

**Table S1.** Descriptive statistics of the yield-related traits in the Keumkang/Olgeuru doubled haploid population<sup>2)</sup>.

Trait <sup>y)</sup>	Year	Mean	Max	Min	Std	Var	Krt	Skw
DHD (d)	2017	183.9	191.0	177.0	3.20	10.3	-0.53	0.02
	2018	182.8	187.0	178.0	2.66	7.1	-0.89	0.48
	2019	182.2	186.0	177.0	2.42	5.8	-0.72	-0.20
	Mean	183.0	188.0	177.3	2.76	7.7	-0.71	0.10
CL (cm)	2017	70.3	89.0	53.0	7.06	49.9	-0.14	0.15
	2018	86.1	97.0	71.0	6.15	37.9	-0.84	-0.37
	2019	75.2	90.0	63.0	6.29	39.5	-0.49	0.08
	Mean	77.2	92.0	62.3	6.50	42.4	-0.49	-0.05
SL (cm)	2017	8.1	10.9	6.0	0.85	0.7	2.40	1.25
	2018	8.1	10.5	6.3	0.80	0.6	1.88	1.15
	2019	8.0	10.9	6.5	0.89	0.8	2.19	1.37
	Mean	8.1	10.8	6.3	0.85	0.7	2.16	1.26
KPS (no.)	2017	33.8	44.0	25.0	4.40	19.3	-0.64	0.16
	2018	33.8	42.0	26.0	3.54	12.6	-0.39	0.23
	2019	33.2	40.0	28.0	2.70	7.3	-0.32	0.43
	Mean	33.6	42.0	26.3	3.55	13.1	-0.45	0.27
TN (no./m <sup>2</sup> )	2017	844.3	1282.5	590.0	43.33	1877.3	2.16	0.98
	2018	850.0	1242.5	587.5	44.50	1980.7	1.81	0.96
	2019	860.6	1237.5	630.0	41.94	1759.2	1.91	1.08
	Mean	851.6	1254.2	602.5	43.26	1872.4	1.96	1.01
TW (g/l)	2017	804.3	843.0	754.0	15.79	249.2	0.74	-0.62
	2018	804.0	843.0	751.0	16.63	276.5	0.25	-0.37
	2019	809.8	855.0	764.0	16.56	274.1	0.37	-0.15
	Mean	806.0	847.0	756.3	16.33	266.6	0.45	-0.38
TKW (g)	2017	40.0	47.1	30.7	3.47	12.1	-0.38	-0.21
	2018	39.5	46.3	31.3	3.32	11.0	-0.31	-0.13
	2019	39.5	49.2	30.5	3.65	13.3	-0.30	0.09
	Mean	39.7	47.5	30.8	3.48	12.1	-0.33	-0.08
YD (kg/10a)	2017	439.5	560.0	342.0	44.41	1972.4	-0.38	0.23
	2018	436.2	531.0	340.0	44.72	1999.5	-0.75	0.04
	2019	436.1	644.0	334.0	48.13	2316.0	2.07	0.89
	Mean	437.3	578.3	338.7	45.75	2096.0	0.31	0.39

<sup>2)</sup> Max = maximum, Min = minimum, Std = standard deviation, Var = variance, Krt = kurtosis, Skw = skewness

<sup>y)</sup> DHD, days to heading date; CL, culm length; SL, spike length; KPS, kernel per spike; TN, tiller number per m<sup>2</sup>; TW; test weight; TKW, thousand kernel weight; YD, yield.

