GEPHE SUMMARY

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

GepheID
GP00002464

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

Trait State in Taxon A
Ostrinia furnacalis - Bt-Cry1Ac susceptible

Trait State in Taxon B
Ostrinia furnacalis - Bt-Cry1Ac resistant lab selected strain

Ancestral State
Taxon A

Taxonomic Status
Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Intraspecific^#gephebase-summary-title)

Taxon A

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

Common Name
Asian corn borer

Synonyms
Asian corn borer; Ostrinia furnacalis (Guenee, 1854); Ostrinia furnicalis

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; Pyraloidea; Crambidae; Pyraustinae; Ostrinia

Parent
Ostrinia () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 29056)

NCBI Taxonomy ID
93504 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 93504)

is Taxon A an Infraspecies?
No

Taxon B

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

Common Name
Asian corn borer

Synonyms
Asian corn borer; Ostrinia furnacalis (Guenee, 1854); Ostrinia furnicalis

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; Pyraloidea; Crambidae; Pyraustinae; Ostrinia

Parent
Ostrinia () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 29056)

NCBI Taxonomy ID
93504 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 93504)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
-

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 zea
A0A1B0RHM4 (http://www.uniprot.org/uniprot/A0A1B0RHM4)

GenebankID or UniProtKB
()

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

Presumptive Null

Unknown (https://www.gephebase.org/search-criteria?/and+Presumptive Null=^Unknown^#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

10-99 bp

Molecular Details of the Mutation

MPR-r2 has a 26-amino acid residue deletion in the TBR which results in reduced binding of Cry1Ac compared to the MPR from the susceptible strain.

Experimental Evidence

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

Main Reference

Downregulation and mutation of a Cadherin gene associated with Cry1Ac resistance in the Asian Corn Borer, Ostrinia furnacalis (GuenÃ©e). (2014) (https://pubmed.ncbi.nlm.nih.gov/25216082)

Authors

Jin T; Chang X; Gatehouse AM; Wang Z; Edwards MG; He K

Abstract

Development of resistance in target pests is a major threat to long-term use of transgenic crops expressing Bacillus thuringiensis (Bt) Cry toxins. To manage and/or delay the evolution of resistance in target insects through the implementation of effective strategies, it is essential to understand the basis of resistance. One of the most important mechanisms of insect resistance to Bt crops is the alteration of the interactions between Cry toxins and their receptors in the midgut. A Cry1Ac-selected strain of Asian corn borer (ACB), Ostrinia furnacalis, a key pest of maize in China, evolved three mutant alleles of a cadherin-like protein (OfCAD) (MPR-r1, MPR-r2 and MPR-r3), which mapped within the toxin-binding region (TBR). Each of the three mutant alleles possessed two or three amino acid substitutions in this region, especially Thr1457â†'Ser. In highly resistant larvae (ACB-Ac200), MPR-r2 had a 26-amino acid residue deletion in the TBR, which resulted in reduced binding of Cry1Ac compared to the MPR from the susceptible strain, suggesting that the number of amino acid deletions influences the level of resistance. Furthermore, downregulation of OfCAD gene (ofcad) transcription was observed in the Cry1Ac resistant strain, ACB-Ac24, suggesting that Cry1Ac resistance in ACB is associated with the downregulation of the transcript levels of the cadherin-like protein gene. The OfCAD identified from ACB exhibited a high degree of similarity to other members of the cadherin super-family in lepidopteran species.

Additional References

Mechanisms of Resistance to Insecticidal Proteins from Bacillus thuringiensis. (2021) (https://pubmed.ncbi.nlm.nih.gov/33417820)

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

1 (https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^cadherin^/and+Taxon ID=^93504^/or+Gene Gephebase=^cadherin^/and+Taxon ID=^93504^#gephebase-summary-title)

EXTERNAL LINKS

COMMENTS