

GEPHE SUMMARY

Bm-iAANAT (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=%Bm-iAANAT%#gephebase-summary-title)	Gephebase Gene	GP00000145	GephelD
	Entry Status	Martin	Main curator
Published			

PHENOTYPIC CHANGE

	Trait Category		
Morphology (https://www.gephebase.org/search-criteria?/and+Trait+Category=%Morphology%#gephebase-summary-title)	Trait		
Coloration (larva) (https://www.gephebase.org/search-criteria?/and+Trait=%Coloration+%28larva%29%#gephebase-summary-title)	Trait State in Taxon A		
Bombyx mori - WT	Trait State in Taxon B		
Bombyx mori - melanism (mln) strains	Ancestral State		
Taxon A	Taxonomic Status		
Domesticated (https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=%Domesticated%#gephebase-summary-title)			
Taxon A	Latin Name		Taxon B
Bombyx mori (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=%Bombyx+mori%#gephebase-summary-title)	Bombyx mori (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=%Bombyx+mori%#gephebase-summary-title)		Latin Name
domestic silkworm	Common Name		Common Name
domestic silkworm; silk moth; silkworm; Bombyx mori Linnaeus, 1758	Synonyms		Synonyms
species	Rank		Rank
	Lineage		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; Bombycoidea; Bombycidae; Bombycinae; Bombyx			
Bombyx () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7090)	Parent		Parent
7091 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7091)	NCBI Taxonomy ID		NCBI Taxonomy ID
No	is Taxon A an Infraspecies?		is Taxon B an Infraspecies?
	Yes		Yes
		Bombyx mori - melanism (mln) strains	Taxon B Description

GENOTYPIC CHANGE

Aanat	Generic Gene Name	UniProtKB Bombyx mori
AANAT	Synonyms	GenebankID or UniProtKB
-	String	
-	Sequence Similarities	
-	GO - Molecular Function	
GO:0016740 : transferase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0016740)		
-	GO - Biological Process	
-	GO - Cellular Component	
-		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

100-999 bp

Molecular Details of the Mutation

126-bp deletion overlapping with end of exon 4 and resulting in misplicing. Linkage analysis and genomic studies have shown that Bombyx arylalkamine-N-acetyl transferase, the homologous gene (Dat) that converts dopamine into N-acetyl dopamine, encodes a precursor of N-acetyl dopamine, sclerotin in Drosophila and it is the gene responsible for mln.

Experimental Evidence

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

Main Reference

Disruption of an N-acetyltransferase gene in the silkworm reveals a novel role in pigmentation. (2010) (<https://pubmed.ncbi.nlm.nih.gov/21062865>)

Authors

Zhan S; Guo Q; Li M; Li M; Li J; Miao X; Huang Y

Abstract

The pigmentation of insects has served as an excellent model for the study of morphological trait evolution and developmental biology. The melanism (mln) mutant of the silkworm *Bombyx mori* is notable for its strong black coloration, phenotypic differences between larval and adult stages, and its widespread use in strain selection. Here, we report the genetic and molecular bases for the formation of the mln morphological trait. Fine mapping revealed that an arylalkylamine N-acetyltransferase (AANAT) gene co-segregates with the black coloration patterns. Coding sequence variations and expression profiles of AANAT are also associated with the melanic phenotypes. A 126 bp deletion in the mln genome causes two alternatively spliced transcripts with premature terminations. An enzymatic assay demonstrated the absolute loss of AANAT activity in the mutant proteins. We also performed RNA interference of AANAT in wild-type pupae and observed a significant proportion of adults with ectopic black coloration. These findings indicate that functional deletion of this AANAT gene accounts for the mln mutation in silkworm. AANAT is also involved in a parallel melanin synthesis pathway in which ebony plays a role, whereas no pigmentation defect has been reported in the *Drosophila* model or in other insects to date. To the best of our knowledge, the mln mutation is the first characterized mutant phenotype of insects with AANAT, and this result contributes to our understanding of dopamine metabolism and melanin pattern polymorphisms.

Additional References

Mutations of an arylalkylamine-N-acetyltransferase, Bm-iAANAT, are responsible for silkworm melanism mutant. (2010) (<https://pubmed.ncbi.nlm.nih.gov/20332088>)

RELATED GEPHE

Related Genes

9 (apontic-like, cardinal, cortex, SCARB1, SCRB15, Wnt1, Carotenoid-binding protein (CBP), Tyrosine hydroxylase, UGT86 (Bm-UGT10286)) (<https://www.gephebase.org/search-criteria?/or+Taxon+ID=%7091%/and+Trait=Coloration/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

@Splicing