

FMO2 (https://www.gephebase.org/search-criteria?/and+GeneGephebase=^FMO2^#gephebase-summary-title)	Gephebase Gene	GP00002065	GepheID
Published	Entry Status	Cao	Main curator

	Trait Category
Physiology (https://www.gephebase.org/search-criteria?/and+Trait+Category=^Physiology^#gephebase-summary-title)	
	Trait
Xenobiotic resistance (insecticide) (https://www.gephebase.org/search-criteria?/and+Trait=^Xenobiotic resistance (insecticide)^#gephebase-summary-title)	
	Trait State in Taxon A
Plutella xylostella -diamide (chlorantraniliprole) susceptible	
	Trait State in Taxon B
Plutella xylostella - diamide (chlorantraniliprole) resistant	
	Ancestral State
Taxon A	
	Taxonomic Status
Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=^Intraspecific^#gephebase-summary-title)	

GENOTYPIC CHANGE

GO - Biological Process

GO:0017144 : drug metabolic process (<https://www.ebi.ac.uk/QuickGO/term/GO:0017144>)
GO:0006805 : xenobiotic metabolic process (<https://www.ebi.ac.uk/QuickGO/term/GO:0006805>)
GO:0006082 : organic acid metabolic process (<https://www.ebi.ac.uk/QuickGO/term/GO:0006082>)
GO:0006739 : NADP metabolic process (<https://www.ebi.ac.uk/QuickGO/term/GO:0006739>)
GO:0070995 : NADPH oxidation (<https://www.ebi.ac.uk/QuickGO/term/GO:0070995>)
GO:0072592 : oxygen metabolic process (<https://www.ebi.ac.uk/QuickGO/term/GO:0072592>)
GO:0009404 : toxin metabolic process (<https://www.ebi.ac.uk/QuickGO/term/GO:0009404>)

GO - Cellular Component

GO:0016021 : integral component of membrane (<https://www.ebi.ac.uk/QuickGO/term/GO:0016021>)
GO:0016020 : membrane (<https://www.ebi.ac.uk/QuickGO/term/GO:0016020>)
GO:0005789 : endoplasmic reticulum membrane (<https://www.ebi.ac.uk/QuickGO/term/GO:0005789>)

	Presumptive Null
No (<a +no+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Presumptive Null=">https://www.gephebase.org/search-criteria?/and+Presumptive Null="+No+"#gephebase-summary-title)	
	Molecular Type
Cis-regulatory (<a +cis-regulatory+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Molecular Type=">https://www.gephebase.org/search-criteria?/and+Molecular Type="+Cis-regulatory+"#gephebase-summary-title)	
	Aberration Type
Insertion (<a +insertion+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Aberration Type=">https://www.gephebase.org/search-criteria?/and+Aberration Type="+Insertion+"#gephebase-summary-title)	
	Insertion Size
100-999 bp	
	Molecular Details of the Mutation
a putative transposon (233bp) insertion in the HAW promoter sequence just 140 bp upstream of the start codon of PxFMO2 which was absent in the ROTH promoter, the boundaries of all copies of this element were found to be defined by 34 bp imperfect terminal inverted repeats, increase the expression of the gene PxFMO2 downstream	
	Experimental Evidence
Candidate Gene (<a +candidate="" gene+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Experimental Evidence=">https://www.gephebase.org/search-criteria?/and+Experimental Evidence="+Candidate Gene+"#gephebase-summary-title)	
	Main Reference
A flavin-dependent monooxygenase confers resistance to chlorantraniliprole in the diamondback moth, <i>Plutella xylostella</i> . (2019) (https://pubmed.ncbi.nlm.nih.gov/31626952)	
	Authors
Mallott M; Hamm S; Troczka BJ; Randall E; Pym A; Grant C; Baxter S; Vogel H; Shelton AM; Field LM; Williamson MS; Paine M; Zimmer CT; Slater R; Elias J; Bass C	
	Abstract
The diamondback moth, <i>Plutella xylostella</i> , is a damaging pest of cruciferous crops, and has evolved resistance to many of the insecticides used for control, including members of the diamide class. Previous work on the molecular basis of resistance to diamides has documented mutations in the target-site, the ryanodine receptor, in resistant populations of <i>P. xylostella</i> worldwide. In contrast the role of metabolic resistance to this insecticide class is significantly less clear. Here we show that overexpression of a flavin-dependent monooxygenase (FMO) confers resistance to the diamide chlorantraniliprole in <i>P. xylostella</i> . Transcriptome profiling of diamide resistant strains, with and without target-site resistance, revealed constitutive over-expression of several transcripts encoding detoxification enzymes compared to susceptible strains. Two of these, CYP6BG1, and PxFMO2 were particularly highly overexpressed (33,000 and 14,700-fold, respectively) in a resistant strain (HAW) lacking target-site resistance. After 17 generations without diamide selection the resistance of the HAW strain fell by 52-fold and the expression of PxFMO2 by ~1300-fold, however, the expression of CYP6BG1 declined by only 3-fold. Generation of transgenic <i>Drosophila melanogaster</i> expressing these genes demonstrated that PxFMO2, but not CYP6BG1, confers resistance in vivo. Overexpression of PxFMO2 in the HAW strain is associated with mutations, including a putative transposable element insertion, in the promoter of this gene. These enhance the expression of a reporter gene when expressed in a lepidopteran cell line suggesting they are, at least in part, responsible for the overexpression of PxFMO2 in the resistant strain. Our results provide new evidence that insect FMOs can be recruited to provide resistance to synthetic insecticides.	
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	Additional References

RELATED GEPHE

	Related Genes
10 (ABCC2, Acetylcholinesterase (Ace-1), Chitin synthase 1 (CHS1), CYP6BG1, glutamate-gated chloride channel (GluCl), MAP4K4, nAChR, para (kdr), resistance to dieldrin, RYR) (<a +51655+"="" and+grouphaplotypes='true#gephebase-summary-title"' and+trait="Xenobiotic" href="https://www.gephebase.org/search-criteria?/or+Taxon ID=" resistance="">https://www.gephebase.org/search-criteria?/or+Taxon ID="+51655+"/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title)	
	Related Haplotypes
No matches found.	

EXTERNAL LINKS

COMMENTS

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