GEPHE SUMMARY

Gephebase Gene

EPSPS (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^EPSPS^#gephebase-summary-title)

GepheID

GP00001888

Entry Status

Published

Main curator

Courtier

PHENOTYPIC CHANGE

Trait Category

Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category=^Physiology^#gephebase-summary-title)

Trait

Xenobiotic resistance (herbicides; glyphosate) (https://www.gephebase.org/search-criteria?/and+Trait=^Xenobiotic resistance (herbicides; glyphosate)^#gephebase-summary-title)

Trait State in Taxon A

Eleusine indica - sensitive

Trait State in Taxon B

Eleusine indica - resistant

Ancestral State

Taxon A

Taxonomic Status

Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Intraspecific^#gephebase-summary-title)

Taxon A

Latin Name

Eleusine indica (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Eleusine indica^#gephebase-summary-title)

Common Name

goosegrass

Synonyms

goosegrass; crabgrass; fowl foot grass; wire grass; yardgrass; Eleusine indica (L.) Gaertn.

Rank

species

Lineage

cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliopsida; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; PACMAD clade; Chloridoideae; Cynodonteae; Eleusininae; Eleusine

Parent

Eleusine () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4510)

NCBI Taxonomy ID

29674 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 29674)

is Taxon A an Infraspecies?

No

Taxon B

Latin Name

Eleusine indica (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Eleusine indica^#gephebase-summary-title)

Common Name

goosegrass

Synonyms

goosegrass; crabgrass; fowl foot grass; wire grass; yardgrass; Eleusine indica (L.) Gaertn.

Rank

species

Lineage

cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliopsida; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; PACMAD clade; Chloridoideae; Cynodonteae; Eleusininae; Eleusine

Parent

Eleusine () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4510)

NCBI Taxonomy ID

29674 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 29674)

is Taxon B an Infraspecies?

No

GENOTYPIC CHANGE

Generic Gene Name

At2g45300

Synonyms

F4L23.19; At2g45300

String

3702.AT2G45300.1 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 3702.AT2G45300.1)

Sequence Similarities

Belongs to the EPSP synthase family.

GO - Molecular Function

GO:0003866 : 3-phosphoshikimate 1-carboxyvinyltransferase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0003866)

GO - Biological Process

GO:0009073 : aromatic amino acid family biosynthetic process (https://www.ebi.ac.uk/QuickGO/term/GO:0009073)
GO:0009423 : chorismate biosynthetic process

UniProtKB Arabidopsis thaliana

P05466 (http://www.uniprot.org/uniprot/P05466)

GenebankID or UniProtKB

()

(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)

Presumptive Null

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

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

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

Pro106Ser leading to 2-4-fold resistance

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Pro	Ser	106

Main Reference

Glyphosate-resistant goosegrass. Identification of a mutation in the target enzyme 5-enolpyruvylshikimate-3-phosphate synthase. (2002) (https://pubmed.ncbi.nlm.nih.gov/12114580)

Authors

Baerson SR; Rodriguez DJ; Tran M; Feng Y; Biest NA; Dill GM

Abstract

The spontaneous occurrence of resistance to the herbicide glyphosate in weed species has been an extremely infrequent event, despite over 20 years of extensive use. Recently, a glyphosate-resistant biotype of goosegrass (Eleusine indica) was identified in Malaysia exhibiting an LD(50) value approximately 2- to 4-fold greater than the sensitive biotype collected from the same region. A comparison of the inhibition of 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS) activity by glyphosate in extracts prepared from the resistant (R) and sensitive (S) biotypes revealed an approximately 5-fold higher IC(50)(glyphosate) for the (R) biotype. Sequence comparisons of the predicted EPSPS mature protein coding regions from both biotypes revealed four single-nucleotide differences, two of which result in amino acid changes. One of these changes, a proline to serine substitution at position 106 in the (R) biotype, corresponds to a substitution previously identified in a glyphosate-insensitive EPSPS enzyme from Salmonella typhimurium. Kinetic data generated for the recombinant enzymes suggests that the second substitution identified in the (R) EPSPS does not contribute significantly to its reduced glyphosate sensitivity. Escherichia coli aroA- (EPSPS deficient) strains expressing the mature EPSPS enzyme from the (R) biotype exhibited an approximately 3-fold increase in glyphosate tolerance relative to strains expressing the mature EPSPS from the (S) biotype. These results provide the first evidence for an altered EPSPS enzyme as an underlying component of evolved glyphosate resistance in any plant species.

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

1 (https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^EPSPS^/and+Taxon ID=^29674^/or+Gene Gephebase=^EPSPS^/and+Taxon ID=^29674^#gephebase-summary-title)

EXTERNAL LINKS

COMMENTS