

## GEPHE SUMMARY

EPSPS ( <a href="https://www.gephebase.org/search-criteria?/and+Gene">https://www.gephebase.org/search-criteria?/and+Gene</a> Gephebase= <sup>^</sup> EPSPS <sup>^</sup> #gephebase-summary-title)	Gephebase Gene	GP00001903	GepheID
Published	Entry Status	Courtier	Main curator

## PHENOTYPIC CHANGE

Physiology ( <a href="https://www.gephebase.org/search-criteria?/and+Trait">https://www.gephebase.org/search-criteria?/and+Trait</a> Category= <sup>^</sup> Physiology <sup>^</sup> #gephebase-summary-title)	Trait Category		
Xenobiotic resistance (herbicides; glyphosate) ( <a href="https://www.gephebase.org/search-criteria?/and+Trait=&lt;sup&gt;^&lt;/sup&gt;Xenobiotic resistance (herbicides; glyphosate)&lt;sup&gt;^&lt;/sup&gt;#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait=<sup>^</sup>Xenobiotic resistance (herbicides; glyphosate)<sup>^</sup>#gephebase-summary-title</a> )	Trait		
Lolium rigidum - sensitive	Trait State in Taxon A		
Lolium rigidum - resistant	Trait State in Taxon B		
Taxon A	Ancestral State		
Intraspecific ( <a href="https://www.gephebase.org/search-criteria?/and+Taxonomic">https://www.gephebase.org/search-criteria?/and+Taxonomic</a> Status= <sup>^</sup> Intraspecific <sup>^</sup> #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=&lt;sup&gt;^&lt;/sup&gt;Lolium rigidum&lt;sup&gt;^&lt;/sup&gt;#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=<sup>^</sup>Lolium rigidum<sup>^</sup>#gephebase-summary-title</a> )	Lolium rigidum ( <a href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=&lt;sup&gt;^&lt;/sup&gt;Lolium rigidum&lt;sup&gt;^&lt;/sup&gt;#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=<sup>^</sup>Lolium rigidum<sup>^</sup>#gephebase-summary-title</a> )	Lolium rigidum ( <a href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=&lt;sup&gt;^&lt;/sup&gt;Lolium rigidum&lt;sup&gt;^&lt;/sup&gt;#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=<sup>^</sup>Lolium rigidum<sup>^</sup>#gephebase-summary-title</a> )	
-	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) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4520">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4520</a> )	Parent	Parent	
89674 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 89674">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 89674</a> )	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 ( <a href="http://www.uniprot.org/uniprot/P05466">http://www.uniprot.org/uniprot/P05466</a> )	UniProtKB Arabidopsis thaliana
F4L23.19; At2g45300	Synonyms	()	GenebankID or UniProtKB
3702.AT2G45300.1 ( <a href="http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 3702.AT2G45300.1">http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 3702.AT2G45300.1</a> )	String		
Belongs to the EPSP synthase family.	Sequence Similarities		
GO:0003866 : 3-phosphoshikimate 1-carboxyvinyltransferase activity ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0003866">https://www.ebi.ac.uk/QuickGO/term/GO:0003866</a> )	GO - Molecular Function		
GO:0009073 : aromatic amino acid family biosynthetic process ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0009073">https://www.ebi.ac.uk/QuickGO/term/GO:0009073</a> )	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 ([#gpepbase-summary-title](https://www.gephebase.org/search-criteria?/and+Presumptive+Null+No))

Presumptive Null

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

Molecular Type

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

Experimental Evidence

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

Main Reference

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

Authors

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Abstract

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.

Additional References

## RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

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

## EXTERNAL LINKS

## COMMENTS