

GEPHE SUMMARY

	Gephebase Gene	GephelD
cadherin (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=cadherin^#gephebase-summary-title)	GP00002055	Main curator
	Entry Status	Courtier
Published		

PHENOTYPIC CHANGE

	Trait Category
Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category=Physiology^#gephebase-summary-title)	
Xenobiotic resistance (insecticide; Bt Cry1Ac) (https://www.gephebase.org/search-criteria?/and+Trait=Xenobiotic+resistance+(insecticide;+Bt+Cry1Ac)^#gephebase-summary-title)	Trait
Helicoverpa punctigera - Bt susceptible	Trait State in Taxon A
Helicoverpa punctigera - Bt resistant	Trait State in Taxon B
Taxon A	Ancestral State
Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=Intraspecific^#gephebase-summary-title)	Taxonomic Status

Taxon A		Taxon B	
	Latin Name		Latin Name
Helicoverpa punctigera (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Helicoverpa+punctigera^#gephebase-summary-title)		Helicoverpa punctigera (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Helicoverpa+punctigera^#gephebase-summary-title)	
-	Common Name	-	Common Name
-	Synonyms	-	Synonyms
-	Rank	-	Rank
species	Lineage	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		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	
Helicoverpa () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7112)	Parent	Helicoverpa () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7112)	Parent
27545 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=27545)	NCBI Taxonomy ID	27545 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=27545)	NCBI Taxonomy ID
No	is Taxon A an Infraspecies?	No	is Taxon B an Infraspecies?

GENOTYPIC CHANGE

	Generic Gene Name	UniProtKB Helicoverpa armigera
BtR	Synonyms	GenebankID or UniProtKB
-	0	
-	String	
-	Sequence Similarities	
GO:0005509 : calcium ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005509)	GO - Molecular Function	
GO:0007156 : homophilic cell adhesion via plasma membrane adhesion molecules (https://www.ebi.ac.uk/QuickGO/term/GO:0007156)	GO - Biological Process	
GO:0016021 : integral component of membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0016021)	GO - Cellular Component	

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

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

SNP Coding Change

-

Molecular Details of the Mutation

splice site GT mutated in GA so that splicing does not occur correctly and a 58bp insertion is found in the cDNA sequence of the cadherin gene. This insertion disrupts the coding sequence in cadherin domain 9 causing a downstream frameshift and a premature stop codon for the rest of the protein. This would result in a truncated protein of 1243 amino acids without the putative binding domain; the membrane anchoring domain; presumably retained inside the cell and not exposed to the Cry1Ac; or alternatively; exported into the gut where it would be degraded

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	-	-	-

Main Reference

Isolating, characterising and identifying a Cry1Ac resistance mutation in field populations of *Helicoverpa punctigera*. (2018) (<https://pubmed.ncbi.nlm.nih.gov/29422629>)

Authors

Walsh T; James B; Chakroun M; Ferré J; Downes S

Abstract

Transgenic cotton expressing insecticidal proteins from *Bacillus thuringiensis* (Bt) has been grown in Australia for over 20 years and resistance remains the biggest threat. The native moth, *Helicoverpa punctigera* is a significant pest of cotton. A genotype causing resistance to Cry1Ac in *H. punctigera* was isolated from the field and a homozygous line established. The phenotype is recessive and homozygous individuals possess 113 fold resistance to Cry1Ac. Individuals that carry Cry1Ac resistance genes are rare in Australia with a frequency of 0.033 being detected in field populations. RNAseq, RT-PCR and DNA sequencing reveals a single nucleotide polymorphism at a splice site in the cadherin gene as the causal mutation, resulting in the partial transcription of the intron and a premature stop codon. Analysis of Cry1Ac binding to *H. punctigera* brush border membrane vesicles showed that it is unaffected by the disrupted cadherin gene. This suggests that the major Cry1Ac target is not cadherin but that this molecule plays a key role in resistance and therefore the mode of action. This work adds to our knowledge of resistance mechanisms in *H. punctigera* and the growing literature around the role of cadherin in the mode of action of Cry1 type Bt proteins.

Additional References

RELATED GEPHE

Related Genes

1 (ABCA2) (<https://www.gephebase.org/search-criteria?/or+Taxon+ID=%27545%27/and+Trait=Xenobiotic+resistance/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

@Splicing @CodingInNonCodingRegion