

GEPHE SUMMARY

CYP9A ( <a href="https://www.gephebase.org/search-criteria?/and+GeneGephebase=CYP9A#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+GeneGephebase=CYP9A#gephebase-summary-title</a> )	Gephebase Gene	GP00002476	GepheID
Published	Entry Status	Courtier	Main curator

PHENOTYPIC CHANGE

Physiology ( <a href="https://www.gephebase.org/search-criteria?/and+TraitCategory=Physiology#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+TraitCategory=Physiology#gephebase-summary-title</a> )	Trait Category		
Xenobiotic resistance (insecticide; deltamethrin) ( <a href="https://www.gephebase.org/search-criteria?/and+Trait=Xenobiotic+resistance+(insecticide;+deltamethrin)#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait=Xenobiotic+resistance+(insecticide;+deltamethrin)#gephebase-summary-title</a> )	Trait		
Spodoptera frugiperda - sensitive	Trait State in Taxon A		
Spodoptera frugiperda - resistant	Trait State in Taxon B		
Data not curated	Ancestral State		
Intraspecific ( <a href="https://www.gephebase.org/search-criteria?/and+TaxonomicStatus=Intraspecific#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+TaxonomicStatus=Intraspecific#gephebase-summary-title</a> )	Taxonomic Status		
	Taxon A	Taxon B	
Spodoptera frugiperda ( <a href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Spodoptera+frugiperda#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Spodoptera+frugiperda#gephebase-summary-title</a> )	Latin Name	Spodoptera frugiperda ( <a href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Spodoptera+frugiperda#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Spodoptera+frugiperda#gephebase-summary-title</a> )	Latin Name
fall armyworm	Common Name	fall armyworm	Common Name
fall armyworm; Spodoptera frugiperda (Smith, 1797)	Synonyms	fall armyworm; Spodoptera frugiperda (Smith, 1797)	Synonyms
species	Rank	species	Rank
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Endopterygota; Amphiesmenoptera; Lepidoptera; Glossata; Neolepidoptera; Heteroneura; Dityrsia; Obtectomera; Noctuoidea; Noctuidae; Amphipyridae; Spodoptera	Lineage	cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Endopterygota; Amphiesmenoptera; Lepidoptera; Glossata; Neolepidoptera; Heteroneura; Dityrsia; Obtectomera; Noctuoidea; Noctuidae; Amphipyridae; Spodoptera	Lineage
Spodoptera () - (Rank: genus) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7106">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7106</a> )	Parent	Spodoptera () - (Rank: genus) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7106">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7106</a> )	Parent
7108 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7108">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7108</a> )	NCBI Taxonomy ID	7108 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7108">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7108</a> )	NCBI Taxonomy ID
No	is Taxon A an Intraspecies?	No	is Taxon B an Intraspecies?

GENOTYPIC CHANGE

-	Generic Gene Name	0	UniProtKB
-	Synonyms	0	GenebankID or UniProtKB
-	String		
-	Sequence Similarities		
-	GO - Molecular Function		
-	GO - Biological Process		
-	GO - Cellular Component		
No	( <a href="https://www.gephebase.org/search-criteria?/and+Presumptive+Null=No#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Presumptive+Null=No#gephebase-summary-title</a> )		Presumptive Null

Gene Amplification (<https://www.gephebase.org/search-criteria?/and+Molecular+Type=%5E+Gene+Amplification%5E#gephebase-summary-title>)

Molecular Type

Insertion (<https://www.gephebase.org/search-criteria?/and+Aberration+Type=%5E+Insertion%5E#gephebase-summary-title>)

Aberration Type

unknown

Insertion Size

In sensitive alleles the gene cluster is composed of 12 CYP9A genes and two alcohol dehydrogenase genes. All 30 resistant alleles have two copies of this unit while 28 and 6 alleles of the sensitive individuals had one and two copies, respectively.

Molecular Details of the Mutation

Association Mapping (<https://www.gephebase.org/search-criteria?/and+Experimental+Evidence=%5E+Association+Mapping%5E#gephebase-summary-title>)

Experimental Evidence

Adaptation by copy number variation increases insecticide resistance in the fall armyworm. (2020) (<https://pubmed.ncbi.nlm.nih.gov/33184418>)

Main Reference

Gimenez S; Abdelgaffar H; Goff GL; Hilliou F; Blanco CA; Hänniger S; Bretaudeau A; Legeai F; Nagre N; Jurat-Fuentes JL; d'Alençon E; Nam K

Authors

Understanding the genetic basis of insecticide resistance is a key topic in agricultural ecology. The adaptive evolution of multi-copy detoxification genes has been interpreted as a cause of insecticide resistance, yet the same pattern can also be generated by the adaptation to host-plant defense toxins. In this study, we tested in the fall armyworm, *Spodoptera frugiperda* (Lepidoptera: Noctuidae), if adaptation by copy number variation caused insecticide resistance in two geographically distinct populations with different levels of resistance and the two host-plant strains. We observed a significant allelic differentiation of genomic copy number variations between the two geographic populations, but not between host-plant strains. A locus with positively selected copy number variation included a CYP gene cluster. Toxicological tests supported a central role for CYP enzymes in deltamethrin resistance. Our results indicate that copy number variation of detoxification genes might be responsible for insecticide resistance in fall armyworm and that evolutionary forces causing insecticide resistance could be independent of host-plant adaptation.

Abstract

Additional References

## RELATED GEPHE

2 (ABCC2, GSTe) (<https://www.gephebase.org/search-criteria?/or+Taxon+ID=%5E7108%5E/and+Trait=Xenobiotic+resistance/and+groupHaplotypes=true#gephebase-summary-title>)

Related Genes

No matches found.

Related Haplotypes

## EXTERNAL LINKS

## COMMENTS