

## Supplementary data

**Figure S1.** QTL cluster on 2B detected with composite interval mapping by using Windows QTL Cartographer 2.5. Chl, chlorophyll content; LAI, leaf area index; PH, plant height; SN, spike number; BM, biomass; GY, grain yield. The trials for each trait were described in brackets, e.g. 09-7 means at 7 days post anthesis in year 2009.

**Figure S2.** QTL cluster on 4B detected with composite interval mapping by using Windows QTL Cartographer 2.5. Fo, the minimum fluorescence level; Fm, the maximum fluorescence level; PI, performance index; TRo/CS, trapped energy flux per cross section; LAI, leaf area index; PH, plant height; SN, spike number; HI, harvest index. The trials for each trait were described in brackets, e.g. 09-7 means at 7 days post anthesis in year 2009.

**Table S1.** Co-relation coefficients between photosynthesis and GY related traits.

**Table S2.** Selection effects on photosynthetic traits by using two SSR markers *Xgwm192.1* and *Xgwm165.1* on chromosome 4B.

**Table S1.** Co-relation coefficients between photosynthesis and GY related traits.

Traits	PH	SN	BM	GY	HI
Chl	<b>-0.383*</b>	0.067	-0.112	0.079	<b>0.441**</b>
Fo	-0.297	0.121	-0.013	0.098	0.276
Fm	-0.217	0.173	0.106	0.157	0.165
Fv/Fm	-0.033	0.151	0.170	0.135	-0.028
PI	-0.179	-0.061	0.002	0.044	0.155
TRo/CS	-0.287	0.150	0.027	0.125	0.258
ETo/CS	<b>-0.392*</b>	0.025	-0.088	0.052	<b>0.349*</b>
DIo/CS	-0.201	-0.037	-0.146	-0.039	0.216
RC/CSm	-0.175	0.162	0.193	0.242	0.222
A	0.261	0.191	0.168	0.148	-0.029
LAI	<b>0.617**</b>	0.247	<b>0.424**</b>	0.302	-0.245
PH		0.281	<b>0.517**</b>	<b>0.329*</b>	<b>-0.417**</b>
SN			<b>0.786**</b>	<b>0.731**</b>	0.055
BM				<b>0.930**</b>	0.047
GY					<b>0.403**</b>

Chl, chlorophyll content; Fo, the minimum fluorescence level; Fm, the maximum fluorescence level; Fv/Fm, the maximal quantum yield of photosystem II photochemistry; PI, performance index; TRo/CS, trapped energy flux per cross section; ETo/CS, electron transport flux per cross section; DIo/CS, dissipated energy flux per cross section; RC/CSm, density of reaction center per excited cross section; A, net CO<sub>2</sub> assimilation rate; LAI, leaf area index; PH, plant height; SN, spike number; BM, biomass; GY, grain yield; HI, harvest index.

**Table S2.** Selection effects on photosynthetic traits by using two SSR markers *Xgwm192.1* and *Xgwm165.1* on chromosome 4B.

