Arbuscular Mycorrhizal Colonization Defines Root Ecological Strategies in an Extreme Arid Environment

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Table S1. Details of the location and climatic characteristics of the six study sites. The De Martonne aridity index (DEMAI) was calculated as MAP/ (MAT + 10); thus, a lower DEMAI value indicates higher aridity. The climate data (mean annual precipitation, MAP; mean annual temperature, MAT) were sourced from Dirección General de Aguas, Chile (http://snia.dga.cl/BNAConsultas/reportes) and from CEAZA-Met weather station (www.ceazamet.cl)

Site	Acronym	Coordinates	MAP (mm)	MAT (ºC)	DEMAI
Pan de Azúcar	**PAN**	26º08'S, 70º39'W	4	22.9	0.1
Quebrada El León	**QL**	26º57'S, 70º45'W	14	17.2	0.5
Llanos de Challe	**LLA**	27º59'S, 71º07'W	28	16.6	1.1
Chañaral de Aceituno	**CHA**	29º06'S, 71º27'W	45	16.1	1.7
Porotitos	**PO**	29º43'S, 71º19'W	80	15.3	3.2
Fray Jorge	**FJ**	30º38'S, 71º40'W	147	13.6	6.2

Table S2. Mean and standard error of the mean (SE) for arbuscular mycorrhizal colonization and root traits measured in 32 shrub species in the coastal Atacama Desert (Chile). RD, root diameter; RTD, root tissue density; SRA, specific root area; SRL, specific root length; RDMC, root dry matter content; RNC, root N content; RC:N, root C:N ratio; RCC, root C content; colM: AM colonization. FJ, Fray Jorge; PO, Porotitos; CHA, Chañaral de Aceituno; LLA, Llanos de Challe; QL, Quebrada El León; PAN, Pan de Azúcar.

Order	Family	Species	Site	colM (%)	RD (mm)	SRL (m gr^{-1})	SRA (cm^2 gr^{-1})	RTD (g cm^{-3})	RDMC (mg gr^{-1})	RNC (%)	RCC (%)	RC:N
Asterales	Asteraceae	*Baccharis paniculata* DC.	FJ - PO	76 ± 8	0.70 ± 0.05	6.33 ± 0.83	122.75 ± 9.10	0.52 ± 0.04	447.32 ± 24.16	1.53 ± 0.08	39.75 ± 1.15	26.61 ± 1.28
Asterales	Asteraceae	*Bahia ambrosioides* Lag.	PO	80 ± 10	0.67 ± 0.09	5.54 ± 1.18	104.91 ± 15.44	0.65 ± 0.11	483.5 ± 68.36	0.93 ± 0.04	40.60 ± 1.70	43.75 ± 1.66
Asterales	Asteraceae	*Chuquiraga ulicina* (Hook. & Arn.) Hook. & Arn.	CHA - QL	66 ± 10	0.61 ± 0.05	6.38 ± 0.92	111.74 ± 12.47	0.66 ± 0.05	493.03 ± 22.80	0.83 ± 0.06	45.42 ± 3.91	56.77 ± 7.55
Asterales	Asteraceae	*Encelia canescens* Lam.	CHA – LLA - QL	86 ± 6	0.62 ± 0.03	6.49 ± 1.11	167.79 ± 45.42	0.75 ± 0.11	494.63 ± 36.21	1.27 ± 0.17	44.95 ± 1.13	41.64 ± 4.68
Asterales	Asteraceae	*Erigeron fasciculatus* Colla	PO	100 ± 0	0.65 ± 0.06	8.14 ± 1.47	158.04 ± 14.88	0.41 ± 0.03	311.44 ± 12.70	1.17 ± 0.28	42.91 ± 1.04	40.98 ± 9.21
Asterales	Asteraceae	*Gutierrezia resinosa* (Hook. & Arn.) S.F. Blake	FJ – PO	91 ± 4	0.64 ± 0.04	7.22 ± 1.19	125.50 ± 16.46	0.50 ± 0.03	409.93 ± 24.66	0.67 ± 0.06	42.56 ± 0.89	66.61 ± 6.03
Asterales	Asteraceae	*Gypothamnium pinifolium* Phil.	PAN	72 ± 17	0.63 ± 0.03	8.36 ± 1.17	162.88 ± 20.59	0.42 ± 0.05	629.51 ± 23.94	0.98 ± 0.09	41.64 ± 6.04	45.53 ± 9.87
Asterales	Asteraceae	*Haplopappus parvifolius* (DC.) Gay	PO	76 ± 15	0.72 ± 0.07	4.55 ± 0.46	97.79 ± 6.13	0.60 ± 0.06	485.31 ± 30.23	1.21 ± 0.10	41.86 ± 0.16	35.52 ± 2.97

