## GEPHE SUMMARY

Gephebase Gene

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

GepheID

GP00000160

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

Trait State in Taxon A

Helicoverpa armigera - Bt susceptible

Trait State in Taxon B

Helicoverpa armigera -Bt 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

BtR

Synonyms

-

String

-

Sequence Similarities

-

GO - Molecular Function

GO:0005509 : calcium ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005509)

GO - Biological Process

GO:0007156 : homophilic cell adhesion via plasma membrane adhesion molecules (https://www.ebi.ac.uk/QuickGO/term/GO:0007156)

GO - Cellular Component

UniProtKB Helicoverpa armigera

Q19KJ3 (http://www.uniprot.org/uniprot/Q19KJ3)

GenebankID or UniProtKB

DQ523166 (https://www.ncbi.nlm.nih.gov/nuccore/DQ523166)

GO:0016021 : integral component of membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0016021)
GO:0005886 : plasma membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0005886)

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

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

Molecular Details of the Mutation

premature stop codon in exon 4; truncated protein missing approximately two-thirds of the C terminus

Experimental Evidence

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

Main Reference

Disruption of a cadherin gene associated with resistance to Cry1Ac {delta}-endotoxin of Bacillus thuringiensis in Helicoverpa armigera. (2005) (https://pubmed.ncbi.nlm.nih.gov/15691952)

Authors

Xu X; Yu L; Wu Y

Abstract

A laboratory strain (GY) of Helicoverpa armigera (Hubner) was established from surviving larvae collected from transgenic cotton expressing a Bacillus thuringiensis var. kurstaki insecticidal protein (Bt cotton) in Gaoyang County, Hebei Province, People's Republic of China, in 2001. The GYBT strain was derived from the GY strain through 28 generations of selection with activated Cry1Ac delivered by diet surface contamination. When resistance to Cry1Ac in the GYBT strain increased to 564-fold after selection, we detected high levels of cross-resistance to Cry1Aa (103-fold) and Cry1Ab (>46-fold) in the GYBT strain with reference to those in the GY strain. The GYBT strain had a low level of cross-resistance to B. thuringiensis var. kurstaki formulation (Btk) (5-fold) and no cross-resistance to Cry2Aa (1.4-fold). Genetic analysis showed that Cry1Ac resistance in the GYBT strain was controlled by one autosomal and incompletely recessive gene. The cross-resistance pattern and inheritance mode suggest that the Cry1Ac resistance in the GYBT strain of H. armigera belongs to "mode 1," the most common type of lepidopteran resistance to B. thuringiensis toxins. A cadherin gene was cloned and sequenced from both the GY and GYBT strains. Disruption of the cadherin gene by a premature stop codon was associated with a high level of Cry1Ac resistance in H. armigera. Tight linkage between Cry1Ac resistance and the cadherin locus was observed in a backcross analysis. Together with previous evidence found with Heliothis virescens and Pectinophora gossypiella, our results confirmed that the cadherin gene is a preferred target for developing DNA-based monitoring of B. thuringiensis resistance in field populations of lepidopteran pests.

Additional References

## RELATED GEPHE

Related Genes

6 (ABCA2, Aminopeptidase N (APN), CYP337B3, Ha_BtR, 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

No matches found.

## EXTERNAL LINKS

## COMMENTS