

|                                                                                                                                                                                                                                                                         |                |            |              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------|--------------|
| FLC (Flowering Locus C) ( <a href="https://www.gephebase.org/search-criteria?/and+GeneGephebase=~FLC+(Flowering+Locus+C)^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+GeneGephebase=~FLC (Flowering Locus C)^#gephebase-summary-title</a> ) | Gephebase Gene | GP00000333 | GepheID      |
| Published                                                                                                                                                                                                                                                               | Entry Status   | Martin     | Main curator |

|                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Trait Category                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                    |
| Physiology ( <a href="https://www.gephebase.org/search-criteria?/and+Trait+Category=~Physiology~#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait+Category=~Physiology~#gephebase-summary-title</a> )                                                 |                                                                                                                                                                                                                                                                                    |
| Trait                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                    |
| Flowering time ( <a href="https://www.gephebase.org/search-criteria?/and+Trait=~Flowering+time~#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait=~Flowering+time~#gephebase-summary-title</a> )                                                       |                                                                                                                                                                                                                                                                                    |
| Trait State in Taxon A                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                    |
| Arabidopsis thaliana- Col0                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                    |
| Trait State in Taxon B                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                    |
| Arabidopsis thaliana- Da(1)-12 and Shakhdera                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                    |
| Ancestral State                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                    |
| Data not curated                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                    |
| Taxonomic Status                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                    |
| Intraspecific ( <a href="https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=~Intraspecific~#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=~Intraspecific~#gephebase-summary-title</a> )                                    |                                                                                                                                                                                                                                                                                    |
| Taxon A                                                                                                                                                                                                                                                                            | Taxon B                                                                                                                                                                                                                                                                            |
| Arabidopsis thaliana<br>( <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<br>( <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> )        |
| Common Name                                                                                                                                                                                                                                                                        | Common Name                                                                                                                                                                                                                                                                        |
| thale cress                                                                                                                                                                                                                                                                        | thale cress                                                                                                                                                                                                                                                                        |
| Synonyms                                                                                                                                                                                                                                                                           | Synonyms                                                                                                                                                                                                                                                                           |
| 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                                                                                                            |
| Rank                                                                                                                                                                                                                                                                               | Rank                                                                                                                                                                                                                                                                               |
| species                                                                                                                                                                                                                                                                            | species                                                                                                                                                                                                                                                                            |
| Lineage                                                                                                                                                                                                                                                                            | Lineage                                                                                                                                                                                                                                                                            |
| 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 |
| Parent                                                                                                                                                                                                                                                                             | Parent                                                                                                                                                                                                                                                                             |
| Arabidopsis () - (Rank: genus)<br>( <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)<br>( <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> )                                                                                              |
| NCBI Taxonomy ID                                                                                                                                                                                                                                                                   | NCBI Taxonomy ID                                                                                                                                                                                                                                                                   |
| 3702<br>( <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<br>( <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> )                                                                                                                        |
| is Taxon A an Intraspecies?                                                                                                                                                                                                                                                        | is Taxon B an Intraspecies?                                                                                                                                                                                                                                                        |
| Yes                                                                                                                                                                                                                                                                                | Yes                                                                                                                                                                                                                                                                                |
| Taxon A Description                                                                                                                                                                                                                                                                | Taxon B Description                                                                                                                                                                                                                                                                |
| Arabidopsis thaliana- Col0                                                                                                                                                                                                                                                         | Arabidopsis thaliana- Da(1)-12 and Shakhdera                                                                                                                                                                                                                                       |

| FLC                                                                                                                                                                                                                 | Generic Gene Name       | UniProtKB Arabidopsis thaliana                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                     | Synonyms                | Q9S7Q7 ( <a href="http://www.uniprot.org/uniprot/Q9S7Q7">http://www.uniprot.org/uniprot/Q9S7Q7</a> )                 |
| AGAMOUS-like 25; AGL25; FLF; FLOWERING LOCUS C; FLOWERING LOCUS F; MADS BOX PROTEIN FLOWERING LOCUS F; REDUCED STEM BRANCHING 6; RSB6; T31P16.130; T31P16_130; At5g10140                                            |                         | GenebankID or UniProtKB                                                                                              |
|                                                                                                                                                                                                                     | String                  | AF116528 ( <a href="https://www.ncbi.nlm.nih.gov/nucore/AF116528">https://www.ncbi.nlm.nih.gov/nucore/AF116528</a> ) |
| 3702.AT5G10140.1<br>( <a href="http://string-db.org/newstring.cgi/show_network_section.pl?identifier=3702.AT5G10140.1">http://string-db.org/newstring.cgi/show_network_section.pl?identifier=3702.AT5G10140.1</a> ) |                         |                                                                                                                      |
|                                                                                                                                                                                                                     | Sequence Similarities   |                                                                                                                      |
| -                                                                                                                                                                                                                   |                         |                                                                                                                      |
|                                                                                                                                                                                                                     | GO - Molecular Function |                                                                                                                      |
| GO:0046983 : protein dimerization activity<br>( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0046983">https://www.ebi.ac.uk/QuickGO/term/GO:0046983</a> )                                                         |                         |                                                                                                                      |

