GEPHE SUMMARY

Gephebase Gene

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

GepheID

GP00001885

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

Lolium multiflorum - sensitive

Trait State in Taxon B

Lolium multiflorum - 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

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

Common Name

Italian ryegrass

Synonyms

Lolium italicum; Lolium perenne subsp. multiflorum; Lolium perenne var. multiflorum; Italian ryegrass; Lolium italicum A.Braun, 1834, nom. illeg.; Lolium multiflorum Lam., 1779; Lolium perenne subsp. multiflorum (Lam.) Husn., 1899; Lolium perenne var. multiflorum (Lam.) Parn., 1845

Rank

species

Lineage

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

Parent

Lolium () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4520)

NCBI Taxonomy ID

4521 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4521)

is Taxon A an Infraspecies?

No

Taxon B

Latin Name

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

Common Name

Italian ryegrass

Synonyms

Lolium italicum; Lolium perenne subsp. multiflorum; Lolium perenne var. multiflorum; Italian ryegrass; Lolium italicum A.Braun, 1834, nom. illeg.; Lolium multiflorum Lam., 1779; Lolium perenne subsp. multiflorum (Lam.) Husn., 1899; Lolium perenne var. multiflorum (Lam.) Parn., 1845

Rank

species

Lineage

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

Parent

Lolium () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4520)

NCBI Taxonomy ID

4521 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4521)

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

UniProtKB Arabidopsis thaliana

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

GenebankID or UniProtKB

()

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

Presumptive Null

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

Molecular Type

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

Aberration Type

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

Insertion Size

10-100 kb

Molecular Details of the Mutation

15-25 copies of the EPSPS gene

Experimental Evidence

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

Main Reference

EPSPS gene amplification in glyphosate-resistant Italian ryegrass (Lolium perenne ssp. multiflorum) from Arkansas. (2012) (https://pubmed.ncbi.nlm.nih.gov/22815255)

Authors

Salas RA; Dayan FE; Pan Z; Watson SB; Dickson JW; Scott RC; Burgos NR

Abstract

Resistance to glyphosate in weed species is a major challenge for the sustainability of glyphosate use in crop and non-crop systems. A glyphosate-resistant Italian ryegrass population has been identified in Arkansas. This research was conducted to elucidate its resistance mechanism.

The investigation was conducted on resistant and susceptible plants from a population in Desha County, Arkansas (Des03). The amounts of glyphosate that caused 50% overall visual injury were 7 to 13 times greater than those for susceptible plants from the same population. The EPSPS gene did not contain any point mutation that has previously been associated with resistance to glyphosate, nor were there any other mutations on the EPSPS gene unique to the Des03 resistant plants. The resistant plants had 6-fold higher basal EPSPS enzyme activities than the susceptible plants, but their I(50) values in response to glyphosate were similar. The resistant plants contained up to 25 more copies of EPSPS gene than the susceptible plants. The level of resistance to glyphosate correlated with increases in EPSPS enzyme activity and EPSPS copy number.

Increased EPSPS gene amplification and EPSPS enzyme activity confer resistance to glyphosate in the Des03 population. This is the first report of EPSPS gene amplification in glyphosate-resistant Italian ryegrass. Other resistance mechanism(s) may also be involved.

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

2 (https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^EPSPS^/and+Taxon ID=^4521^/or+Gene Gephebase=^EPSPS^/and+Taxon ID=^4521^#gephebase-summary-title)

EXTERNAL LINKS

COMMENTS