GEPHE SUMMARY

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

GepheID
GP00002636

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 (METI-I acaricide) (https://www.gephebase.org/search-criteria?/and+Trait=^Xenobiotic resistance (METI-I acaricide)^#gephebase-summary-title)

Trait State in Taxon A
Panonychus citri - sensitive

Trait State in Taxon B
Panonychus citri - resistant from Iran

Ancestral State
Taxon A

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

Taxon A

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

Common Name
citrus red mite

Synonyms
citrus red mite; citrus fruit mite; Panonychus citri (McGregor, 1916); Panonnychus citri

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Chelicerata; Arachnida; Acari; Acariformes; Trombidiformes; Prostigmata; Eleutherengona; Raphignathae; Tetranychoidea; Tetranychidae; Panonychus

Parent
Panonychus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 50022)

NCBI Taxonomy ID
50023 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 50023)

is Taxon A an Infraspecies?
No

Taxon B

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

Common Name
citrus red mite

Synonyms
citrus red mite; citrus fruit mite; Panonychus citri (McGregor, 1916); Panonnychus citri

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Chelicerata; Arachnida; Acari; Acariformes; Trombidiformes; Prostigmata; Eleutherengona; Raphignathae; Tetranychoidea; Tetranychidae; Panonychus

Parent
Panonychus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 50022)

NCBI Taxonomy ID
50023 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 50023)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
ND-20

Synonyms
20 kDa; CG9172; Dmel\CG9172; Dmel_CG9172; dNDUFS7; dNDUFS7A; ND20; NUKM; PSST

String
7227.FBpp0073949 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 7227.FBpp0073949)

Sequence Similarities
Belongs to the complex I 20 kDa subunit family.

GO - Molecular Function
GO:0046872 : metal ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0046872)
GO:0048038 : quinone binding (https://www.ebi.ac.uk/QuickGO/term/GO:0048038)
GO:0051539 : 4 iron, 4 sulfur cluster binding (https://www.ebi.ac.uk/QuickGO/term/GO:0051539)
GO:0008137 : NADH dehydrogenase (ubiquinone) activity (https://www.ebi.ac.uk/QuickGO/term/GO:0008137)

UniProtKB Drosophila melanogaster
Q9VXK7 (http://www.uniprot.org/uniprot/Q9VXK7)

GenebankID or UniProtKB
()

GO - Biological Process

GO:0000302 : response to reactive oxygen species (https://www.ebi.ac.uk/QuickGO/term/GO:0000302)
GO:0008340 : determination of adult lifespan (https://www.ebi.ac.uk/QuickGO/term/GO:0008340)
GO:2000331 : regulation of terminal button organization (https://www.ebi.ac.uk/QuickGO/term/GO:2000331)
GO:0009060 : aerobic respiration (https://www.ebi.ac.uk/QuickGO/term/GO:0009060)
GO:0015990 : electron transport coupled proton transport (https://www.ebi.ac.uk/QuickGO/term/GO:0015990)
GO:0032981 : mitochondrial respiratory chain complex I assembly (https://www.ebi.ac.uk/QuickGO/term/GO:0032981)

GO - Cellular Component

GO:0005747 : mitochondrial respiratory chain complex I (https://www.ebi.ac.uk/QuickGO/term/GO:0005747)

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

H92R

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	His	Arg	92

Main Reference

Molecular and genetic analysis of resistance to METI-I acaricides in Iranian populations of the citrus red mite Panonychus citri. (2020) (https://pubmed.ncbi.nlm.nih.gov/32284140)

Authors

Alavijeh ES; Khajehali J; Snoeck S; Panteleri R; Ghadamyari M; Jonckheere W; Bajda S; Saalwaechter C; Geibel S; Douris V; Vontas J; Van Leeuwen T; Dermauw W

Abstract

The citrus red mite, Panonychus citri, is a major pest on citrus all around the world. Mitochondrial Electron Transport Inhibitors of complex I (METI-I) acaricides such as fenpyroximate have been used extensively to control P. citri populations, which resulted in multiple reports of METI-I resistant populations in the field. In this study, biochemical and molecular mechanisms of fenpyroximate resistance were investigated in P. citri. Seven populations were collected from Northern provinces of Iran. Resistance ratios were determined and reached up to 75-fold in comparison to a fenpyroximate susceptible population. Cross-resistance to two additional METI-I acaricides, pyridaben and tebufenpyrad, was detected. PBO synergism experiments, in vivo enzyme assays and gene expression analysis suggest a minor involvement of cytochrome P450 monooxygenases in fenpyroximate resistance, which is in contrast with many reported cases for the closely related Tetranychus urticae. Next, we determined the frequency of a well-known mutation in the target-site of METI-Is, the PSST subunit, associated with METI-I resistance. Indeed, the H92R substitution was detected in a highly fenpyroximate resistant P. citri population. Additionally, a new amino acid substitution at a conserved site in the PSST subunit was detected, A94V, with higher allele frequencies in a moderately resistant population. Marker-assisted back-crossing in a susceptible background confirmed the potential involvement of the newly discovered A94V mutation in fenpyroximate resistance. However, introduction of the A94V mutation in the PSST homologue of D. melanogaster using CRISPR-Cas9 did not result in fenpyroximate resistant flies. In addition, differences in binding curves between METI-Is and complex I measured directly, in isolated transgenic and wildtype mitochondria preparations, could not be found.

Additional References

RELATED GEPHE

Related Genes

1 (cytochrome b) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^50023^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS