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Appendix 1

Table A1.Thirteen mean trait values of in the planted experiment. ANGE = *Andropogon gerardii,* ASTU = *Asclepias tuberosa,* DECA = *Desmodium canadense,* ELCA = *Elymus canadensis,* ELTR = *Elymus trachycaulus,* LECA = *Lespedeza capitata,* MOFI = *Monarda fistulosa,* PEHI = *Penstemon hirsutus,* PYTE = *Pycnanthemum tenuifolium,* PYVI = *Pycnanthemum virginianum,* RUHI = *Rudbeckia hirta*, SCSC = *Schizachyrium scoparium,* SOAL = *Solidago altisima,* SONE = *Solidago nemoralis*. SLA = specific leaf area; SRL = specific root length; RRL = relative root length.

Traits	ANGE	ASTU	DECA	ELCA	ELTR	LECA	MOFI	PEHI	PYTE	PYVI	RUHI	SCSC	SOAL	SONE
SLA ($cm^2\ g^{-1}$)	17.53	16.20	18.31	15.22	14.80	12.24	13.81	14.75	12.97	16.98	16.92	18.42	11.08	14.21
filamentous root	1.00	0.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
branching root	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
tap root	0.00	1.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00
SRL ($cm\ g^{-1}$)	11.98	42.13	22.82	19.25	10.58	46.46	35.19	182.59	45.76	25.84	20.94	20.83	10.27	40.20
root investment	5.74	19.54	7.52	1.38	1.40	4.42	1.72	0.39	1.16	3.30	1.96	1.21	0.40	0.52
leafiness (leaves cm^{-1})	0.54	3.05	1.52	1.09	1.03	2.03	2.24	2.27	3.29	3.89	1.27	1.66	0.65	1.32
branchiness (branches cm^{-1})	0.00	0.00	0.51	0.00	0.00	0.62	0.12	0.19	0.10	0.03	0.10	0.00	0.25	0.15
stem strength	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.05	0.02

RRL	2.73	4.53	3.78	2.46	1.97	4.46	6.51	7.52	9.14	4.62	4.96	3.00	0.99	7.93
seed mass (mg)	2.45	6.08	5.22	5.73	3.59	2.65	0.32	0.08	0.05	0.10	0.31	1.62	0.18	0.23
field height (cm)	114.98	57.26	104.19	94.25	86.14	72.72	97.65	50.00	53.01	66.98	69.63	52.38	114.69	54.16
toughness (g mm^{-1})	106.20	54.30	40.75	218.63	123.13	64.10	35.25	55.50	162.50	110.50	37.17	102.67	53.55	33.42
relative abundance (%)	17.4	3.2	12.7	6.5	1.7	1.1	12.9	2.2	0.1	0.8	6.0	2.8	30.0	2.7

Table A2. Five mean trait values of four functional groups in the functional group removal experiment measured in 2011. A = Poaceae and Cyperaceae, B = Asteraceae, C = Fabaceae, D = Forbs.

Traits	A	B	C	D
Maxium plant height (cm)	54.57	36.70	26.21	31.07
Leaf phosphorus content (mg g^{-1})	0.29	0.23	0.18	0.23
Leaf nitrogen content (mg g^{-1})	2.12	2.36	3.87	2.91
Per capita seed mass (mg)	1.34	0.56	1.32	1.67
Specific leaf area (cm^2 g^{-1})	222.20	210.34	211.83	181.46
relative abundance (%)	49.4	12.1	7.3	31.1

Table A3. Results of linear models explaining the complementarity effect (CE) and the selection effect (SE) in 2012 in the planted experiment. Independent variable include: mean pairwise phylogenetic distance based on abundance (MPD_a), community weighted mean (CWM) trait values of the 13 single traits, functional dispersion (FD_{is}) of the 13 single traits, and all traits together [$FD_{is(all)}$], and linear mixed models to explain the complementarity effect (CE) and the selection effect (SE) from 2011–2014 in the functional group removal experiment with mean pairwise phylogenetic distance based on abundance (MPD_a), or community weighted mean (CWM) trait values of the 5 single traits, functional dispersion (FD_{is}) of the 5 single traits, or all traits together [$FD_{is(all)}$] as fixed factors, and year crossed plot as random factors. Shown are the Akaike's information criterion corrected for small samples (AIC_c), change in AIC_c relative to the top-ranked model (ΔAIC_c), AIC_c weight ($wAIC_c$, model probability), R^2 in linear models, variance explained by the fixed effects (R^2_m, marginal R^2 values) and variance explained by the fixed and random effects (R^2_c, conditional R^2 values) in linear mixed models. SLA = specific leaf area; SRL = specific root length; RRL = relative root length; H_{max} = maximum height; P = leaf phosphorus content; N = leaf nitrogen content.

Responses	Predictors	AIC_c	ΔAIC_c	$wAIC_c$	R^2_m (or R^2)	R^2_c
Planted experiment						
CE	MPD_a	352.566	0.000	0.666	0.41	N.A.
	$FD_{is(branchiness)}$	354.005	1.439	0.325	0.38	N.A.
	$FD_{is(SLA)}$	362.593	10.027	0.004	0.24	N.A.
	$FD_{is(all)}$	364.517	11.951	0.002	0.20	N.A.
	$FD_{is(filamentous\ root)}$	365.752	13.186	0.001	0.17	N.A.
	$CWM_{(branchiness)}$	366.667	14.101	0.001	0.16	N.A.
	$FD_{is(stem\ strength)}$	368.159	15.593	<0.001	0.12	N.A.
	$FD_{is(root\ investment)}$	368.559	15.993	<0.001	0.11	N.A.
	$FD_{is(seed\ mass)}$	368.888	16.322	<0.001	0.11	N.A.

	$FD_{is(toughness)}$	370.124	17.559	<0.001	0.08	N.A.
	$FD_{is(tap\ root)}$	370.846	18.281	<0.001	0.06	N.A.
	$CWM_{(branching\ root)}$	371.045	18.479	<0.001	N.A.	N.A.
	~1	371.045	18.479	<0.001	N.A.	N.A.
	$CWM_{(toughness)}$	372.339	19.773	<0.001	0.03	N.A.
	$CWM_{(filamentous\ root)}$	372.405	19.839	<0.001	0.02	N.A.
	$FD_{is(field\ height)}$	372.515	19.949	<0.001	0.02	N.A.
	$FD_{is(leafiness)}$	372.566	20.000	<0.001	0.02	N.A.
	$CWM_{(leafiness)}$	372.647	20.081	<0.001	0.02	N.A.
	$FD_{is(branching\ root)}$	372.775	20.210	<0.001	0.02	N.A.
	$CWM_{(tap\ root)}$	372.923	20.357	<0.001	0.01	N.A.
	$FD_{is(RRL)}$	372.972	20.407	<0.001	0.01	N.A.
	$CWM_{(SRL)}$	373.125	20.560	<0.001	0.01	N.A.
	$CWM_{(seed\ mass)}$	373.157	20.592	<0.001	0.01	N.A.
	$CWM_{(RRL)}$	373.322	20.757	<0.001	<0.01	N.A.
	$CWM_{(stem\ strength)}$	373.324	20.758	<0.001	<0.01	N.A.
	$CWM_{(field\ height)}$	373.342	20.776	<0.001	<0.01	N.A.
	$CWM_{(root\ investment)}$	373.347	20.781	<0.001	<0.01	N.A.
	$CWM_{(SLA)}$	373.378	20.813	<0.001	<0.01	N.A.
	$FD_{is(SRL)}$	373.385	20.820	<0.001	<0.01	N.A.
SE	$FD_{is(field\ height)}$	365.284	0.000	0.796	0.27	N.A.
	$CWM_{(field\ height)}$	371.350	6.066	0.038	0.15	N.A.
	$FD_{is(all)}$	371.460	6.176	0.036	0.14	N.A.

$FD_{is(toughness)}$	372.331	7.048	0.023	0.12	N.A.
$FD_{is(leafiness)}$	372.587	7.303	0.021	0.12	N.A.
$FD_{is(SRL)}$	374.182	8.898	0.009	0.08	N.A.
$FD_{is(seed\ mass)}$	374.895	9.612	0.007	0.07	N.A.
MPD_a	374.989	9.705	0.006	0.06	N.A.
$FD_{is(RRL)}$	375.284	10.000	0.005	0.06	N.A.
$CWM_{(branching\ root)}$	375.287	10.003	0.005	N.A.	N.A.
~1	375.287	10.003	0.005	N.A.	N.A.
$CWM_{(toughness)}$	375.702	10.418	0.004	0.05	N.A.
$FD_{is(SLA)}$	375.893	10.610	0.004	0.04	N.A.
$CWM_{(branchiness)}$	376.167	10.883	0.003	0.04	N.A.
$CWM_{(SRL)}$	376.394	11.111	0.003	0.03	N.A.
$FD_{is(root\ investment)}$	376.499	11.216	0.003	0.03	N.A.
$CWM_{(leafiness)}$	376.501	11.218	0.003	0.03	N.A.
$FD_{is(stem\ strength)}$	376.523	11.239	0.003	0.03	N.A.
$CWM_{(stem\ strength)}$	376.602	11.318	0.003	0.03	N.A.
$CWM_{(seed\ mass)}$	376.771	11.487	0.003	0.02	N.A.
$FD_{is(tap\ root)}$	376.804	11.520	0.003	0.02	N.A.
$FD_{is(branchiness)}$	376.923	11.639	0.002	0.02	N.A.
$CWM_{(RRL)}$	377.033	11.749	0.002	0.02	N.A.
$CWM_{(tap\ root)}$	377.068	11.785	0.002	0.01	N.A.
$FD_{is(branching\ root)}$	377.263	11.979	0.002	0.01	N.A.
$FD_{is(filamentous\ root)}$	377.281	11.997	0.002	0.01	N.A.

	$CWM_{(SLA)}$	377.338	12.055	0.002	0.01	N.A.
	$CWM_{(filamentous\ root)}$	377.624	12.341	0.002	<0.01	N.A.
	$CWM_{(root\ investment)}$	377.628	12.344	0.002	<0.01	N.A.
<u>Functional group removal experiment</u>						
CE	MPD_a	1713.782	0.000	0.992	0.14	0.51
	$FD_{is(SLA)}$	1724.337	10.555	0.005	0.11	0.50
	$FD_{is(all)}$	1725.647	11.865	0.003	0.09	0.50
	$FD_{is(Hmax)}$	1729.260	15.478	<0.001	0.08	0.52
	$CWM_{(P)}$	1732.790	19.008	<0.001	0.02	0.52
	$FD_{is(P)}$	1736.130	22.348	<0.001	0.04	0.53
	$CWM_{(SM)}$	1738.772	24.990	<0.001	0.02	0.50
	$CWM_{(N)}$	1739.987	26.205	<0.001	0.01	0.52
	$FD_{is(N)}$	1741.086	27.304	<0.001	<0.01	0.53
	$FD_{is(SM)}$	1742.047	28.265	<0.001	<0.01	0.52
	~1	1744.501	30.719	<0.001	<0.01	0.52
	$CWM_{(Hmax)}$	1745.852	32.070	<0.001	0.01	0.52
	$CWM_{(SLA)}$	1748.505	34.723	<0.001	<0.01	0.52
SE	$FD_{is(Hmax)}$	1444.691	0.000	0.897	0.25	0.41
	$FD_{is(all)}$	1449.296	4.605	0.090	0.24	0.39
	MPD_a	1453.238	8.547	0.012	0.21	0.37
	$FDis_{(P)}$	1458.895	14.204	0.001	0.21	0.37
	$FDis_{(N)}$	1480.174	35.483	<0.001	0.13	0.37
	$CWM_{(P)}$	1502.286	57.595	<0.001	<0.01	0.33

$FD_{is(SM)}$	1505.645	60.954	<0.001	0.01	0.32
$FD_{is(SLA)}$	1506.152	61.461	<0.001	0.01	0.34
$CWM_{(SM)}$	1506.559	61.868	<0.001	<0.01	0.33
$CWM_{(N)}$	1507.245	62.554	<0.001	<0.01	0.35
$CWM_{(SLA)}$	1508.518	63.827	<0.001	0.03	0.34
~1	1508.942	64.251	<0.001	<0.01	0.34
$CWM_{(Hmax)}$	1512.600	67.909	<0.001	0.01	0.32

Figure A1. Relationship between functional group richness (FGR) and the residual of biomass after controlling the effect of abundance ($p < 0.001$; $R^2 = 0.28$) in 2014 in the removal experiment.