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Supplementary Material

Reduced soybean photosynthetic nitrogen use efficiency associated with evolutionary genetic bottlenecks

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Table S1. Leaf trait values individual genotypes from different soybean populations differing in evolutionary history

Genotypes evaluated within each population were 22 for Wild relatives, 50 for Asian landraces, 14 North America (NA_m) ancestors, 25 Elite cultivars from NA_m, and 10 from Argentina (ARG). Data are mean \pm s.e. of 2 years and five replications ($n=10$)

Population	Genotype	Photosynthetic N use efficiency		Maximum photosynthesis		Specific leaf N		Specific leaf weight		Leaf N concentration	
		(umol CO ₂ g N ⁻¹ s ⁻¹)		(μ mol CO ₂ m ⁻² s ⁻¹)		(g N cm ⁻²)		(g cm ⁻²)		(g N g ⁻¹ \times 100)	
		Mean	s.e.	Mean	s.e.	Mean	s.e.	Mean	s.e.	Mean	s.e.
Wild relative (<i>G. soja</i>)	PI326582A	5.93	2.05	13.93	5.12	2.33	0.21	58.61	5.56	4.01	0.21
Wild relative (<i>G. soja</i>)	PI339871A	11.42	0.81	19.83	2.17	1.74	0.14	42.03	3.19	4.17	0.13
Wild relative (<i>G. soja</i>)	PI366120	13.11	0.92	19.20	1.13	1.47	0.18	33.40	6.29	4.43	0.23
Wild relative (<i>G. soja</i>)	PI407027	10.27	2.06	17.65	2.90	1.78	0.13	40.80	4.24	4.43	0.19
Wild relative (<i>G. soja</i>)	PI407131	11.23	1.88	17.13	2.77	1.60	0.19	37.56	3.43	4.22	0.16
Wild relative (<i>G. soja</i>)	PI407140	7.63	2.80	13.48	4.68	1.78	0.04	44.09	0.98	4.04	0.18
Wild relative (<i>G. soja</i>)	PI407170	11.12	1.15	22.72	2.55	2.06	0.12	44.29	1.82	4.63	0.11
Wild relative (<i>G. soja</i>)	PI407275	13.78	2.07	21.57	3.56	1.58	0.16	40.06	4.55	3.95	0.05
Wild relative (<i>G. soja</i>)	PI407282	9.01	1.02	19.36	4.24	2.09	0.24	51.46	6.82	4.09	0.18
Wild relative (<i>G. soja</i>)	PI407301	12.54	1.68	20.73	2.22	1.64	0.15	42.42	5.01	3.86	0.14
Wild relative (<i>G. soja</i>)	PI447004	11.27	2.87	21.73	5.87	2.37	0.08	53.31	3.59	4.25	0.06
Wild relative (<i>G. soja</i>)	PI458536	7.35	1.45	17.25	3.53	2.35	0.10	59.25	2.33	3.98	0.20
Wild relative (<i>G. soja</i>)	PI458538	6.76	0.75	22.30	2.61	3.29	0.10	73.57	4.13	4.49	0.15
Wild relative (<i>G. soja</i>)	PI464935	7.81	1.21	15.89	3.25	2.00	0.20	49.69	5.18	4.04	0.11
Wild relative (<i>G. soja</i>)	PI468400A	11.15	1.45	21.43	1.50	1.95	0.35	43.04	4.62	4.28	0.24
Wild relative (<i>G. soja</i>)	PI483464A	9.10	1.48	21.11	4.28	2.32	0.11	48.94	3.63	4.48	0.18
Wild relative (<i>G. soja</i>)	PI483465	8.68	1.23	20.22	2.75	2.33	0.06	60.82	2.76	3.86	0.25
Wild relative (<i>G. soja</i>)	PI549046	9.09	1.23	19.24	1.60	2.22	0.07	47.62	4.21	4.12	0.16
Wild relative (<i>G. soja</i>)	PI562559	13.02	0.72	23.01	2.67	1.78	0.15	41.51	3.37	4.31	0.18
Wild relative (<i>G. soja</i>)	PI562565	11.16	1.04	22.44	2.93	2.00	0.24	46.33	6.69	4.44	0.13
Wild relative (<i>G. soja</i>)	PI597459D	16.04	2.78	29.45	3.50	1.86	0.24	45.80	5.67	4.02	0.11
Wild relative (<i>G. soja</i>)	PI597461A	10.39	1.13	23.35	2.37	2.52	0.04	51.07	5.10	4.00	0.09

