

GEPHE SUMMARY

	Gephebase Gene	GephelD
ABCC2 (#gephebase-summary-title)	GP00002461	Main curator
Published	Entry Status	Courtier

PHENOTYPIC CHANGE

Trait Category		Trait	Taxon A	Taxon B
Taxonomic Status		Ancestral State	Latin Name	
Physiology (#gephebase-summary-title)			Spodoptera frugiperda	Spodoptera frugiperda
Xenobiotic resistance (insecticide; Bt toxins) (<a and+taxon+and+synonyms='^Spodoptera+frugiperda"' href="https://www.gephebase.org/search-criteria?/and+Trait=^Xenobiotic+resistance+(insecticide;+Bt+toxins)#gephebase-summary-title)</td><td></td><td></td><td>(#gephebase-summary-title)	(#gephebase-summary-title)			
Spodoptera frugiperda - susceptible		Trait State in Taxon A	fall armyworm	fall armyworm
Spodoptera frugiperda - individuals from Puerto Rico resistant to transgenic maize expressing the Cry1Fa toxin		Trait State in Taxon B	fall armyworm; Spodoptera frugiperda (Smith, 1797)	fall armyworm; Spodoptera frugiperda (Smith, 1797)
Taxon A		Ancestral State	species	species
Intraspecific (#gephebase-summary-title)			cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Endopterygota; Amphiesmenoptera; Lepidoptera; Glossata; Neolepidoptera; Heteroneura; Ditrysia; Obtectomera; Noctuoidea; Noctuidae; Amphipyriinae; Spodoptera	cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Endopterygota; Amphiesmenoptera; Lepidoptera; Glossata; Neolepidoptera; Heteroneura; Ditrysia; Obtectomera; Noctuoidea; Noctuidae; Amphipyriinae; Spodoptera
			Parent	Parent
Spodoptera () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7106)			Spodoptera () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7106)	
7108 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7108)		NCBI Taxonomy ID	7108 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7108)	NCBI Taxonomy ID
No			is Taxon A an Infraspecies?	is Taxon B an Infraspecies?
			No	

GENOTYPIC CHANGE

MRP1	Generic Gene Name	UniProtKB Drosophila melanogaster
-	Synonyms	GenebankID or UniProtKB
-	String	
-	Sequence Similarities	
-	GO - Molecular Function	
GO:0005524 : ATP binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005524)		
GO:0008514 : organic anion transmembrane transporter activity (https://www.ebi.ac.uk/QuickGO/term/GO:0008514)		
GO:0140359 : ABC-type transporter activity (https://www.ebi.ac.uk/QuickGO/term/GO:0140359)		
	GO - Biological Process	

GO - Cellular Component

GO:0005887 : integral component of plasma membrane
(<https://www.ebi.ac.uk/QuickGO/term/GO:0005887>)

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

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

Molecular Details of the Mutation

A nine-base deletion (position 39–47) and a two-base insertion (GC at position 2218) lead to a frameshift and the occurrence of a premature stop codon. The truncated protein is 746 amino acids whereas the ABCC2 of the susceptible strain encodes a protein of 1349 amino acids.

Experimental Evidence

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

Main Reference

Mechanism and DNA-based detection of field-evolved resistance to transgenic Bt corn in fall armyworm (*Spodoptera frugiperda*). (2017) (<https://pubmed.ncbi.nlm.nih.gov/28883440>)

Authors

Banerjee R; Hasler J; Meagher R; Nagoshi R; Hietala L; Huang F; Narva K; Jurat-Fuentes JL

Abstract

Evolution of resistance threatens sustainability of transgenic crops producing insecticidal proteins from the bacterium *Bacillus thuringiensis* (Bt). The fall armyworm (*Spodoptera frugiperda*) is a devastating pest of corn in the Western Hemisphere initially controlled by transgenic Bt corn producing the Cry1Fa insecticidal protein (event TC1507). However field-evolved resistance to TC1507 was observed in Puerto Rico in 2007 and has subsequently been reported in a number of locations in North and South America. Early studies on Puerto Rico fall armyworm populations found that the resistance phenotype was associated with reduced expression of alkaline phosphatase. However, in this work we show that field-evolved resistance to Cry1Fa Bt corn in Puerto Rico is closely linked to a mutation in an ATP Binding Cassette subfamily C2 (ABCC2) gene that functions as a Cry1Fa receptor in susceptible insects. Furthermore, we report a DNA-based genotyping test used to demonstrate the presence of the resistant (SfABCC2mut) allele in Puerto Rico populations in 2007, coincident with the first reports of damage to TC1507 corn. These DNA-based field screening data provide strong evidence that resistance to TC1507 in fall armyworm maps to the SfABCC2 gene and provides a useful molecular marker for detecting the SfABCC2mut allele in resistant fall armyworm.

Additional References

Mutational disruption of the ABCC2 gene in fall armyworm, *Spodoptera frugiperda*, confers resistance to the Cry1Fa and Cry1A.105 insecticidal proteins. (2018)
(<https://pubmed.ncbi.nlm.nih.gov/29740041>)

RELATED GEPHE

Related Genes

2 (CYP9A, GSTe) (<https://www.gephebase.org/search-criteria?/or+Taxon+ID=%7108%/and+Trait=Xenobiotic+resistance/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

1 (<https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=%ABCC2%/and+Taxon+ID=%7108%/or+Gene+Gephebase=%ABCC2%/and+Taxon+ID=%7108%#gephebase-summary-title>)

EXTERNAL LINKS

COMMENTS