

GEPHE SUMMARY

|                                                                                                                                                                                                                                           |                |              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------|
| SG3/At4g30720 ( <a href="https://www.gephebase.org/search-criteria?/and+GeneGephebase=^SG3/At4g30720^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+GeneGephebase=^SG3/At4g30720^#gephebase-summary-title</a> ) | Gephebase Gene | GepheID      |
|                                                                                                                                                                                                                                           | GP00001036     |              |
|                                                                                                                                                                                                                                           | Entry Status   | Martin       |
| Published                                                                                                                                                                                                                                 |                | Main curator |

PHENOTYPIC CHANGE

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

GENOTYPIC CHANGE

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|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------------------------------------------------------------------------------------------------------------------------|
| PDE327                                                                                                                                                                                                             | Generic Gene Name       | UniProtKB Arabidopsis thaliana                                                                                         |
| PIGMENT DEFECTIVE 327; T10C21.70; T10C21_70; At4g30720                                                                                                                                                             | Synonyms                | F4JQE2 ( <a href="http://www.uniprot.org/uniprot/F4JQE2">http://www.uniprot.org/uniprot/F4JQE2</a> )                   |
| 3702.AT4G30720.1 ( <a href="http://string-db.org/newstring.cgi/show_network_section.pl?identifier= 3702.AT4G30720.1">http://string-db.org/newstring.cgi/show_network_section.pl?identifier= 3702.AT4G30720.1</a> ) | String                  | GenebankID or UniProtKB                                                                                                |
|                                                                                                                                                                                                                    |                         | CP002687 ( <a href="https://www.ncbi.nlm.nih.gov/nuccore/CP002687">https://www.ncbi.nlm.nih.gov/nuccore/CP002687</a> ) |
| -                                                                                                                                                                                                                  | Sequence Similarities   |                                                                                                                        |
| -                                                                                                                                                                                                                  | GO - Molecular Function |                                                                                                                        |
|                                                                                                                                                                                                                    | GO - Biological Process |                                                                                                                        |
| GO:0015979 : photosynthesis ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0015979">https://www.ebi.ac.uk/QuickGO/term/GO:0015979</a> )                                                                          |                         |                                                                                                                        |
|                                                                                                                                                                                                                    | GO - Cellular Component |                                                                                                                        |

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|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| GO:0009507 : chloroplast ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0009507">https://www.ebi.ac.uk/QuickGO/term/GO:0009507</a> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Presumptive Null                  |
| Yes ( <a href="https://www.gephebase.org/search-criteria?/and+Presumptive Null=~Yes^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Presumptive Null=~Yes^#gephebase-summary-title</a> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Molecular Type                    |
| Coding ( <a href="https://www.gephebase.org/search-criteria?/and+Molecular Type=~Coding^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Molecular Type=~Coding^#gephebase-summary-title</a> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Aberration Type                   |
| Deletion ( <a href="https://www.gephebase.org/search-criteria?/and+Aberration Type=~Deletion^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Aberration Type=~Deletion^#gephebase-summary-title</a> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 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 ( <a href="https://www.gephebase.org/search-criteria?/and+Experimental Evidence=~Linkage Mapping^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Experimental Evidence=~Linkage Mapping^#gephebase-summary-title</a> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Main Reference                    |
| Gene transposition causing natural variation for growth in Arabidopsis thaliana. (2010) ( <a href="https://pubmed.ncbi.nlm.nih.gov/20485571">https://pubmed.ncbi.nlm.nih.gov/20485571</a> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Authors                           |
| Vlad D; Rappaport F; Simon M; Loudet O                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Abstract                          |
| <p>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 paralogue’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.</p> |                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 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), ILL1, TZP, FUMARASE 2, ICARUS1, RPP1, SRF3) ( <a href="https://www.gephebase.org/search-criteria?/or+Taxon ID=~3702^/and+Trait=Growth/and+groupHaplotypes=true#gephebase-summary-title">https://www.gephebase.org/search-criteria?/or+Taxon ID=~3702^/and+Trait=Growth/and+groupHaplotypes=true#gephebase-summary-title</a> ) | Related Haplotypes |
| No matches found.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                    |

EXTERNAL LINKS

COMMENTS

@Epistasis