Parent

Helicoverpa () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7112)

NCBI Taxonomy ID

29058 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 29058)

is Taxon B an Infraspecies?

No

GENOTYPIC CHANGE

Generic Gene Name

ABCA2

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

-

UniProtKB Helicoverpa armigera

A0A0S0G7V0 (http://www.uniprot.org/uniprot/A0A0S0G7V0)

GenebankID or UniProtKB

()

GO - Cellular Component

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

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

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

Insertion Size

1-10 kb

Molecular Details of the Mutation

Insertion of a LTR retrotransposon

Experimental Evidence

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

Main Reference

Diverse cadherin mutations conferring resistance to Bacillus thuringiensis toxin Cry1Ac in Helicoverpa armigera. (2010) (https://pubmed.ncbi.nlm.nih.gov/20079435)

Authors

Zhao J; Jin L; Yang Y; Wu Y

Abstract

Transgenic cotton expressing Bacillus thuringiensis (Bt) toxins has been widely adopted to control some key lepidopteran pests including the bollworm Helicoverpa armigera. Evolution of resistance to Bt cotton by target pests is a major threat to the continued success of Bt cotton. Previous results revealed 3 null alleles (r1-r3) of a cadherin gene (Ha_BtR) conferring Cry1Ac resistance in H. armigera. An F(1) screen of 123 single-pair families was conducted between a Cry1Ac-resistant strain (the SCD-r1 strain, homozygous for the r1 allele of Ha_BtR) and field-derived insects from Jiangpu population (Jiangsu province, China) in 2008. Five new null alleles of Ha_BtR (r4-r8) were identified in six candidate single-pair families. These null alleles were created through either an insertion or a point mutation. Interestingly, intact alleles of Ha_BtR were found in two field-derived insects from another two candidate single-pair families. It suggests that these two field-derived insects may carry novel resistance alleles of Ha_BtR, with missense mutations resulting in a non-functional cadherin protein, or a major dominant mutation at a locus other than cadherin. The resistance allele frequency of Ha_BtR was detected at an appreciable level (0.024) in the Jiangpu population of H. armigera in 2008. Together with previous findings, a total of eight different resistance alleles of Ha_BtR were identified from three Chinese strains of H. armigera. Mutational diversity of Ha_BtR could impair DNA screening for Bt resistance allele frequency in the field, and an F(1) screen should be used routinely for monitoring cadherin-based resistance allele frequencies in H. armigera.

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Additional References

Identification and molecular detection of a deletion mutation responsible for a truncated cadherin of Helicoverpa armigera. (2006) (https://pubmed.ncbi.nlm.nih.gov/16935222)

RELATED GEPHE

Related Genes

6 (ABCA2, Aminopeptidase N (APN), cadherin, CYP337B3, para (kdr), tetraspanin) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^29058^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

7 (https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^Ha_BtR^/and+Taxon ID=^29058^/or+Gene Gephebase=^Ha_BtR^/and+Taxon ID=^29058^#gephebase-summary-title)

EXTERNAL LINKS

COMMENTS

@TE Parallelism: repeated loss-of-function