Traits		Xiaoyan 54 allele	Jing 411 allele	Trials
Flag leaf photosynthesis related	Chl	49.4 ± 2.9	47.9 ± 2.8*	09-7
		48.7 ± 3.0	47.5 ± 2.6*	09-14
	Fo	456.8 ± 20.4	441.3 ± 19.0**	09-7
		412.5 ± 15.2	402.6 ± 15.8**	09-14
		410.0 ± 15.1	403.8 ± 13.9*	10-14
	Fm	2589.4 ± 170.2	2519.5 ± 119.9*	09-7
		2374.9 ± 124.4	2260.5 ± 99.3**	09-14
		2451.7 ± 153.7	2384.6 ± 119.6*	10-14
	Fv/Fm	0.825 ± 0.008	0.821 ± 0.008*	09-14
	TRo/CS	375.5 ± 16.7	363.3 ± 15.1**	09-7
		340.3 ± 12.1	330.3 ± 11.7**	09-14
		341.1 ± 13.7	335 ± 11.2*	10-14
	ETo/CS	236.3 ± 11.5	230.9 ± 10.3*	09-7
		206.4 ± 9.0	201.0 ± 8.8**	09-14
	DIo/CS	81.3 ± 6.4	78.0 ± 5.1**	09-7
	PI	4.47 ± 0.62	4.76 ± 0.49*	09-7
	RC/CSm	1408.5 ± 100.4	1357.1 ± 100.2*	09-14
	A	20.63 ± 1.94	22.37 ± 2.48**	10-14
Canopy photosynthate acquisition, accumulation, and partition related	LAI	2.63 ± 0.48	2.30 ± 0.46*	09-7
		2.76 ± 0.48	2.11 ± 0.32**	09-17
	PH	79.2 ± 6.4	87.2 ± 7.7**	10
	SN	83.2 ± 10.8	72.6 ± 7.4**	09
	HI	0.444 ± 0.023	0.428 ± 0.026*	10

Chl, chlorophyll content; Fo, the minimum fluorescence level; Fm, the maximum fluorescence level; Fv/Fm, the maximal quantum yield of photosystem II photochemistry; PI, performance index; TRo/CS, trapped energy flux per cross section; ETo/CS, electron transport flux per cross section; DIo/CS, dissipated energy flux per cross section; RC/CSm, density of reaction center per excited cross section; A, net CO<sub>2</sub> assimilation rate; LAI, leaf area index; PH, plant height; SN, spike number; HI, harvest index. \*, \*\* the significant level at  $P < 0.05$  and  $P < 0.01$ , respectively. The trials for each trait were described as year-date, e.g. 09-7 means at 7 days post anthesis in year 2009.

Figure S1.

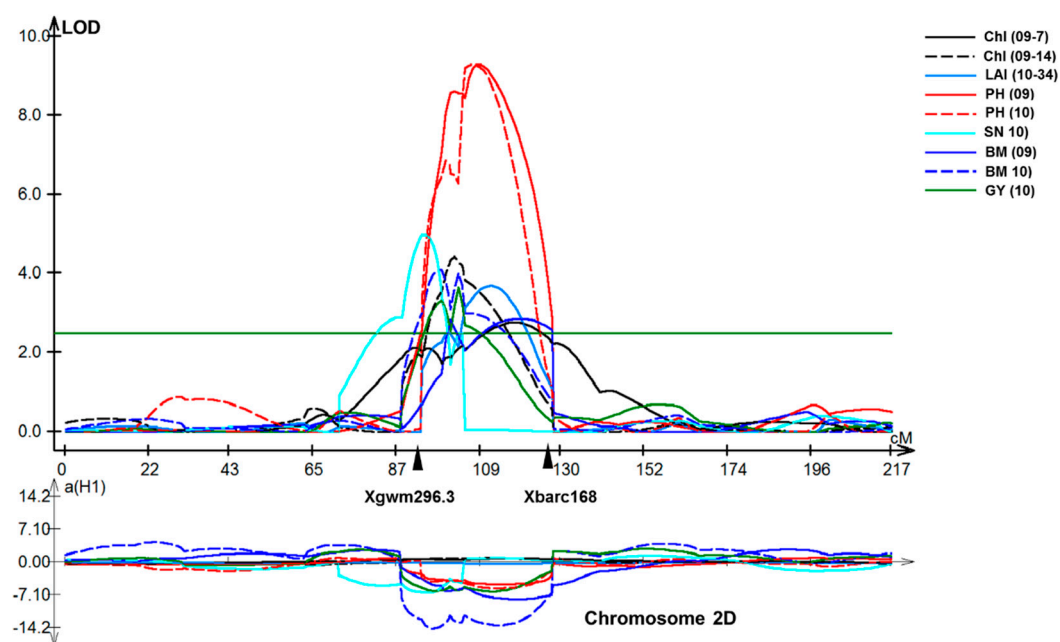


Figure S2.

