## GEPHE SUMMARY

Gephebase Gene

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

GepheID

GP00000549

Entry Status

Published

Main curator

Martin

## PHENOTYPIC CHANGE

Trait Category

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

Trait

Toxicity levels (cyanogenic glucoside) (https://www.gephebase.org/search-criteria?/and+Trait=^Toxicity levels (cyanogenic glucoside)^#gephebase-summary-title)

Trait State in Taxon A

Trifolium repens - cyanogenic

Trait State in Taxon B

Trifolium repens - acyanogenic

Ancestral State

Taxon A

Taxonomic Status

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

### Taxon A

Latin Name

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

Common Name

white clover

Synonyms

white clover; creeping white clover; Trifolium repens L.; Triflorum repens

Rank

species

Lineage

cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; rosids; fabids; Fabales; Fabaceae; Papilionoideae; 50 kb inversion clade; NPAAA clade; Hologalegina; IRL clade; Trifolieae; Trifolium

Parent

Trifolium () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 3898 )

NCBI Taxonomy ID

3899 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 3899 )

is Taxon A an Infraspecies?

No

### Taxon B

Latin Name

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

Common Name

white clover

Synonyms

white clover; creeping white clover; Trifolium repens L.; Triflorum repens

Rank

species

Lineage

cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; rosids; fabids; Fabales; Fabaceae; Papilionoideae; 50 kb inversion clade; NPAAA clade; Hologalegina; IRL clade; Trifolieae; Trifolium

Parent

Trifolium () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 3898 )

NCBI Taxonomy ID

3899 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 3899 )

is Taxon B an Infraspecies?

No

## GENOTYPIC CHANGE

Generic Gene Name

LI

Synonyms

-

String

-

Sequence Similarities

Belongs to the glycosyl hydrolase 1 family.

GO - Molecular Function

GO:0008422 : beta-glucosidase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0008422)
GO:0102483 : scopolin beta-glucosidase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0102483)

GO - Biological Process

GO:0005975 : carbohydrate metabolic process (https://www.ebi.ac.uk/QuickGO/term/GO:0005975)

GO - Cellular Component

UniProtKB Trifolium repens

P26205 (http://www.uniprot.org/uniprot/P26205)

GenebankID or UniProtKB

X56733 (https://www.ncbi.nlm.nih.gov/nuccore/X56733)

-

Presumptive Null

Yes (https://www.gephebase.org/search-criteria?/and+Presumptive Null=^Yes^#gephebase-summary-title)

Molecular Type

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

Aberration Type

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

Deletion Size

unknown

Molecular Details of the Mutation

Gene deletion

Experimental Evidence

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

Main Reference

Evidence on the molecular basis of the Ac/ac adaptive cyanogenesis polymorphism in white clover (Trifolium repens L). (2008) (https://pubmed.ncbi.nlm.nih.gov/18458107)

Authors

Olsen KM; Hsu SC; Small LL

Abstract

White clover is polymorphic for cyanogenesis, with both cyanogenic and acyanogenic plants occurring in nature. This chemical defense polymorphism is one of the longest-studied and best-documented examples of an adaptive polymorphism in plants. It is controlled by two independently segregating genes: Ac/ac controls the presence/absence of cyanogenic glucosides; and Li/li controls the presence/absence of their hydrolyzing enzyme, linamarase. Whereas Li is well characterized at the molecular level, Ac has remained unidentified. Here we report evidence that Ac corresponds to a gene encoding a cytochrome P450 of the CYP79D protein subfamily (CYP79D15), and we describe the apparent molecular basis of the Ac/ac polymorphism. CYP79D orthologs catalyze the first step in cyanogenic glucoside biosynthesis in other cyanogenic plant species. In white clover, Southern hybridizations indicate that CYP79D15 occurs as a single-copy gene in cyanogenic plants but is absent from the genomes of ac plants. Gene-expression analyses by RT-PCR corroborate this finding. This apparent molecular basis of the Ac/ac polymorphism parallels our previous findings for the Li/li polymorphism, which also arises through the presence/absence of a single-copy gene. The nature of these polymorphisms may reflect white clover's evolutionary origin as an allotetraploid derived from cyanogenic and acyanogenic diploid progenitors.

Additional References

Recurrent gene deletions and the evolution of adaptive cyanogenesis polymorphisms in white clover (Trifolium repens L.). (2013) (https://pubmed.ncbi.nlm.nih.gov/22694056)

## RELATED GEPHE

Related Genes

1 (CYP79D15) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^3899^/and+Trait=Toxicity levels/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

## EXTERNAL LINKS

## COMMENTS