

GEPHE SUMMARY

| | | | |
|--|----------------|------------|--------------|
| two pore channel (https://www.gephebase.org/search-criteria/?and+Gene+Gephebase^two+pore+channel^#gephebase-summary-title) | Gephebase Gene | GP00001433 | GephelD |
| Published | Entry Status | Prigent | Main curator |
| | | | |

PHENOTYPIC CHANGE

| Trait Category | | | |
|--|---|---|-----------------------------|
| Physiology (https://www.gephebase.org/search-criteria/?and+Trait+Category^Physiology^#gephebase-summary-title) | Trait | | |
| Xenobiotic resistance (soil contamination; serpentine) (https://www.gephebase.org/search-criteria/?and+Trait=Xenobiotic+resistance+(soil+contamination;+serpentine)^#gephebase-summary-title) | | | |
| Arabidopsis arenosa Hochlantsch & Kasperstein populations not adapted to serpentine | Trait State in Taxon A | | |
| Arabidopsis arenosa Gulsen population adapted to serpentine | Trait State in Taxon B | | |
| Taxon A | Ancestral State | | |
| Taxonomic Status | | | |
| Intraspecific (https://www.gephebase.org/search-criteria/?and+Taxonomic+Status^Intraspecific^#gephebase-summary-title) | | | |
| Taxon A | | Taxon B | |
| Arabidopsis arenosa | Latin Name | Arabidopsis arenosa | Latin Name |
| (https://www.gephebase.org/search-criteria/?and+Taxon+and+Synonyms^Arabidopsis+arenosa^#gephebase-summary-title) | | (https://www.gephebase.org/search-criteria/?and+Taxon+and+Synonyms^Arabidopsis+arenosa^#gephebase-summary-title) | |
| - | Common Name | - | Common Name |
| Arabis arenosa; Cardaminopsis arenosa; Arabidopsis arenosa (L.) Lawalree; Arabis arenosa (L.) Scop.; Cardaminopsis arenosa (L.) Hayek. | Synonyms | Arabis arenosa; Cardaminopsis arenosa; Arabidopsis arenosa (L.) Lawalree; Arabis arenosa (L.) Scop.; Cardaminopsis arenosa (L.) Hayek. | Synonyms |
| species | Rank | species | Rank |
| cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; rosids; malvids; Brassicales; Brassicaceae; Camelinae; Arabidopsis | Lineage | cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; rosids; malvids; Brassicales; Brassicaceae; Camelinae; Arabidopsis | Lineage |
| Arabidopsis () - (Rank: genus) | Parent | Arabidopsis () - (Rank: genus) | Parent |
| (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3701) | | (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3701) | |
| 38785 | NCBI Taxonomy ID | 38785 | NCBI Taxonomy ID |
| (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=38785) | | (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=38785) | |
| Yes | is Taxon A an Infraspecies? | Yes | is Taxon B an Infraspecies? |
| | Taxon A Description | | Taxon B Description |
| Arabidopsis arenosa Hochlantsch & Kasperstein populations not adapted to serpentine | Arabidopsis arenosa Gulsen population adapted to serpentine | | |

GENOTYPIC CHANGE

| Generic Gene Name | | | |
|---|-------------------------|--|--------------------------------|
| TPC1 | Synonyms | Q94K18 (http://www.uniprot.org/uniprot/Q94K18) | UniProtKB Arabidopsis thaliana |
| ATCCH1; ATTPC1; CALCIUM CHANNEL 1; FATTY ACID OXYGENATION UPREGULATED 2; FOU2; T5L23.5; two-pore channel 1; two-pore channel 1; CCH1; At4g03560; F9H3.19 | | 0 | GenebankID or UniProtKB |
| 3702.AT4G03560.1 | String | | |
| (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=3702.AT4G03560.1) | | | |
| Belongs to the calcium channel alpha-1 subunit (TC 1.A.1.11) family. Two pore calcium channel subfamily. | Sequence Similarities | | |
| | GO - Molecular Function | | |

GO:0042802 : identical protein binding
(<https://www.ebi.ac.uk/QuickGO/term/GO:0042802>)
GO:0005509 : calcium ion binding (<https://www.ebi.ac.uk/QuickGO/term/GO:0005509>)
GO:0005245 : voltage-gated calcium channel activity
(<https://www.ebi.ac.uk/QuickGO/term/GO:0005245>)

