

GEPHE SUMMARY

EPSPS (https://www.gephebase.org/search-criteria?/and+Gene Gephebase= [^] EPSPS [^] #gephebase-summary-title)	Gephebase Gene	GP00001883	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		
Amaranthus palmeri - sensitive	Trait State in Taxon A		
Amaranthus palmeri - 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
Amaranthus palmeri (<a href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=<sup>^</sup>Amaranthus palmeri<sup>^</sup>#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=[^]Amaranthus palmeri[^]#gephebase-summary-title)		Amaranthus palmeri (<a href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=<sup>^</sup>Amaranthus palmeri<sup>^</sup>#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=[^]Amaranthus palmeri[^]#gephebase-summary-title)	
-	Common Name	-	Common Name
	Synonyms		Synonyms
Amaranthus palmeri S.Watson		Amaranthus palmeri S.Watson	
species	Rank	species	Rank
	Lineage		Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliopsida; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetales; Caryophyllales; Amaranthaceae; Amaranthus	Parent	cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliopsida; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetales; Caryophyllales; Amaranthaceae; Amaranthus	Parent
Amaranthus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3564)	NCBI Taxonomy ID	Amaranthus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3564)	NCBI Taxonomy ID
107608 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=107608)		107608 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=107608)	
	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: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 (<https://www.gephebase.org/search-criteria?/and+Presumptive+Null=~No~#gephebase-summary-title>)

Presumptive Null

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

Molecular Type

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

Aberration Type

10-100 kb

Insertion Size

Genomes of resistant plants contain from 5-fold to more than 160-fold more copies of the EPSPS gene than did genomes of susceptible plants - the duplicated section of DNA including the 10â€%kb EPSPS gene is at least 30â€%kb long

Molecular Details of the Mutation

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

Experimental Evidence

Gene amplification confers glyphosate resistance in *Amaranthus palmeri*. (2010) (<https://pubmed.ncbi.nlm.nih.gov/20018685>)

Main Reference

Gaines TA; Zhang W; Wang D; Bukun B; Chisholm ST; Shaner DL; Nissen SJ; Patzoldt WL; Tranel PJ; Culpepper AS; Grey TL; Webster TM; Vencill WK; Sammons RD; Jiang J; Preston C; Leach JE; Westra P

Authors

Abstract

The herbicide glyphosate became widely used in the United States and other parts of the world after the commercialization of glyphosate-resistant crops. These crops have constitutive overexpression of a glyphosate-insensitive form of the herbicide target site gene, 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS). Increased use of glyphosate over multiple years imposes selective genetic pressure on weed populations. We investigated recently discovered glyphosate-resistant *Amaranthus palmeri* populations from Georgia, in comparison with normally sensitive populations. EPSPS enzyme activity from resistant and susceptible plants was equally inhibited by glyphosate, which led us to use quantitative PCR to measure relative copy numbers of the EPSPS gene. Genomes of resistant plants contained from 5-fold to more than 160-fold more copies of the EPSPS gene than did genomes of susceptible plants. Quantitative RT-PCR on cDNA revealed that EPSPS expression was positively correlated with genomic EPSPS relative copy number. Immunoblot analyses showed that increased EPSPS protein level also correlated with EPSPS genomic copy number. EPSPS gene amplification was heritable, correlated with resistance in pseudo-F(2) populations, and is proposed to be the molecular basis of glyphosate resistance. FISH revealed that EPSPS genes were present on every chromosome and, therefore, gene amplification was likely not caused by unequal chromosome crossing over. This occurrence of gene amplification as an herbicide resistance mechanism in a naturally occurring weed population is particularly significant because it could threaten the sustainable use of glyphosate-resistant crop technology.

Additional References

RELATED GEPHE

No matches found.

Related Genes

No matches found.

Related Haplotypes

EXTERNAL LINKS

COMMENTS

The EPSPS gene is present on all chromosomes