

GEPHE SUMMARY

CYP321A8 (https://www.gephebase.org/search-criteria/?and+Gene Gephebase=%CYP321A8%#gephebase-summary-title)	Gephebase Gene	GP00002394	GepheID
	Entry Status	Courtier	Main curator
Published			

PHENOTYPIC CHANGE

Trait Category			
Physiology (https://www.gephebase.org/search-criteria/?and+Trait+Category=%Physiology%#gephebase-summary-title)	Trait		
Xenobiotic resistance (organophosphate; chlorpyrifos; pyrethroid; cypermethrin; deltamethrin) (https://www.gephebase.org/search-criteria/?and+Trait=%Xenobiotic+resistance+organophosphate;+chlorpyrifos;+pyrethroid;+cypermethrin;+deltamethrin%#gephebase-summary-title)			
sensitive	Trait State in Taxon A		
resistant	Trait State in Taxon B		
Taxon A	Ancestral State		
Taxonomic Status			
Intraspecific (https://www.gephebase.org/search-criteria/?and+Taxonomic+Status=%Intraspecific%#gephebase-summary-title)			
Taxon A		Taxon B	
Spodoptera exigua (https://www.gephebase.org/search-criteria/?and+Taxon+and+Synonyms=%Spodoptera+exigua%#gephebase-summary-title)	Latin Name	Spodoptera exigua (https://www.gephebase.org/search-criteria/?and+Taxon+and+Synonyms=%Spodoptera+exigua%#gephebase-summary-title)	Latin Name
beet armyworm	Common Name	beet armyworm	Common Name
beet armyworm; pigweed caterpillar; small mottled willow caterpillar; Spodoptera exigua (Hubner, 1808)	Synonyms	beet armyworm; pigweed caterpillar; small mottled willow caterpillar; Spodoptera exigua (Hubner, 1808)	Synonyms
species	Rank	species	Rank
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; Amphipyriinae; Spodoptera	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; Amphipyriinae; Spodoptera	Lineage
Spodoptera () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7106)	Parent	Spodoptera () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7106)	Parent
7107 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7107)	NCBI Taxonomy ID	7107 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7107)	NCBI Taxonomy ID
No	is Taxon A an Infraspecies?	No	is Taxon B an Infraspecies?

GENOTYPIC CHANGE

CYP321A8	Generic Gene Name	UniProtKB Spodoptera exigua A0A286QUG5 (http://www.uniprot.org/uniprot/A0A286QUG5)
-	Synonyms	GenebankID or UniProtKB Spodoptera exigua
-	String	A0A286QUG5 (https://www.ncbi.nlm.nih.gov/nuccore/A0A286QUG5)
Belongs to the cytochrome P450 family.	Sequence Similarities	
	GO - Molecular Function	
GO:0020037 : heme binding (https://www.ebi.ac.uk/QuickGO/term/GO:0020037)		
GO:0005506 : iron ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005506)		
GO:0004497 : monooxygenase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004497)		
GO:0016705 : oxidoreductase activity, acting on paired donors, with incorporation or		

- GO - Cellular Component

	Presumptive Null
No (https://www.gephebase.org/search-criteria?/and+Presumptive+Null=%No%#gephebase-summary-title)	Molecular Type
Cis-regulatory (https://www.gephebase.org/search-criteria?/and+Molecular+Type=%Cis-regulatory%#gephebase-summary-title)	Aberration Type
SNP (https://www.gephebase.org/search-criteria?/and+Aberration+Type=%SNP%#gephebase-summary-title)	Molecular Details of the Mutation
A > G at position -197bp in a cis-regulatory region, leading to increased expression of the gene	Experimental Evidence
Candidate Gene (https://www.gephebase.org/search-criteria?/and+Experimental+Evidence=%Candidate+Gene%#gephebase-summary-title)	Main Reference
Changes in both trans- and cis-regulatory elements mediate insecticide resistance in a lepidopteron pest, <i>Spodoptera exigua</i> . (2021) (https://pubmed.ncbi.nlm.nih.gov/33690635)	Authors
Hu B; Huang H; Hu S; Ren M; Wei Q; Tian X; Esmail Abdalla Elzaki M; Bass C; Su J; Reddy Palli S	Abstract
The evolution of insect resistance to insecticides is frequently associated with overexpression of one or more cytochrome P450 enzyme genes. Although overexpression of CYP450 genes is a well-known mechanism of insecticide resistance, the underlying regulatory mechanisms are poorly understood. Here we uncovered the mechanisms of overexpression of the P450 gene, CYP321A8 in a major pest insect, <i>Spodoptera exigua</i> that is resistant to multiple insecticides. CYP321A8 confers resistance to organophosphate (chlorpyrifos) and pyrethroid (cypermethrin and deltamethrin) insecticides in this insect. Constitutive upregulation of transcription factors CncC/Maf are partially responsible for upregulated expression of CYP321A8 in the resistant strain. Reporter gene assays and site-directed mutagenesis analyses demonstrated that CncC/Maf enhanced the expression of CYP321A8 by binding to specific sites in the promoter. Additional cis-regulatory elements resulting from a mutation in the CYP321A8 promoter in the resistant strain facilitates the binding of the orphan nuclear receptor, Knirps, and enhances the promoter activity. These results demonstrate that two independent mechanisms; overexpression of transcription factors and mutations in the promoter region resulting in a new cis-regulatory element that facilitates binding of the orphan nuclear receptor are involved in overexpression of CYP321A8 in insecticide-resistant <i>S. exigua</i> .	Additional References

RELATED GEPHE

	Related Genes
4 (ABCC2, CYP9A186, GSTe, RYR) (https://www.gephebase.org/search-criteria?/or+Taxon+ID=%7107%/and+Trait=Xenobiotic+resistance/and+groupHaplotypes=true#gephebase-summary-title)	Related Haplotypes
No matches found.	

EXTERNAL LINKS

COMMENTS