Asian landraces	FC33243	9.42	0.83	22.82	1.44	2.48	0.10	58.54	1.83	4.28	0.18
Asian landraces	PI398296	8.12	0.54	20.79	1.17	2.60	0.11	61.02	2.80	4.27	0.07
Asian landraces	PI399043	7.94	0.79	17.50	1.62	2.23	0.09	55.74	2.98	4.06	0.16
Asian landraces	PI407801	9.31	0.73	21.29	1.93	2.30	0.12	53.59	3.02	4.32	0.12
Asian landraces	PI407849	7.53	0.51	19.23	1.32	2.63	0.13	61.49	3.40	4.27	0.10
Asian landraces	PI408342	10.75	0.62	19.72	1.06	1.86	0.12	43.49	1.74	4.26	0.18
Asian landraces	PI423954	9.72	0.91	19.60	1.75	2.07	0.16	53.98	3.47	3.86	0.29
Asian landraces	PI423967	8.42	0.71	21.21	1.90	2.47	0.07	54.97	2.15	4.48	0.07
Asian landraces	PI424391	9.30	0.69	19.33	0.96	2.10	0.10	50.26	2.67	4.20	0.14
Asian landraces	PI468916	12.93	0.88	27.80	1.80	2.15	0.12	47.87	3.00	4.49	0.12
Asian landraces	PI567258	8.77	0.53	21.10	1.55	2.39	0.08	58.28	2.07	4.13	0.15
Asian landraces	PI567293	8.06	0.61	23.25	1.49	2.84	0.12	65.06	3.59	4.29	0.13
Asian landraces	PI567298	11.28	0.62	22.49	1.11	2.00	0.06	47.73	1.75	4.21	0.10
Asian landraces	PI567364	9.70	0.94	22.09	1.66	2.36	0.14	54.84	2.98	4.29	0.06
Asian landraces	PI567368	10.36	0.30	24.90	1.02	2.40	0.06	58.47	1.67	4.11	0.08
Asian landraces	PI567395	9.95	0.71	22.28	1.98	2.28	0.23	50.20	3.93	4.51	0.24
Asian landraces	PI567481	8.74	0.76	21.93	1.59	2.58	0.18	62.18	4.35	4.17	0.11
Asian landraces	PI567503	9.47	1.73	19.23	2.23	2.45	0.04	60.59	1.71	4.45	0.07
Asian landraces	PI567525	9.06	0.58	22.41	1.30	2.50	0.11	60.55	1.97	4.14	0.16
Asian landraces	PI567700	8.84	1.06	21.51	2.32	2.44	0.12	60.16	2.41	4.09	0.16
Asian landraces	PI587552	9.64	0.87	20.93	1.44	2.22	0.11	53.50	2.53	4.16	0.13
Asian landraces	PI587666	9.43	0.86	19.26	1.83	2.05	0.11	49.00	1.99	4.18	0.09
Asian landraces	PI587752	9.30	0.43	25.75	0.88	2.78	0.09	63.42	1.93	4.40	0.09
Asian landraces	PI587799	9.50	0.65	21.08	1.10	2.27	0.15	52.88	2.88	4.29	0.13
Asian landraces	PI587946A	11.45	0.18	18.15	3.95	1.58	0.32	34.80	8.62	4.60	0.23
Asian landraces	PI588047	9.34	0.67	22.31	1.18	2.37	0.04	54.45	2.88	4.10	0.06
Asian landraces	PI588053A	8.45	0.38	21.83	0.63	2.60	0.08	60.06	1.70	4.35	0.11
Asian landraces	PI594451	9.20	0.79	18.90	1.27	2.11	0.13	54.93	3.31	3.86	0.10
Asian landraces	PI594554	7.81	0.65	20.40	1.43	2.61	0.10	52.65	2.24	4.96	0.11
Asian landraces	PI594579	10.30	0.83	23.63	1.29	2.36	0.14	53.77	2.87	4.39	0.10
Asian landraces	PI594615	10.96	0.80	23.20	1.27	2.14	0.09	54.74	1.92	3.93	0.13
Asian landraces	PI594629	9.47	0.46	22.92	0.76	2.43	0.07	55.17	1.47	4.40	0.05
Asian landraces	PI594770A	9.66	0.59	21.74	1.44	2.30	0.17	53.16	3.80	4.34	0.10
Asian landraces	PI594773	9.62	0.55	20.86	1.85	2.15	0.14	52.78	2.09	4.06	0.14
Asian landraces	PI594777	8.83	0.75	20.61	1.20	2.38	0.07	58.85	2.53	4.07	0.12
Asian landraces	PI594788	7.80	1.10	18.92	2.76	2.41	0.10	58.02	1.84	4.15	0.12