Asterales	Asteraceae	*Ophryosporus paradoxus* (Hook. & Arn.) Benth. & Hook. ex B.D. Jacks.	PO	44 ± 17	0.72 ± 0.06	6.49 ± 1.39	138.13 ± 17.59	0.43 ± 0.04	339.93 ± 21.26	1.42 ± 0.25	40.46 ± 0.43	30.69 ± 6.51
Asterales	Asteraceae	*Ophryosporus triangularis* Meyen	LLA	56 ± 9	0.62 ± 0.04	9.15 ± 2.21	169.63 ± 32.04	0.42 ± 0.05	294.23 ± 66.89	1.09 ± 0.26	42.37 ± 1.39	42.29 ± 7.38
Asterales	Asteraceae	*Polyachyrus fuscus* (Meyen) Walp.	LLA - QL	85 ± 5	0.88 ± 0.06	6.57 ± 1.81	153.45 ± 26.04	0.36 ± 0.03	294.45 ± 41.44	0.81 ± 0.07	42.23 ± 1.44	53.64 ± 4.54
Asterales	Asteraceae	*Polyachyrus poeppigii* Kuntze ex Less.	PO	72 ± 16	0.80 ± 0.11	5.13 ± 1.94	103.45 ± 14.81	0.54 ± 0.04	421.35 ± 33.50	0.89 ± 0.25	43.12 ± 0.94	56.18 ± 13.8
Asterales	Asteraceae	*Proustia cuneifolia* D. Don	FJ	38 ± 13	0.48 ± 0.06	9.44 ± 1.52	128.75 ± 14.66	0.70 ± 0.04	633.04 ± 36.16	1.83 ± 0.39	42.35 ± 1.99	27.6 ± 5.90
Boraginales	Heliotropiaceae	*Heliotropium floridum* (A. DC.) Clos	LLA – QL	78 ± 9	0.41 ± 0.03	10.64 ± 2.25	121.32 ± 17.04	0.90 ± 0.06	561.48 ± 29.07	1.14 ± 0.12	37.90 ± 1.64	36.5 ± 5.19
Boraginales	Heliotropiaceae	*Heliotropium pycnophyllum* Phil.	PA	62 ± 18	0.44 ± 0.08	11.56 ± 4.54	117.21 ± 25.04	0.94 ± 0.07	540.54 ± 37.77	1.77 ± 0.24	38.01 ± 1.53	22.88 ± 2.69
Caryophyllales	Aizoaceae	*Tetragonia angustifolia* Barnéoud	QL - PA	63 ± 13	0.40 ± 0.03	14.84 ± 3.02	158.49 ± 23.61	0.80 ± 0.08	563.71 ± 21.15	1.25 ± 0.10	32.10 ± 1.06	27.29 ± 2.56
Caryophyllales	Aizoaceae	*Tetragonia maritima* Barnéoud	CHA	72 ± 15	0.58 ± 0.04	5.39 ± 0.83	95.64 ± 12.76	0.76 ± 0.07	699.74 ± 39.90	1.24 ± 0.13	35.33 ± 1.67	30.11 ± 3.92