GO:0003700 : DNA-binding transcription factor activity  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0003700>)  
GO:0000977 : RNA polymerase II regulatory region sequence-specific DNA binding  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0000977>)  
GO:0043565 : sequence-specific DNA binding  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0043565>)  
GO:0008134 : transcription factor binding  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0008134>)  
GO:0000982 : transcription factor activity, RNA polymerase II proximal promoter  
sequence-specific DNA binding (<https://www.ebi.ac.uk/QuickGO/term/GO:0000982>)  
GO:0044212 : transcription regulatory region DNA binding  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0044212>)

GO - Biological Process

GO:0007275 : multicellular organism development  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0007275>)  
GO:0045944 : positive regulation of transcription by RNA polymerase II  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0045944>)  
GO:0030154 : cell differentiation (<https://www.ebi.ac.uk/QuickGO/term/GO:0030154>)  
GO:0009908 : flower development (<https://www.ebi.ac.uk/QuickGO/term/GO:0009908>)  
GO:0009910 : negative regulation of flower development  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0009910>)  
GO:0042752 : regulation of circadian rhythm  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0042752>)  
GO:0009266 : response to temperature stimulus  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0009266>)  
GO:0010048 : vernalization response  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0010048>)

GO - Cellular Component

GO:0005634 : nucleus (<https://www.ebi.ac.uk/QuickGO/term/GO:0005634>)

Presumptive Null

Unknown (<https://www.gephebase.org/search-criteria?/and+Presumptive Null=~Unknown~#gephebase-summary-title>)

Molecular Type

Cis-regulatory (<https://www.gephebase.org/search-criteria?/and+Molecular Type=~Cis-regulatory~#gephebase-summary-title>)

Aberration Type

Unknown (<https://www.gephebase.org/search-criteria?/and+Aberration Type=~Unknown~#gephebase-summary-title>)

Molecular Details of the Mutation

Not identified

Experimental Evidence

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

Main Reference

Attenuation of FLOWERING LOCUS C activity as a mechanism for the evolution of summer-annual flowering behavior in Arabidopsis. (2003) (<https://pubmed.ncbi.nlm.nih.gov/12904584>)

Authors

Michaels SD; He Y; Scortecci KC; Amasino RM

Abstract

Plant species have evolved a wide variety of flowering habits, each adapted to maximize reproductive success in their local environment. Even within a species, accessions from different environments can exhibit markedly different flowering behavior. In Arabidopsis, some accessions are rapid-cycling summer annuals, whereas others accessions are late flowering and vernalization responsive and thus behave as winter annuals. Two genes, FLOWERING LOCUS C (FLC) and FRIGIDA (FRI), interact synergistically to confer the winter-annual habit. Previous work has shown that many summer-annual accessions contain null mutations in the FRI gene; thus it appears that these summer-annual accessions have arisen from winter-annual ancestors by losing FRI function. In this work we demonstrate that naturally occurring allelic variation in FLC has provided another route to the evolution of summer-annual flowering behavior in Arabidopsis. We have identified two summer-annual accessions, Da (1)-12 and Shakh dara, that contain functional alleles of FRI, but are early flowering because of weak alleles of FLC. We have also determined that the weak allele of FLC found in Landsberg erecta is naturally occurring. Unlike accessions that have arisen because of loss-of-function mutations in FRI, the FLC alleles from Da (1)-12, Shakh dara, and Landsberg erecta are not nulls; however, they exhibit lower steady-state mRNA levels than strong alleles of FLC. Sequence analysis indicates that these weak alleles of FLC have arisen independently at least twice during the course of evolution.

Additional References

Adaptive divergence in flowering time among natural populations of Arabidopsis thaliana: Estimates of selection and QTL mapping. (2017) (<https://pubmed.ncbi.nlm.nih.gov/27859214>)

RELATED GEPHE

Related Genes

12 (AGAMOUS-LIKE 50, Cryptochrome 2 (CRY2) EDI allele, EARLY FLOWERING 3(ELF3), FLM (MAF1), Flowering locus T (FT), Frigida (FRI), Frigida like 1 (FRL1), Frigida like 2 (FRL2), MADS AFFECTING FLOWERING 2 (MAF2), SVP (SHORT VEGETATIVE PHASE), VIN3, HUA2) (<https://www.gephebase.org/search-criteria?/or+Taxon ID=~3702~/and+Trait=Flowering time/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

6 ([https://www.gephebase.org/search-criteria?/or+Gene Gephebase=~FLC \(Flowering Locus C\)~/and+Taxon ID=~3702~/or+Gene Gephebase=~FLC \(Flowering Locus C\)~/and+Taxon ID=~3702~#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene Gephebase=~FLC (Flowering Locus C)~/and+Taxon ID=~3702~/or+Gene Gephebase=~FLC (Flowering Locus C)~/and+Taxon ID=~3702~#gephebase-summary-title))

EXTERNAL LINKS

COMMENTS

