

GEPHE SUMMARY

RCR3 (https://www.gephebase.org/search-criteria?/and+GeneGephebase=~RCR3~#gephebase-summary-title)	Gephebase Gene	GP00000963	GepheID
	Entry Status	Courtier	Main curator
	Published		

PHENOTYPIC CHANGE

Physiology (https://www.gephebase.org/search-criteria?/and+TraitCategory=~Physiology~#gephebase-summary-title)		Trait Category	
Pathogen resistance (https://www.gephebase.org/search-criteria?/and+Trait=~Pathogenresistance~#gephebase-summary-title)		Trait	
Solanum peruvianum		Trait State in Taxon A	
Solanum peruvianum		Trait State in Taxon B	
Data not curated		Ancestral State	
Intraspecific (https://www.gephebase.org/search-criteria?/and+TaxonomicStatus=~Intraspecific~#gephebase-summary-title)		Taxonomic Status	
Taxon A		Taxon B	
Solanum peruvianum (https://www.gephebase.org/search-criteria?/and+TaxonandSynonyms=~Solanumperuvianum~#gephebase-summary-title)		Solanum peruvianum (https://www.gephebase.org/search-criteria?/and+TaxonandSynonyms=~Solanumperuvianum~#gephebase-summary-title)	
-		-	
Lycopersicon peruvianum; Solanum peruvianum var. dentatum; Peruvian tomato; Lycopersicon peruvianum (L.) Mill.; Solanum peruvianum L.		Lycopersicon peruvianum; Solanum peruvianum var. dentatum; Peruvian tomato; Lycopersicon peruvianum (L.) Mill.; Solanum peruvianum L.	
species		species	
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; asterids; lamiids; Solanales; Solanaceae; Solanoideae; Solaneae; Solanum; Lycopersicon		cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; asterids; lamiids; Solanales; Solanaceae; Solanoideae; Solaneae; Solanum; Lycopersicon	
Lycopersicon () - (Rank: subgenus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=49274)		Lycopersicon () - (Rank: subgenus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=49274)	
4082 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4082)		4082 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4082)	
is Taxon A an Intraspecies?		is Taxon B an Intraspecies?	
No		No	

GENOTYPIC CHANGE

Rcr3	Generic Gene Name	UniProtKB Solanum lycopersicum
	Synonyms	Q8S333 (http://www.uniprot.org/uniprot/Q8S333)
	String	GenebankID or UniProtKB
101251145		AFP73362 (https://www.ncbi.nlm.nih.gov/nuccore/AFP73362)
4081.Solyc02g076980.2.1 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=4081.Solyc02g076980.2.1)	Sequence Similarities	
Belongs to the peptidase C1 family.	GO - Molecular Function	
GO:0004197 : cysteine-type endopeptidase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004197)	GO - Biological Process	
GO:0051603 : proteolysis involved in cellular protein catabolic process (https://www.ebi.ac.uk/QuickGO/term/GO:0051603)	GO - Cellular Component	

GO:0005615 : extracellular space (<https://www.ebi.ac.uk/QuickGO/term/GO:0005615>)

GO:0005764 : lysosome (<https://www.ebi.ac.uk/QuickGO/term/GO:0005764>)

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

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

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

Nonsynonymous

Candidate amino acid changes are I206K and/or Q222E and/or S330A

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

Presumptive Null

Molecular Type

Aberration Type

SNP Coding Change

Molecular Details of the Mutation

Experimental Evidence

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	-	-	-

Balancing selection at the tomato RCR3 Guardee gene family maintains variation in strength of pathogen defense. (2012) (<https://pubmed.ncbi.nlm.nih.gov/22829777>)

HÄŕrger AC; Ilyas M; Stephan W; Tellier A; van der Hoorn RA; Rose LE

Main Reference

Authors

Abstract

Coevolution between hosts and pathogens is thought to occur between interacting molecules of both species. This results in the maintenance of genetic diversity at pathogen antigens (or so-called effectors) and host resistance genes such as the major histocompatibility complex (MHC) in mammals or resistance (R) genes in plants. In plant-pathogen interactions, the current paradigm posits that a specific defense response is activated upon recognition of pathogen effectors via interaction with their corresponding R proteins. According to the “Guard-Hypothesis,” R proteins (the “guards”) can sense modification of target molecules in the host (the “guardees”) by pathogen effectors and subsequently trigger the defense response. Multiple studies have reported high genetic diversity at R genes maintained by balancing selection. In contrast, little is known about the evolutionary mechanisms shaping the guardee, which may be subject to contrasting evolutionary forces. Here we show that the evolution of the guardee RCR3 is characterized by gene duplication, frequent gene conversion, and balancing selection in the wild tomato species Solanum peruvianum. Investigating the functional characteristics of 54 natural variants through in vitro and in planta assays, we detected differences in recognition of the pathogen effector through interaction with the guardee, as well as substantial variation in the strength of the defense response. This variation is maintained by balancing selection at each copy of the RCR3 gene. Our analyses pinpoint three amino acid polymorphisms with key functional consequences for the coevolution between the guardee (RCR3) and its guard (Cf-2). We conclude that, in addition to coevolution at the “guardee-effector” interface for pathogen recognition, natural selection acts on the “guard-guardee” interface. Guardee evolution may be governed by a counterbalance between improved activation in the presence and prevention of auto-immune responses in the absence of the corresponding pathogen.

Additional References

RELATED GEPHE

1 (Mii.2) (<https://www.gephebase.org/search-criteria?/or+Taxon ID=~4082^/and+Trait=Pathogen resistance/and+groupHaplotypes=true#gephebase-summary-title>)

No matches found.

Related Genes

Related Haplotypes

EXTERNAL LINKS

COMMENTS

@BalancingSelection