Asian landraces	PI602991	12.15	0.41	21.55	1.95	1.77	0.10	43.64	0.02	4.05	0.23
Asian landraces	PI603318	7.64	0.55	21.87	1.41	2.89	0.13	72.40	3.46	4.01	0.08
Asian landraces	PI603336	5.94	0.97	15.85	2.26	2.71	0.08	67.69	3.28	4.04	0.19
Asian landraces	PI603357	7.82	0.56	19.32	1.20	2.49	0.06	61.49	2.39	4.08	0.11
Asian landraces	PI603384	7.94	0.52	19.40	1.26	2.45	0.07	60.39	2.17	4.07	0.07
Asian landraces	PI603420	9.36	0.46	21.07	1.39	2.23	0.06	56.26	1.65	3.99	0.12
Asian landraces	PI603424A	7.98	0.24	16.45	0.71	2.12	0.10	67.24	1.24	3.21	0.09
Asian landraces	PI603516	10.21	0.76	21.63	1.21	2.15	0.09	50.25	2.03	4.28	0.05
Asian landraces	PI603596	9.37	0.68	21.62	0.98	2.35	0.14	55.82	4.04	4.24	0.06
Asian landraces	PI603675	7.69	0.52	21.00	1.36	2.74	0.13	61.47	2.08	4.45	0.10
Asian landraces	PI603756	9.51	0.83	23.65	1.66	2.48	0.12	57.35	2.05	4.32	0.11
Asian landraces	PI81775	6.81	0.52	19.34	1.98	2.82	0.16	71.31	2.23	3.96	0.19
Asian landraces	PI89138	8.37	0.76	22.10	1.91	2.68	0.19	62.11	4.74	4.34	0.13
Asian landraces	PI97094	7.88	1.29	18.57	2.93	2.35	0.17	58.68	4.48	4.07	0.23
NAm ancestors	PI548298	9.61	0.90	23.38	1.20	2.59	0.04	63.05	2.81	4.30	0.06
NAm ancestors	PI548311	7.87	0.32	23.26	1.15	2.94	0.07	70.92	1.98	4.18	0.14
NAm ancestors	PI548318	8.57	0.44	22.00	1.12	2.57	0.07	63.53	1.78	4.06	0.11
NAm ancestors	PI548362	9.62	0.51	24.94	1.05	2.63	0.13	60.94	2.68	4.31	0.05
NAm ancestors	PI548379	8.54	0.87	22.66	1.54	2.72	0.09	65.18	2.40	4.19	0.10
NAm ancestors	PI548382	6.92	1.61	17.38	4.21	2.44	0.09	60.00	3.51	4.10	0.13
NAm ancestors	PI548406	7.02	0.75	18.86	2.07	2.63	0.11	67.68	2.02	3.92	0.18
NAm ancestors	PI548445	11.71	1.26	23.62	1.27	2.17	0.07	46.08	1.50	4.55	0.09
NAm ancestors	PI548456	8.95	0.96	20.78	2.11	2.35	0.12	59.22	3.26	4.00	0.17
NAm ancestors	PI548477	9.03	1.07	19.21	1.65	2.19	0.14	51.92	4.07	4.36	0.23
NAm ancestors	PI548485	10.09	0.45	23.40	0.92	2.34	0.09	56.29	1.98	4.16	0.11
NAm ancestors	PI548488	9.30	0.79	24.34	1.96	2.66	0.10	62.68	2.97	4.30	0.20
NAm ancestors	PI548603	9.69	0.64	25.18	0.92	2.68	0.17	62.03	3.65	4.31	0.09
NAm ancestors	PI548657	10.79	0.69	21.96	1.41	2.06	0.13	49.10	3.32	4.21	0.10
Elite NAm cultivars	PI508083	7.28	0.35	22.04	1.22	3.02	0.07	71.00	2.11	4.27	0.05
Elite NAm cultivars	PI508266	10.20	0.82	20.26	1.10	2.03	0.11	48.94	2.47	4.21	0.06
Elite NAm cultivars	PI515961	8.88	0.59	21.07	1.23	2.41	0.12	56.47	2.68	4.28	0.11
Elite NAm cultivars	PI518664	9.45	1.44	19.58	2.48	2.19	0.17	51.74	3.97	4.24	0.05
Elite NAm cultivars	PI522236	9.61	0.52	23.70	1.74	2.45	0.10	56.49	3.03	4.37	0.08
Elite NAm cultivars	PI525453	8.53	1.38	22.93	1.77	2.52	0.10	67.19	2.73	4.18	0.14
Elite NAm cultivars	PI531382	6.83	0.58	20.42	1.68	3.11	0.10	79.13	3.68	3.94	0.15
Elite NAm cultivars	PI533602	10.62	0.47	22.02	0.79	2.07	0.08	49.61	1.46	4.07	0.12

