

GEPHE SUMMARY

Gephebase Gene
cadherin

Entry Status
Published

GepheID
GP00002055

Main curator
Courtier

PHENOTYPIC CHANGE

Trait Category
Physiology

Trait
Xenobiotic resistance (insecticide; Bt Cry1Ac)

Trait State in Taxon A
Helicoverpa punctigera - Bt susceptible

Trait State in Taxon B
Helicoverpa punctigera -Bt resistant

Ancestral State
Taxon A

Taxonomic Status
Intraspecific

Taxon A

Latin Name
Helicoverpa punctigera

Common Name
-

Synonyms
-

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Amphimesnoptera; Lepidoptera; Glossata; Neolepidoptera; Heteroneura; Ditrysia; Obtectomera; Noctuoidea; Noctuidae; Heliothinae; Helicoverpa

Parent
Helicoverpa () - (Rank: genus)

NCBI Taxonomy ID
27545

is Taxon A an Intraspecies?
No

Taxon B

Latin Name
Helicoverpa punctigera

Common Name
-

Synonyms
-

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Amphimesnoptera; Lepidoptera; Glossata; Neolepidoptera; Heteroneura; Ditrysia; Obtectomera; Noctuoidea; Noctuidae; Heliothinae; Helicoverpa

Parent
Helicoverpa () - (Rank: genus)

NCBI Taxonomy ID
27545

is Taxon B an Intraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
BtR

Synonyms
-

String
-

Sequence Similarities
-

GO - Molecular Function
GO:0005509 : calcium ion binding

GO - Biological Process
GO:0007156 : homophilic cell adhesion via plasma membrane adhesion molecules

GO - Cellular Component
GO:0016021 : integral component of membrane
GO:0005886 : plasma membrane

Presumptive Null
Yes

UniProtKB *Helicoverpa armigera*
Q19KJ3

GenebankID or UniProtKB

Molecular Type

Coding

Aberration Type

SNP

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

	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)

Authors

Walsh T; James B; Chakroun M; FerrÃ© 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)

Related Haplotypes

No matches found.

COMMENTS

@Splicing @CodingInNonCodingRegion