

## GEPHE SUMMARY

	Gephebase Gene	GephelD
Ha_BtR ( <a href="https://www.gephebase.org/search-criteria?/and+Gene">https://www.gephebase.org/search-criteria?/and+Gene</a> Gephebase=^Ha_BtR^#gephebase-summary-title)	GP00000427	Main curator
Published	Entry Status	Martin

## PHENOTYPIC CHANGE

Trait Category		
Physiology ( <a href="https://www.gephebase.org/search-criteria?/and+Trait">https://www.gephebase.org/search-criteria?/and+Trait</a> Category=^Physiology^#gephebase-summary-title)		
Xenobiotic resistance (insecticide; Bt Cry1Ac toxin) ( <a href="https://www.gephebase.org/search-criteria?/and+Trait=Xenobiotic+resistance+(insecticide;+Bt+Cry1Ac+toxin)^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait=Xenobiotic+resistance+(insecticide;+Bt+Cry1Ac+toxin)^#gephebase-summary-title</a> )	Trait	
Helicoverpa armigera - Bt-Cry1Ac susceptible	Trait State in Taxon A	
Helicoverpa armigera - Bt-Cry1Ac resistant	Trait State in Taxon B	
Taxon A	Ancestral State	
Taxonomic Status		
Intraspecific ( <a href="https://www.gephebase.org/search-criteria?/and+Taxonomic">https://www.gephebase.org/search-criteria?/and+Taxonomic</a> Status=^Intraspecific^#gephebase-summary-title)		
Taxon A		Taxon B
Latin Name		Latin Name
Helicoverpa armigera ( <a href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Helicoverpa+armigera^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Helicoverpa+armigera^#gephebase-summary-title</a> )		Helicoverpa armigera ( <a href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Helicoverpa+armigera^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Helicoverpa+armigera^#gephebase-summary-title</a> )
Common Name		Common Name
cotton bollworm		cotton bollworm
Synonyms		Synonyms
Heliothis (Helicoverpa) armigera; Heliothis armigera; cotton bollworm; American bollworm; corn ear worm; scarce bordered straw; tobacco budworm; Helicoverpa armigera (Hubner, 1808)		Heliothis (Helicoverpa) armigera; Heliothis armigera; cotton bollworm; American bollworm; corn ear worm; scarce bordered straw; tobacco budworm; Helicoverpa armigera (Hubner, 1808)
Rank		Rank
species		species
Lineage		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		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		Parent
Helicoverpa () - (Rank: genus) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7112">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7112</a> )		Helicoverpa () - (Rank: genus) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7112">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7112</a> )
NCBI Taxonomy ID		NCBI Taxonomy ID
29058 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 29058">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 29058</a> )		29058 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 29058">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 29058</a> )
is Taxon A an Infraspecies?		is Taxon B an Infraspecies?
No		No

## GENOTYPIC CHANGE

ABCA2	Generic Gene Name	UniProtKB Helicoverpa armigera
-	Synonyms	AoA0S0G7V0 ( <a href="http://www.uniprot.org/uniprot/AoA0S0G7V0">http://www.uniprot.org/uniprot/AoA0S0G7V0</a> )
-	String	GenebankID or UniProtKB
-	Sequence Similarities	0
-	GO - Molecular Function	
GO:0005524 : ATP binding ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0005524">https://www.ebi.ac.uk/QuickGO/term/GO:0005524</a> )		
GO:0042626 : ATPase activity, coupled to transmembrane movement of substances ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0042626">https://www.ebi.ac.uk/QuickGO/term/GO:0042626</a> )		
-	GO - Biological Process	
-		

## 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

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

Deletion Size

10-100 kb

Molecular Details of the Mutation

10kb deletion

Experimental Evidence

Candidate Gene (<https://www.gephebase.org/search-criteria?/and+Experimental+Evidence=%Candidate+Gene%#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

Diverse cadherin mutations conferring resistance to *Bacillus thuringiensis* toxin Cry1Ac in *Helicoverpa armigera*. (2010) (<https://pubmed.ncbi.nlm.nih.gov/20079435>)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%29+and+Trait=Xenobiotic+resistance/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

7 ([https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=%Ha\\_BtR%29+and+Taxon+ID=%29058%29/or+Gene+Gephebase=%Ha\\_BtR%29+and+Taxon+ID=%29058%29#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=%Ha_BtR%29+and+Taxon+ID=%29058%29/or+Gene+Gephebase=%Ha_BtR%29+and+Taxon+ID=%29058%29#gephebase-summary-title))

## EXTERNAL LINKS

## COMMENTS

Parallelism: repeated loss-of-function