

**Supplementary Material:**

Table S1 Details of the genetic linkage maps from the cross of 'Kuili' and 'YLZ1'.

Table S2. Details of the genetic linkage map of male parent 'YLZ1'.

Table S3. Details of the genetic linkage map of female parent 'Kuili'.

Table S4 Population segregation characteristics of leaf phenotypic traits and photosynthetic physiological indices in F<sub>1</sub> generation.

Table S1 Details of the genetic linkage maps from the cross of 'Kuili' and 'YLZ1'.

Group	marker_number	Map length(cM)	Average distance (cM)	Max.gap(cM)
lg1	317	99.79	0.31	6.36
lg2	487	202.69	0.42	5
lg3	584	169.13	0.29	4.78
lg4	485	138.01	0.28	3.4
lg5	339	100.97	0.3	8.97
lg6	679	242.76	0.36	5.83
lg7	367	120.38	0.33	3.99
lg8	310	104.96	0.34	2.82
lg9	171	197.41	1.15	7.77
lg10	214	215.28	1.01	8.04
lg11	343	93.87	0.27	3.45
lg12	282	127.21	0.45	8.36
total	4578	1812.46	0.4	8.97

Table S2 Details of the genetic linkage map of male parent 'YLZ1'.

Group	marker_number	Map length(cM)	Average distance (cM)	Max.gap(cM)
lg1	241	127.89	0.53	9.24
lg2	351	253.44	0.72	8.3
lg3	442	212.9	0.48	6.89
lg4	350	177.24	0.51	5.18
lg5	229	108.84	0.48	11.31
lg6	520	297.42	0.57	8.3
lg7	268	149.24	0.56	4.58
lg8	175	114.77	0.66	5.63
lg9	159	253.73	1.6	10.97
lg10	77	161.89	2.1	11.14
lg11	281	134.37	0.48	6.4
lg12	177	176.99	1	13.52
total	3270	2168.7	0.66	13.52

Table S3 Details of the genetic linkage map of female parent 'Kuili'.

Group	marker_number	Map length(cM)	Average distance (cM)	Max.gap(cM)
lg1	129	54.88	0.43	6.26

lg2	253	150.28	0.59	4.67
lg3	260	119.19	0.46	7.66
lg4	206	85.33	0.41	5.18
lg5	180	73.96	0.41	3.39
lg6	279	188.12	0.67	10.37
lg7	171	91.52	0.54	9.73
lg8	184	89.6	0.49	3.87
lg9	51	85.22	1.67	10.72
lg10	194	251.82	1.3	12.92
lg11	145	53.36	0.37	3.39
lg12	178	76.3	0.43	10.13
total	2230	1319.58	0.59	12.92

Table S4 Population segregation characteristics of leaf phenotypic traits and photosynthetic physiological indices in F<sub>1</sub> generation.

Traits	Mean	Variance	SD	Variation range	CV (%)	Skewness	Kurtosis
Leaf length (cm)	19.47	6.22	2.49	13.39 ~ 27.74	12.82	0.00	0.08
Leaf width (cm)	7.44	0.84	0.92	5.18 ~ 9.67	12.35	-0.11	-0.36
Leaf shape index	2.63	0.06	0.24	2.07 ~ 3.38	9.23	0.34	0.15
Leaf area (cm <sup>2</sup> )	106.80	585.50	24.20	53.83 ~ 172.98	22.67	-0.02	-0.24
Petiole length (cm)	1.16	0.14	0.38	0.39 ~ 2.22	32.92	0.22	-0.55
Leaf fresh weight (g)	2.12	0.36	0.60	0.84 ~ 3.59	28.35	-0.02	-0.30
Leaf dry weight (g)	0.93	0.07	0.26	0.41 ~ 1.61	27.49	0.08	-0.28
Leaf moisture content (%)	55.53	13.07	3.62	41.22 ~ 66.93	6.51	-1.48	4.41
Specific leaf weight (g/cm <sup>2</sup> )	0.0087	0.0000	0.0011	0.0063 ~ 0.0114	13.13	0.07	-0.47
$P_n$ (μmol.m <sup>-2</sup> .s <sup>-1</sup> )	13.25	8.98	3.00	6.71 ~ 21.71	22.61	-0.17	-0.26
$G_s$ (mol.m <sup>-2</sup> .s <sup>-1</sup> )	0.1945	0.0038	0.0622	0.0717 ~ 0.3917	31.95	0.48	0.27
$C_i$ (mol.mol <sup>-1</sup> )	220.85	526.53	22.95	166.91 ~ 324.87	10.39	0.50	1.86
$T_r$ (mmol.m <sup>-2</sup> .s <sup>-1</sup> )	5.11	1.63	1.28	2.15 ~ 8.34	25.03	0.05	-0.34
WUE/ (mmol.mol <sup>-1</sup> )	2.68	0.32	0.57	1.46 ~ 4.83	21.20	0.35	0.57
Chl-a/ (mg.g <sup>-1</sup> )	0.71	0.04	0.19	0.30 ~ 1.44	26.79	0.51	0.62
Chl-b/ (mg.g <sup>-1</sup> )	0.22	0.00	0.06	0.09 ~ 0.47	27.71	0.59	0.80
Chl-a+b/ (mg.g <sup>-1</sup> )	0.93	0.06	0.25	0.39 ~ 1.91	26.79	0.49	0.63
Chl-a/b	3.23	0.05	0.22	2.38 ~ 3.89	6.72	-0.66	2.01