Elite NAm cultivars	PI533655	9.78	0.72	24.93	1.00	2.71	0.07	67.02	2.20	4.52	0.05
Elite NAm cultivars	PI536635	6.63	0.48	23.17	1.71	3.51	0.21	81.51	2.41	4.29	0.13
Elite NAm cultivars	PI536636	8.27	0.83	22.55	1.38	2.83	0.17	68.73	5.22	4.18	0.12
Elite NAm cultivars	PI536667	10.53	0.67	25.01	1.26	2.41	0.11	57.16	2.93	4.22	0.04
Elite NAm cultivars	PI540552	7.65	0.44	23.23	1.44	3.06	0.15	75.58	4.20	4.08	0.13
Elite NAm cultivars	PI542403	7.94	0.65	20.75	2.17	2.59	0.13	72.26	3.09	3.61	0.19
Elite NAm cultivars	PI548512	7.15	0.88	22.11	1.35	3.00	0.10	70.18	2.80	4.31	0.05
Elite NAm cultivars	PI548520	8.79	0.41	24.34	1.02	2.79	0.12	66.76	2.47	4.18	0.07
Elite NAm cultivars	PI548524	8.34	1.73	22.30	3.76	2.71	0.13	63.59	4.16	4.27	0.07
Elite NAm cultivars	PI548604	7.78	1.32	20.83	1.64	2.50	0.08	60.03	1.68	4.36	0.06
Elite NAm cultivars	PI548634	7.94	0.43	23.55	1.22	2.98	0.11	68.23	2.47	4.37	0.08
Elite NAm cultivars	PI548639	7.77	0.49	23.58	1.50	3.04	0.08	72.14	2.52	4.22	0.07
Elite NAm cultivars	PI548643	8.50	0.72	21.99	1.92	2.62	0.18	67.74	3.52	3.88	0.19
Elite NAm cultivars	PI548644	8.18	0.50	21.36	1.91	2.61	0.18	67.73	5.04	3.87	0.07
Elite NAm cultivars	PI548985	9.95	0.50	22.36	0.92	2.29	0.14	53.15	3.22	4.31	0.10
Elite NAm cultivars	PI553047	10.28	0.79	23.58	1.46	2.32	0.10	52.68	2.66	4.43	0.06
Elite NAm cultivars	PI556511	6.86	0.63	19.15	1.46	2.94	0.17	67.46	4.30	4.37	0.06
Elite ARG cultivars	A4725RG	8.57	0.70	22.03	1.11	2.42	0.05	58.12	1.66	4.45	0.07
Elite ARG cultivars	A5409RG	9.69	1.15	23.74	1.08	2.46	0.07	55.42	1.75	4.42	0.11
Elite ARG cultivars	DM4210	7.44	0.96	21.31	1.38	2.62	0.03	62.07	2.41	4.53	0.11
Elite ARG cultivars	DM4250	8.56	0.35	22.91	1.33	2.44	0.02	58.56	1.79	4.39	0.10
Elite ARG cultivars	DM4670	8.40	0.69	23.50	1.21	2.78	0.03	62.23	2.58	4.57	0.14
Elite ARG cultivars	DM49	8.53	0.80	23.11	1.38	2.54	0.10	61.68	3.07	4.62	0.07
Elite ARG cultivars	DM4970	8.22	1.25	22.17	1.43	2.55	0.05	60.36	2.06	4.51	0.09
Elite ARG cultivars	NA4413RG	8.89	0.80	23.52	1.32	2.40	0.03	55.94	1.66	4.37	0.10
Elite ARG cultivars	NA4613RG	7.89	0.85	23.07	1.39	2.58	0.09	61.97	2.29	4.51	0.17
Elite ARG cultivars	NA5485RG	9.20	0.84	21.99	1.23	2.39	0.04	56.54	1.21	4.32	0.07
