

ABCC2 (https://www.gephebase.org/search-criteria?/and+GeneGephebase=~ABCC2~#gephebase-summary-title)	Gephebase Gene	GP00000012	GepheID
Published	Entry Status	Martin	Main curator

Trait Category		Trait		Trait State in Taxon A		Trait State in Taxon B		Ancestral State		Taxonomic Status	
Physiology (https://www.gephebase.org/search-criteria?/and+TraitCategory=~Physiology^#gephebase-summary-title)		Xenobiotic resistance (insecticide) (https://www.gephebase.org/search-criteria?/and+Trait=~Xenobiotic+resistance+(insecticide)^#gephebase-summary-title)		Heliothis virescens - Bt susceptible		Heliothis virescens - Bt resistant		Taxon A		Intraspecific (https://www.gephebase.org/search-criteria?/and+TaxonomicStatus=~Intraspecific^#gephebase-summary-title)	
Taxon A		Taxon B		Taxon A		Taxon B		Taxon A		Taxon B	
Heliothis virescens		Heliothis virescens		Heliothis virescens		Heliothis virescens		Heliothis virescens		Heliothis virescens	
(https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=~Heliothis+virescens^#gephebase-summary-title)		(https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=~Heliothis+virescens^#gephebase-summary-title)		(https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=~Heliothis+virescens^#gephebase-summary-title)		(https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=~Heliothis+virescens^#gephebase-summary-title)		(https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=~Heliothis+virescens^#gephebase-summary-title)		(https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=~Heliothis+virescens^#gephebase-summary-title)	
tobacco budworm		tobacco budworm		tobacco budworm		tobacco budworm		tobacco budworm		tobacco budworm	
tobacco budworm; Chloridea virescens; Helicoverpa virescens; Heliothis virescens (Fabricius, 1777)		tobacco budworm; Chloridea virescens; Helicoverpa virescens; Heliothis virescens (Fabricius, 1777)		tobacco budworm; Chloridea virescens; Helicoverpa virescens; Heliothis virescens (Fabricius, 1777)		tobacco budworm; Chloridea virescens; Helicoverpa virescens; Heliothis virescens (Fabricius, 1777)		tobacco budworm; Chloridea virescens; Helicoverpa virescens; Heliothis virescens (Fabricius, 1777)		tobacco budworm; Chloridea virescens; Helicoverpa virescens; Heliothis virescens (Fabricius, 1777)	
species		species		species		species		species		species	
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; Heliothis		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; Heliothis		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; Heliothis		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; Heliothis		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; Heliothis		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; Heliothis	
Heliothis () - (Rank: genus)		Heliothis () - (Rank: genus)		Heliothis () - (Rank: genus)		Heliothis () - (Rank: genus)		Heliothis () - (Rank: genus)		Heliothis () - (Rank: genus)	
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7101)		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7101)		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7101)		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7101)		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7101)		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7101)	
7102		7102		7102		7102		7102		7102	
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7102)		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7102)		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7102)		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7102)		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7102)		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7102)	
is Taxon A an Intraspecies?		is Taxon B an Intraspecies?		is Taxon A an Intraspecies?		is Taxon B an Intraspecies?		is Taxon A an Intraspecies?		is Taxon B an Intraspecies?	
No		No		No		No		No		No	

ABCC2	Generic Gene Name	UniProtKB Plutella xylostella
-	Synonyms	A0A0E3ZDK3 (http://www.uniprot.org/uniprot/A0A0E3ZDK3)
-	String	ADH16740 (https://www.ncbi.nlm.nih.gov/nuccore/ADH16740)
-	Sequence Similarities	
-	GO - Molecular Function	
GO:0005524 : ATP binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005524)		
GO:0042626 : ATPase activity, coupled to transmembrane movement of substances (https://www.ebi.ac.uk/QuickGO/term/GO:0042626)		
-	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
10-99 bp	Molecular Details of the Mutation
22bp deletion	Experimental Evidence
Linkage Mapping (https://www.gephebase.org/search-criteria?/and+Experimental Evidence=~Linkage Mapping~#gephebase-summary-title)	Main Reference
An ABC transporter mutation is correlated with insect resistance to <i>Bacillus thuringiensis</i> Cry1Ac toxin. (2010) (https://pubmed.ncbi.nlm.nih.gov/21187898)	Authors
Gahan LJ; Pauchet Y; Vogel H; Heckel DG	Abstract

Transgenic crops producing insecticidal toxins from *Bacillus thuringiensis* (Bt) are commercially successful in reducing pest damage, yet knowledge of resistance mechanisms that threaten their sustainability is incomplete. Insect resistance to the pore-forming Cry1Ac toxin is correlated with the loss of high-affinity, irreversible binding to the mid-gut membrane, but the genetic factors responsible for this change have been elusive. Mutations in a 12-cadherin-domain protein confer some Cry1Ac resistance but do not block this toxin binding in in vitro assays. We sought to identify mutations in other genes that might be responsible for the loss of binding. We employed a map-based cloning approach using a series of backcrosses with 1,060 progeny to identify a resistance gene in the cotton pest *Heliothis virescens* that segregated independently from the cadherin mutation. We found an inactivating mutation of the ABC transporter ABCC2 that is genetically linked to Cry1Ac resistance and is correlated with loss of Cry1Ac binding to membrane vesicles. ABC proteins are integral membrane proteins with many functions, including export of toxic molecules from the cell, but have not been implicated in the mode of action of Bt toxins before. The reduction in toxin binding due to the inactivating mutation suggests that ABCC2 is involved in membrane integration of the toxin pore. Our findings suggest that ABC proteins may play a key role in the mode of action of Bt toxins and that ABC protein mutations can confer high levels of resistance that could threaten the continued utilization of Bt-expressing crops. However, such mutations may impose a physiological cost on resistant insects, by reducing export of other toxins such as plant secondary compounds from the cell. This weakness could be exploited to manage this mechanism of Bt resistance in the field.

Additional References

RELATED GEPHE

2 (cadherin, para (kdr)) (https://www.gephebase.org/search-criteria?/or+Taxon ID=~7102~/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title)	Related Genes
No matches found.	Related Haplotypes

EXTERNAL LINKS

COMMENTS