

GEPHE SUMMARY

Lr21 (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^Lr21^#gephebase-summary-title)	Gephebase Gene GP00000551	GepheID Main curator
Published	Entry Status Courtier	

PHENOTYPIC CHANGE

Trait Category		
Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category=^Physiology^#gephebase-summary-title)	Trait	
Pathogen resistance (https://www.gephebase.org/search-criteria?/and+Trait=^Pathogen resistance^#gephebase-summary-title)	Trait State in Taxon A	
Triticum aestivum - Wichita	Trait State in Taxon B	
Triticum aestivum - Fielder	Ancestral State	
Data not curated	Taxonomic Status	
Domesticated (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Domesticated^#gephebase-summary-title)		
Taxon A		Taxon B
	Latin Name	Latin Name
Triticum aestivum (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Triticum+aestivum^#gephebase-summary-title)		Triticum aestivum (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Triticum+aestivum^#gephebase-summary-title)
bread wheat	Common Name	Common Name
	Synonyms	Synonyms
Triticum aestivum subsp. aestivum; Triticum vulgare; bread wheat; Canadian hard winter wheat; common wheat; wheat; Triticum aestivum L.; Triticum vulgare L.; Triticum vulgare Vill., nom. illeg.; Tricum aestivum; Triticum aestivam; Triticum aestivum8		Triticum aestivum subsp. aestivum; Triticum vulgare; bread wheat; Canadian hard winter wheat; common wheat; wheat; Triticum aestivum L.; Triticum vulgare L.; Triticum vulgare Vill., nom. illeg.; Tricum aestivum; Triticum aestivam; Triticum aestivum8
	Rank	Rank
species	Lineage	Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; BOP clade; Pooideae; Triticodae; Triticeae; Triticinae; Triticum		cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; BOP clade; Pooideae; Triticodae; Triticeae; Triticinae; Triticum
Triticum () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4564)	Parent	Parent
4565 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4565)	NCBI Taxonomy ID	NCBI Taxonomy ID
Yes	is Taxon A an Infraspecies?	is Taxon B an Infraspecies?
Triticum aestivum - Wichita	Taxon A Description	Taxon B Description

GENOTYPIC CHANGE

-	Generic Gene Name	UniProtKB Triticum aestivum
-	Synonyms	GenebankID or UniProtKB
-	String	
-	Sequence Similarities	
Belongs to the disease resistance NB-LRR family.		
	GO - Molecular Function	
GO:0043531 : ADP binding (https://www.ebi.ac.uk/QuickGO/term/GO:0043531)		
	GO - Biological Process	
	GO - Cellular Component	
GO:0016021 : integral component of membrane		

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

Complex Change (<https://www.gephebase.org/search-criteria?/and+Aberration+Type=%Complex+Change%#gephebase-summary-title>)

Molecular Details of the Mutation

Novel pathogen specificity resulting from chimerism of the parental alleles after intragenic recombination

Experimental Evidence

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

Main Reference

Evolution of new disease specificity at a simple resistance locus in a crop-weed complex: reconstitution of the Lr21 gene in wheat. (2009) (<https://pubmed.ncbi.nlm.nih.gov/19364806>)

Authors

Huang L; Brooks S; Li W; Fellers J; Nelson JC; Gill B

Abstract

The wheat leaf-rust resistance gene Lr21 was first identified in an Iranian accession of goatgrass, *Aegilops tauschii* Coss., the D-genome donor of hexaploid bread wheat, and was introgressed into modern wheat cultivars by breeding. To elucidate the origin of the gene, we analyzed sequences of Lr21 and lr21 alleles from 24 wheat cultivars and 25 accessions of *Ae. tauschii* collected along the Caspian Sea in Iran and Azerbaijan. Three basic nonfunctional lr21 haplotypes, H1, H2, and H3, were identified. Lr21 was found to be a chimera of H1 and H2, which were found only in wheat. We attempted to reconstitute a functional Lr21 allele by crossing the cultivars Fielder (H1) and Wichita (H2). Rust inoculation of 5876 F(2) progeny revealed a single resistant plant that proved to carry the H1H2 haplotype, a result attributed to intragenic recombination. These findings reflect how plants balance the penalty and the necessity of a resistance gene and suggest that plants can reuse "dead" alleles to generate new disease-resistance specificity, leading to a "death-recycle" model of plant-resistance gene evolution at simple loci. We suggest that selection pressure in crop-weed complexes contributes to this process.

Additional References

RELATED GEPHE

Related Genes

4 (Lr67, Pm3, Pore-forming toxin-like (PFT), Mla (=Sr33/AetRGA1e)) (<https://www.gephebase.org/search-criteria?/or+Taxon+ID=%4565%/and+Trait=Pathogen+resistance/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

@Introgression