Caryophyllales	Chenopodiaceae	*Atriplex clivicola* I.M. Johnst.	LLA	20 ± 12	0.41 ± 0.03	12.66 ± 2.88	153.39 ± 29.51	0.81 ± 0.19	596.57 ± 43.40	1.41 ± 0.08	39.5 ± 1.31	28.44 ± 1.99
Caryophyllales	Chenopodiaceae	*Chenopodium petiolare* Kunth	FJ	48 ± 7	0.48 ± 0.07	10.58 ± 2.37	143.55 ± 24.20	0.65 ± 0.06	448.97 ± 22.43	1.00 ± 0.24	38.4 ± 2.38	42.41 ± 8.97
Caryophyllales	Frankeniaceae	*Frankenia chilensis* K. Presl	LLA	46 ± 9	0.40 ± 0.02	10.10 ± 1.91	126.08 ± 26.47	0.93 ± 0.16	450.33 ± 38.68	0.66 ± 0.08	36.55 ± 6.46	58.84 ± 15.05
Caryophyllales	Polygonaceae	*Chorizanthe desertícola* Phil.	CHA	18 ± 7	0.43 ± 0.06	11.03 ± 3.93	122.49 ± 29.87	0.92 ± 0.10	657.60 ± 28.47	0.66 ± 0.06	47.75 ± 0.62	74.96 ± 6.61
Caryophyllales	Polygonaceae	*Chorizanthe frankenioides* J. Remy	PO	92 ± 4	0.75 ± 0.12	4.24 ± 1.57	78.42 ± 9.17	0.75 ± 0.08	535.74 ± 71.92	0.61 ± 0.03	40.72 ± 1.09	66.85 ± 3.53
Fabales	Fabaceae	*Adesmia bedwellii* Skottsb.	FJ	24 ± 16	0.58 ± 0.06	6.88 ± 1.28	111.69 ± 9.66	0.64 ± 0.02	555.79 ± 38.54	2.22 ± 0.38	42.20 ± 1.87	21.67 ± 4.32
Fabales	Fabaceae	*Senna cumingii* (Hook. & Arn.) H.S. Irwin & Barneby	PO	80 ± 15	0.79 ± 0.04	3.97 ± 0.53	93.86 ± 10.30	0.59 ± 0.05	638.79 ± 41.63	1.44 ± 0.24	42.02 ± 3.27	32.94 ± 5.91
Gentianales	Apocynaceae	*Skytanthus acutus* Meyen	LLA – QL - PAN	64 ± 9	0.60 ± 0.03	6.52 ± 0.95	111.54 ± 11.3	0.77 ± 0.1	528.29 ± 35.12	1.04 ± 0.07	39.29 ± 2.18	40.39 ± 4.56
Geraniales	Francoaceae	*Balbisia peduncularis* (Lindl.) D. Don	LLA	84 ± 8	0.50 ± 0.02	7.90 ± 0.81	119.57 ± 7.65	0.69 ± 0.03	588.84 ± 19.81	0.62 ± 0.05	43.72 ± 0.53	72.74 ± 5.89
Malvales	Malvaceae	*Cristaria aspera* Gay	QL	97 ± 2	0.81 ± 0.07	5.03 ± 1.33	103.42 ± 16.51	0.55 ± 0.03	390.69 ± 21.76	0.82 ± 0.07	37.41 ± 0.92	47.23 ± 3.64
Malvales	Malvaceae	*Cristaria glaucophylla*	FJ - PO	88 ± 12	0.68 ± 0.04	5.88 ± 1.22	124.59 ± 25.67	0.56 ± 0.11	372.51 ± 50.24	1.32 ± 0.24	40.60 ± 0.89	33.26 ± 7.35

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Oxalidales	Oxalidaceae	*Oxalis gigantea* Barnéoud	PO - LLA	45 ± 15	0.42 ± 0.02	11.51 ± 1.22	144.96 ± 15.68	0.72 ± 0.08	409.34 ± 29.2	0.86 ± 0.08	47.85 ± 0.81	58.14 ± 5.65
Solanales	Solanaceae	*Lycium chilense* Miers ex Bertero	FJ	70 ± 14	0.66 ± 0.09	8.18 ± 2.64	146.68 ± 29.69	0.46 ± 0.04	438.84 ± 46.59	2.05 ± 0.27	43.8 ± 0.89	21.94 ± 2.37
Solanales	Solanaceae	*Nolana divaricata* (Lindl.) I.M. Johnst.	CHA	74 ± 15	0.65 ± 0.09	10.93 ± 3.6	180.43 ± 42.61	0.44 ± 0.06	500.50 ± 77.56	1.19 ± 0.11	38.04 ± 1.92	33.48 ± 4.27
Solanales	Solanaceae	*Nolana sedifolia* Poepp.	CHA	38 ± 16	0.56 ± 0.05	11.08 ± 2.18	182.43 ± 20.04	0.41 ± 0.03	387.33 ± 67.15	1.74 ± 0.17	40.66 ± 1.04	23.87 ± 2.75

Table S3. Phylogenetic signals Blomberg's *K* and Pagel λ of the eight root traits, Arbuscular mycorrhizal colonization for all species, and the two phylogenetical principal component axes. Bold is indicative of a significant phylogenetic signal. RD, root diameter; RTD, root tissue density; SRA, specific root area; SRL, specific root length; RDMC, root dry matter content; RNC, root N content; RC:N, root C:N ratio; RCC, root C content; colM: AM colonization.

Trait	Blomberg's *K*	P-value	Pagel's λ	P-value
RD	0.13	0.079	0.47	**0.035**
SRL	0.15	0.062	0.29	0.158
SRA	0.03	0.752	0.10	0.779
RTD	0.09	0.212	0.77	**<0.001**
RNC	0.13	0.078	0.32	0.399
RCC	0.21	**0.021**	0.73	**0.005**
RC:N	0.18	**0.036**	0.66	**0.028**
RDMC	0.06	0.365	0.27	0.223
colM	0.12	0.133	0.18	0.505
PC1	0.02	0.815	0.25	0.223
PC2	0.14	0.059	0.43	0.162

Figure S1. Microscopy images (Nikon Eclipse E200, 400× magnification) of arbuscular mycorrhizal colonization in six shrub species from the Coastal Atacama Desert. a) *Tetragonia angustifolia* (QL) b) *Atriplex clivicola* (LLA) c) *Chorizanthe deserticola* (PO), d) *Chenopodium petiolare* FJ e) *Heliotropium floridum* (LLA) and f) *Skythantus acutus* (PA).