GEPHE SUMMARY

Gephebase Gene
acetyl-CoA carboxylase (ACC) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^acetyl-CoA carboxylase (ACC)^#gephebase-summary-title)

GepheID
GP00002616

Entry Status
Published

Main curator
Courtier

PHENOTYPIC CHANGE

Trait Category
Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category=^Physiology^#gephebase-summary-title)

Trait
Xenobiotic resistance (insecticide; spirotetramat) (https://www.gephebase.org/search-criteria?/and+Trait=^Xenobiotic resistance (insecticide; spirotetramat)^#gephebase-summary-title)

Trait State in Taxon A
Myzus persicae

Trait State in Taxon B
Myzus persicae - resistant

Ancestral State
Taxon A

Taxonomic Status
Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Intraspecific^#gephebase-summary-title)

Taxon A

Latin Name
Myzus persicae (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Myzus persicae^#gephebase-summary-title)

Common Name
green peach aphid

Synonyms
Myzus (Nectarosiphon) persicae; green peach aphid; peach-potato aphid; Myzus persicae (Sulzer, 1776); Myzus persiceae

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Paraneoptera; Hemiptera; Sternorrhyncha; Aphidomorpha; Aphidoidea; Aphididae; Aphidinae; Macrosiphini; Myzus

Parent
Myzus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 13163)

NCBI Taxonomy ID
13164 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 13164)

is Taxon A an Infraspecies?
No

Taxon B

Latin Name
Myzus persicae (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Myzus persicae^#gephebase-summary-title)

Common Name
green peach aphid

Synonyms
Myzus (Nectarosiphon) persicae; green peach aphid; peach-potato aphid; Myzus persicae (Sulzer, 1776); Myzus persiceae

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Paraneoptera; Hemiptera; Sternorrhyncha; Aphidomorpha; Aphidoidea; Aphididae; Aphidinae; Macrosiphini; Myzus

Parent
Myzus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 13163)

NCBI Taxonomy ID
13164 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 13164)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
ACC

Synonyms
A1Z784_DROME; acc; Acc; ACoT; CG11198; CG8723; dACC; DmACC; Dmel\CG11198; FBgn0043811; Dmel_CG11198

String
-

Sequence Similarities
-

GO - Molecular Function
GO:0005524 : ATP binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005524)
GO:0046872 : metal ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0046872)
GO:0003989 : acetyl-CoA carboxylase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0003989)

GO - Biological Process
GO:0006633 : fatty acid biosynthetic process

UniProtKB Drosophila melanogaster
Q7JV23 (http://www.uniprot.org/uniprot/Q7JV23)

GenebankID or UniProtKB
()

(https://www.ebi.ac.uk/QuickGO/term/GO:0006633)
GO:0019432 : triglyceride biosynthetic process
(https://www.ebi.ac.uk/QuickGO/term/GO:0019432)
GO:0009744 : response to sucrose (https://www.ebi.ac.uk/QuickGO/term/GO:0009744)
GO:0000902 : cell morphogenesis (https://www.ebi.ac.uk/QuickGO/term/GO:0000902)
GO:0005977 : glycogen metabolic process
(https://www.ebi.ac.uk/QuickGO/term/GO:0005977)
GO:0071329 : cellular response to sucrose stimulus
(https://www.ebi.ac.uk/QuickGO/term/GO:0071329)
GO:2001295 : malonyl-CoA biosynthetic process
(https://www.ebi.ac.uk/QuickGO/term/GO:2001295)

GO - Cellular Component

GO:0005737 : cytoplasm (https://www.ebi.ac.uk/QuickGO/term/GO:0005737)
GO:0005739 : mitochondrion (https://www.ebi.ac.uk/QuickGO/term/GO:0005739)

Presumptive Null

No (https://www.gephebase.org/search-criteria?/and+Presumptive Null=^No^#gephebase-summary-title)

Molecular Type

Coding (https://www.gephebase.org/search-criteria?/and+Molecular Type=^Coding^#gephebase-summary-title)

Aberration Type

SNP (https://www.gephebase.org/search-criteria?/and+Aberration Type=^SNP^#gephebase-summary-title)

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

a single non-synonymous mutation (gCtâ€‰>â€‰gTt) resulting in an alanine to valine substitution in a highly conserved region of the ACC carboxyltransferase (CT) domain

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	GCT	GTT	-
Amino-acid	Ala	Val	2226

Main Reference

Global patterns in genomic diversity underpinning the evolution of insecticide resistance in the aphid crop pest Myzus persicae. (2021) (https://pubmed.ncbi.nlm.nih.gov/34234279)

Authors

Singh KS; Cordeiro EMG; Troczka BJ; Pym A; Mackisack J; Mathers TC; Duarte A; Legeai F; Robin S; Bielza P; Burrack HJ; Charaabi K; Denholm I; Figueroa CC; Ffrench-Constant RH; Jander G; Margaritopoulos JT; Mazzoni E; Nauen R; RamÃrez CC; Ren G; Stepanyan I; Umina PA; Voronova NV; Vontas J; Williamson MS; Wilson ACC; Xi-Wu G; Youn YN; Zimmer CT; Simon JC; Hayward A; Bass C

Abstract

The aphid Myzus persicae is a destructive agricultural pest that displays an exceptional ability to develop resistance to both natural and synthetic insecticides. To investigate the evolution of resistance in this species we generated a chromosome-scale genome assembly and living panel of >110 fully sequenced globally sampled clonal lines. Our analyses reveal a remarkable diversity of resistance mutations segregating in global populations of M. persicae. We show that the emergence and spread of these mechanisms is influenced by host-plant associations, uncovering the widespread co-option of a host-plant adaptation that also offers resistance against synthetic insecticides. We identify both the repeated evolution of independent resistance mutations at the same locus, and multiple instances of the evolution of novel resistance mechanisms against key insecticides. Our findings provide fundamental insights into the genomic responses of global insect populations to strong selective forces, and hold practical relevance for the control of pests and parasites.

Additional References

RELATED GEPHE

Related Genes

8 (Acetylcholinesterase (Ace-1), CYP6CY3, CYP6CY3-CYP6CY4, esterase E4, esterase FE4, nAChR, para (kdr), resistance to dieldrin) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^13164^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS