

GEPHE SUMMARY

	Gephebase Gene	GephelD
SG3/At4g30720 (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^SG3/At4g30720^#gephebase-summary-title)	GP00001036	
	Entry Status	Main curator
Published	Martin	

PHENOTYPIC CHANGE

Trait Category		
Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category="Physiology">#gephebase-summary-title)	Trait	
Growth (shoots) (https://www.gephebase.org/search-criteria?/and+Trait=^Growth (shoots)^#gephebase-summary-title)	Trait State in Taxon A	
Arabidopsis thaliana- Bur-0	Trait State in Taxon B	
Arabidopsis thaliana- Col-0	Ancestral State	
Taxon A	Taxonomic Status	
Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status="Intraspecific">#gephebase-summary-title)		
Taxon A	Latin Name	Latin Name
Arabidopsis thaliana (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Arabidopsis+thaliana^#gephebase-summary-title)		
thale cress	Common Name	
thale cress; mouse-ear cress; thale-cress; Arabidopsis thaliana (L.) Heynh.; Arabidopsis thaliana (thale cress); Arabidopsis_thaliana; Arbisopsis thaliana; thale kress	Synonyms	
species	Rank	
cellular organisms; Eukaryota; Viriplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphylophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; rosids; malvids; Brassicales; Brassicaceae; Camelinae; Arabidopsis	Lineage	
Arabidopsis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3701)	Parent	
3702 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3702)	NCBI Taxonomy ID	NCBI Taxonomy ID
Yes	is Taxon A an Infraspecies?	is Taxon B an Infraspecies?
Arabidopsis thaliana- Bur-0	Taxon A Description	Taxon B Description
Taxon B	Latin Name	Latin Name
Arabidopsis thaliana (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Arabidopsis+thaliana^#gephebase-summary-title)		
thale cress	Common Name	
thale cress; mouse-ear cress; thale-cress; Arabidopsis thaliana (L.) Heynh.; Arabidopsis thaliana (thale cress); Arabidopsis_thaliana; Arbisopsis thaliana; thale kress	Synonyms	
species	Rank	
cellular organisms; Eukaryota; Viriplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphylophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; rosids; malvids; Brassicales; Brassicaceae; Camelinae; Arabidopsis	Lineage	
Arabidopsis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3701)	Parent	
3702 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3702)	NCBI Taxonomy ID	
Yes		
Arabidopsis thaliana- Col-0		

GENOTYPIC CHANGE

PDE327	Generic Gene Name	UniProtKB Arabidopsis thaliana
PIGMENT DEFECTIVE 327; T10C21.70; T10C21_70; At4g30720	Synonyms	GenebankID or UniProtKB
3702.AT4G30720.1 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=3702.AT4G30720.1)	String	CP002687 (https://www.ncbi.nlm.nih.gov/nucore/CP002687)
-	Sequence Similarities	
-	GO - Molecular Function	
-	GO - Biological Process	
GO:0015979 : photosynthesis (https://www.ebi.ac.uk/QuickGO/term/GO:0015979)		
	GO - Cellular Component	

GO:0009507 : chloroplast (<https://www.ebi.ac.uk/QuickGO/term/GO:0009507>)

Presumptive Null

Yes ([https://www.gephebase.org/search-criteria?/and+Presumptive Null=%20Yes%23gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Presumptive%20Null=%20Yes%23gephebase-summary-title))

Molecular Type

Coding ([https://www.gephebase.org/search-criteria?/and+Molecular Type=%20Coding%23gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Molecular%20Type=%20Coding%23gephebase-summary-title))

Aberration Type

Deletion ([https://www.gephebase.org/search-criteria?/and+Aberration Type=%20Deletion%23gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Aberration%20Type=%20Deletion%23gephebase-summary-title))

Deletion Size

1-9 bp

Molecular Details of the Mutation

Premature stop codon at the SG3 locus in Bur-0 (a 1bp deletion in exon four of At4g30720 results in a frame shift; predicting a premature stop codon which terminates the ORF after 5 amino acids); but in this accession this gene has a functional copy at a

Experimental Evidence

Linkage Mapping ([https://www.gephebase.org/search-criteria?/and+Experimental Evidence=%20Linkage%20Mapping%23gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Experimental%20Evidence=%20Linkage%20Mapping%23gephebase-summary-title))

Main Reference

Gene transposition causing natural variation for growth in *Arabidopsis thaliana*. (2010) (<https://pubmed.ncbi.nlm.nih.gov/20485571>)

Authors

Vlad D; Rappaport F; Simon M; Loudet O

Abstract

A major challenge in biology is to identify molecular polymorphisms responsible for variation in complex traits of evolutionary and agricultural interest. Using the advantages of *Arabidopsis thaliana* as a model species, we sought to identify new genes and genetic mechanisms underlying natural variation for shoot growth using quantitative genetic strategies. More quantitative trait loci (QTL) still need be resolved to draw a general picture as to how and where in the pathways adaptation is shaping natural variation and the type of molecular variation involved. Phenotypic variation for shoot growth in the Bur-0 x Col-0 recombinant inbred line set was decomposed into several QTLs. Nearly-isogenic lines generated from the residual heterozygosity segregating among lines revealed an even more complex picture, with major variation controlled by opposite linked loci and masked by the segregation bias due to the defective phenotype of SG3 (Shoot Growth-3), as well as epistasis with SG3i (SG3-interactor). Using principally a fine-mapping strategy, we have identified the underlying gene causing phenotypic variation at SG3: At4g30720 codes for a new chloroplast-located protein essential to ensure a correct electron flow through the photosynthetic chain and, hence, photosynthesis efficiency and normal growth. The SG3/SG3i interaction is the result of a structural polymorphism originating from the duplication of the gene followed by divergent parologue's loss between parental accessions. Species-wide, our results illustrate the very dynamic rate of duplication/transposition, even over short periods of time, resulting in several divergent--but still functional-combinations of alleles fixed in different backgrounds. In predominantly selfing species like *Arabidopsis*, this variation remains hidden in wild populations but is potentially revealed when divergent individuals outcross. This work highlights the need for improved tools and algorithms to resolve structural variation polymorphisms using high-throughput sequencing, because it remains challenging to distinguish allelic from paralogous variation at this scale.

Additional References

RELATED GEPHE

Related Genes

13 (AZI1, Brevis radix (BRX), ORGANIC CATION TRANSPORTER 1, Phosphate transporter PHO1, Root System Architecture 1, EARLY FLOWERING 3(ELF3) [possible pseudo-replicate], Enhanced shoot growth under mannitol stress 2 (EGM2), IIL1, TZP, FUMARASE 2, ICARUS1, RPP1, SRF3) (<https://www.gephebase.org/search-criteria?/or+TaxonID=%203702%20/and+Trait=Growth/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

@Epistasis