

GEPHE SUMMARY

Gephebase Gene
EPSPS

Entry Status
Published

GepheID
GP00001885

Main curator
Courtier

PHENOTYPIC CHANGE

Trait Category
Physiology

Trait
Xenobiotic resistance (herbicides; glyphosate)

Trait State in Taxon A
Lolium multiflorum - sensitive

Trait State in Taxon B
Lolium multiflorum - resistant

Ancestral State
Taxon A

Taxonomic Status
Intraspecific

Taxon A

Latin Name
Lolium multiflorum

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; Poaeae Chloroplast Group 2 (Poeae type); Loliinae; Lolium

Parent
Lolium () - (Rank: genus)

NCBI Taxonomy ID
4521

is Taxon A an Intraspecies?
No

Taxon B

Latin Name
Lolium multiflorum

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; Poaeae Chloroplast Group 2 (Poeae type); Loliinae; Lolium

Parent
Lolium () - (Rank: genus)

NCBI Taxonomy ID
4521

is Taxon B an Intraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
At2g45300

Synonyms
F4L23.19; At2g45300

String
3702.AT2G45300.1

Sequence Similarities
Belongs to the EPSP synthase family.

GO - Molecular Function
GO:0003866 : 3-phosphoshikimate 1-carboxyvinyltransferase activity

GO - Biological Process
GO:0009073 : aromatic amino acid family biosynthetic process
GO:0009423 : chorismate biosynthetic process

GO - Cellular Component
GO:0009507 : chloroplast
GO:0009570 : chloroplast stroma

UniProtKB Arabidopsis thaliana
P05466

GenebankID or UniProtKB

Presumptive Null

No

Molecular Type

Gene Amplification

Aberration Type

Insertion

Insertion Size

10-100 kb

Molecular Details of the Mutation

15-25 copies of the EPSPS gene

Experimental Evidence

Candidate Gene

Main Reference

EPSPS gene amplification in glyphosate-resistant Italian ryegrass (*Lolium perenne* ssp. *multiflorum*) from Arkansas. (2012)

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.

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Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

2

EXTERNAL LINKS

COMMENTS