GO - Biological Process

GO:0019722 : calcium-mediated signaling
(<https://www.ebi.ac.uk/QuickGO/term/GO:0019722>)
GO:0010119 : regulation of stomatal movement
(<https://www.ebi.ac.uk/QuickGO/term/GO:0010119>)
GO:0034765 : regulation of ion transmembrane transport
(<https://www.ebi.ac.uk/QuickGO/term/GO:0034765>)
GO:0006816 : calcium ion transport (<https://www.ebi.ac.uk/QuickGO/term/GO:0006816>)
GO:0080141 : regulation of jasmonic acid biosynthetic process
(<https://www.ebi.ac.uk/QuickGO/term/GO:0080141>)
GO:0009845 : seed germination (<https://www.ebi.ac.uk/QuickGO/term/GO:0009845>)

GO - Cellular Component

GO:0016021 : integral component of membrane
(<https://www.ebi.ac.uk/QuickGO/term/GO:0016021>)
GO:0005886 : plasma membrane (<https://www.ebi.ac.uk/QuickGO/term/GO:0005886>)
GO:0005774 : vacuolar membrane (<https://www.ebi.ac.uk/QuickGO/term/GO:0005774>)
GO:0005794 : Golgi apparatus (<https://www.ebi.ac.uk/QuickGO/term/GO:0005794>)
GO:0005773 : vacuole (<https://www.ebi.ac.uk/QuickGO/term/GO:0005773>)
GO:0000325 : plant-type vacuole (<https://www.ebi.ac.uk/QuickGO/term/GO:0000325>)

Presumptive Null

Unknown (<https://www.gephebase.org/search-criteria?/and+Presumptive+Null=%27Unknown%27#gephebase-summary-title>)

Molecular Type

Unknown (<https://www.gephebase.org/search-criteria?/and+Molecular+Type=%27Unknown%27#gephebase-summary-title>)

Aberration Type

Unknown (<https://www.gephebase.org/search-criteria?/and+Aberration+Type=%27Unknown%27#gephebase-summary-title>)

Molecular Details of the Mutation

unknown

Experimental Evidence

Association Mapping (<https://www.gephebase.org/search-criteria?/and+Experimental+Evidence=%27Association+Mapping%27#gephebase-summary-title>)

Main Reference

Borrowed alleles and convergence in serpentine adaptation. (2016) (<https://pubmed.ncbi.nlm.nih.gov/27357660>)

Authors

Arnold BJ; Lahner B; DaCosta JM; Weisman CM; Hollister JD; Salt DE; Bomblies K; Yant L

Abstract

Serpentine barrens represent extreme hazards for plant colonists. These sites are characterized by high porosity leading to drought, lack of essential mineral nutrients, and phytotoxic levels of metals. Nevertheless, nature forged populations adapted to these challenges. Here, we use a population-based evolutionary genomic approach coupled with elemental profiling to assess how autotetraploid *Arabidopsis arenosa* adapted to a multichallenge serpentine habitat in the Austrian Alps. We first demonstrate that serpentine-adapted plants exhibit dramatically altered elemental accumulation levels in common conditions, and then resequence 24 autotetraploid individuals from three populations to perform a genome scan. We find evidence for highly localized selective sweeps that point to a polygenic, multtrait basis for serpentine adaptation. Comparing our results to a previous study of independent serpentine colonizations in the closely related diploid *Arabidopsis lyrata* in the United Kingdom and United States, we find the highest levels of differentiation in 11 of the same loci, providing candidate alleles for mediating convergent evolution. This overlap between independent colonizations in different species suggests that a limited number of evolutionary strategies are suited to overcome the multiple challenges of serpentine adaptation. Interestingly, we detect footprints of selection in *A. arenosa* in the context of substantial gene flow from nearby off-serpentine populations of *A. arenosa*, as well as from *A. lyrata*. In several cases, quantitative tests of introgression indicate that some alleles exhibiting strong selective sweep signatures appear to have been introgressed from *A. lyrata*. This finding suggests that migrant alleles may have facilitated adaptation of *A. arenosa* to this multihazard environment.

Additional References

RELATED GEPHE

Related Genes

9 (ammonium transporter 2;1, calmodulin binding hydrolase, Caspary strip membrane domain protein 1, early responsive to dehydration stress protein 4, Ferroportin 2, high expression of osmotically responsive genes 2, K⁺ uptake permease 9, LACCASE 8, sulfate transporter 1;1) (<https://www.gephebase.org/search-criteria?/or+Taxon+ID=%2738785%27/and+Trait=Xenobiotic+resistance/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

@Introgression convergence with *A. lyrata*

