

GEPHE SUMMARY

EPSPS (https://www.gephebase.org/search-criteria?/and+Gene Gephebase= [^] EPSPS [^] #gephebase-summary-title)	Gephebase Gene	GP00001903	GepheID
Published	Entry Status	Courtier	Main curator

PHENOTYPIC CHANGE

Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category= [^] Physiology [^] #gephebase-summary-title)	Trait Category		
Xenobiotic resistance (herbicides; glyphosate) (<a href="https://www.gephebase.org/search-criteria?/and+Trait=<sup>^</sup>Xenobiotic resistance (herbicides; glyphosate)<sup>^</sup>#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait=[^]Xenobiotic resistance (herbicides; glyphosate)[^]#gephebase-summary-title)	Trait		
Lolium rigidum - sensitive	Trait State in Taxon A		
Lolium rigidum - resistant	Trait State in Taxon B		
Taxon A	Ancestral State		
Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status= [^] Intraspecific [^] #gephebase-summary-title)	Taxonomic Status		
	Taxon A	Taxon B	
	Latin Name	Latin Name	
Lolium rigidum (<a href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=<sup>^</sup>Lolium rigidum<sup>^</sup>#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=[^]Lolium rigidum[^]#gephebase-summary-title)	Lolium rigidum (<a href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=<sup>^</sup>Lolium rigidum<sup>^</sup>#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=[^]Lolium rigidum[^]#gephebase-summary-title)	Lolium rigidum (<a href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=<sup>^</sup>Lolium rigidum<sup>^</sup>#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=[^]Lolium rigidum[^]#gephebase-summary-title)	
-	Common Name	Common Name	
-	Synonyms	Synonyms	
Lolium rigidum Gaudin; Lolium rigidum	Lolium rigidum Gaudin; Lolium rigidum	Lolium rigidum Gaudin; Lolium rigidum	
species	Rank	Rank	
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliopsida; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; BOP clade; Pooideae; Poodae; Poeae; Poeae Chloroplast Group 2 (Poeae type); Loliinae; Lolium	Lineage	Lineage	
Lolium () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4520)	Parent	Parent	
89674 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 89674)	NCBI Taxonomy ID	NCBI Taxonomy ID	
is Taxon A an Intraspecies?		is Taxon B an Intraspecies?	
No		No	

GENOTYPIC CHANGE

At2g45300	Generic Gene Name	P05466 (http://www.uniprot.org/uniprot/P05466)	UniProtKB Arabidopsis thaliana
F4L23.19; At2g45300	Synonyms	()	GenebankID or UniProtKB
3702.AT2G45300.1 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 3702.AT2G45300.1)	String		
Belongs to the EPSP synthase family.	Sequence Similarities		
GO:0003866 : 3-phosphoshikimate 1-carboxyvinyltransferase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0003866)	GO - Molecular Function		
GO:0009073 : aromatic amino acid family biosynthetic process (https://www.ebi.ac.uk/QuickGO/term/GO:0009073)	GO - Biological Process		
GO:0009423 : chorismate biosynthetic process			

(<https://www.ebi.ac.uk/QuickGO/term/GO:0009423>)

GO - Cellular Component

GO:0009507 : chloroplast (<https://www.ebi.ac.uk/QuickGO/term/GO:0009507>)

GO:0009570 : chloroplast stroma (<https://www.ebi.ac.uk/QuickGO/term/GO:0009570>)

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

Presumptive Null

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

Molecular Type

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

Aberration Type

Nonsynonymous

SNP Coding Change

Pro106Ala

Molecular Details of the Mutation

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

Experimental Evidence

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

Glyphosate, paraquat and ACCase multiple herbicide resistance evolved in a *Lolium rigidum* biotype. (2007) (<https://pubmed.ncbi.nlm.nih.gov/16906433>)

Main Reference

Yu Q; Cairns A; Powles S

Authors

Glyphosate is the world's most widely used herbicide. A potential substitute for glyphosate in some use patterns is the herbicide paraquat. Following many years of successful use, neither glyphosate nor paraquat could control a biotype of the widespread annual ryegrass (*Lolium rigidum*), and here the world's first case of multiple resistance to glyphosate and paraquat is confirmed. Dose-response experiments established that the glyphosate rate causing 50% mortality (LD(50)) for the resistant (R) biotype is 14 times greater than for the susceptible (S) biotype. Similarly, the paraquat LD(50) for the R biotype is 32 times greater than for the S biotype. Thus, based on the LD(50)R/S ratio, this R biotype of *L. rigidum* is 14-fold resistant to glyphosate and 32-fold resistant to paraquat. This R biotype also has evolved resistance to the acetyl-coenzyme A carboxylase (ACCase) inhibiting herbicides. The mechanism of paraquat resistance in this biotype was determined as restricted paraquat translocation. Resistance to ACCase-inhibiting herbicides was determined as due to an insensitive ACCase. Two mechanisms endowing glyphosate resistance were established: firstly, a point mutation in the 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS) gene, resulting in an amino acid substitution of proline to alanine at position 106; secondly, reduced glyphosate translocation was found in this R biotype, indicating a co-occurrence of two distinct glyphosate resistance mechanisms within the R population. In total, this R biotype displays at least four co-existing resistance mechanisms, endowing multiple resistance to glyphosate, paraquat and ACCase herbicides. This alarming case in the history of herbicide resistance evolution represents a serious challenge for the sustainable use of the precious agrochemical resources such as glyphosate and paraquat.

Abstract

Additional References

RELATED GEPHE

No matches found.

Related Genes

3 ([#gpebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene+Gephebase+EPSPS+/and+Taxon+ID+89674+/or+Gene+Gephebase+EPSPS+/and+Taxon+ID+89674))

Related Haplotypes

EXTERNAL LINKS

COMMENTS