GEPHE SUMMARY

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

GepheID
GP00002055

Entry Status
Published

Main curator
Courtier

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 punctigera - Bt susceptible

Trait State in Taxon B
Helicoverpa punctigera -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 punctigera (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Helicoverpa punctigera^#gephebase-summary-title)

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; 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
27545 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 27545)

is Taxon A an Infraspecies?
No

Taxon B

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

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; 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
27545 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 27545)

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

UniProtKB Helicoverpa armigera
Q19KJ3 (http://www.uniprot.org/uniprot/Q19KJ3)

GenebankID or UniProtKB
()

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 58â€‰bp 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; 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) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^27545^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

@Splicing @CodingInNonCodingRegion