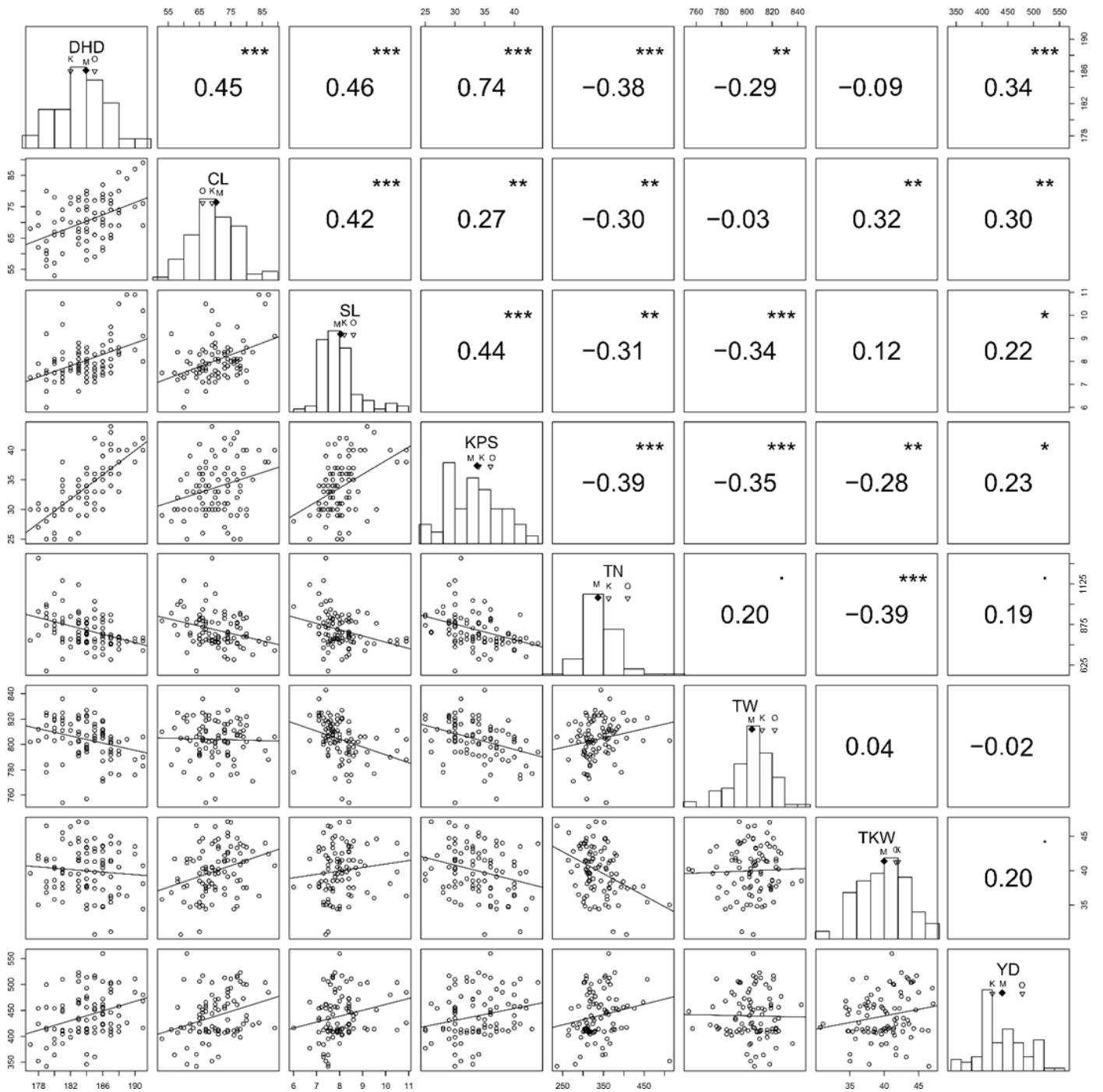
**Table S2.** Effects of *QCl.jbnu-6A*, *QKps.jbnu-3B*, *QTw.jbnu-1A* and *QTKw.jbnu-6A* on different yield-related traits.

Trait <sup>2)</sup>	Allele <sup>y)</sup>	Main effect <sup>3)</sup>										
		<i>QCl.jbnu-6A</i>			<i>QKps.jbnu-3B</i>			<i>QTw.jbnu-1A</i>		<i>QTKw.jbnu-6A</i>		
		2017	2018	2019	2017	2018	2019	2018	2019	2017	2018	2019
DHD (d)	K	183.9	182.6	182.0	181.2	181.2	180.3	182.1	181.7	183.7	182.5	182.0
	O	183.4	182.4	182.2	185.1	183.3	183.1	182.8	182.3	183.5	182.5	182.2
	<i>P-value</i>	ns	ns	ns	***	***	***	ns	ns	ns	ns	ns
	PVE (%)				66.3	21.1	46.0					
CL (cm)	K	73.9	88.9	77.3	67.6	84.9	73.6	84.3	74.2	73.7	88.9	77.3
	O	66.0	82.8	72.9	71.7	86.8	76.2	87.5	76.0	66.1	82.9	72.9
	<i>P-value</i>	***	***	***	**	ns	ns	**	ns	***	***	***
	PVE (%)	43.0	34.7	16.5	16.4			10.9		40.9	30.2	16.5
SL (cm)	K	8.2	8.2	8.2	7.8	7.8	7.8	8.1	7.9	8.2	8.2	8.2
	O	7.9	7.9	7.8	8.2	8.2	8.1	8.1	8.0	7.9	7.9	7.8
	<i>P-value</i>	ns	ns	ns	***	***	**	ns	ns	ns	ns	ns
	PVE (%)				21.6	16.9	16.2					
KPS (no.)	K	33.3	33.5	32.9	30.6	31.7	31.9	33.5	33.0	33.3	33.4	32.9
	O	34.2	34.2	33.4	35.6	35.1	33.9	33.9	33.3	34.1	34.3	33.4
	<i>P-value</i>	ns	ns	ns	***	***	***	ns	ns	ns	ns	ns
	PVE (%)				45.9	31.6	20.8					
TN (no./m <sup>2</sup> )	K	822.3	829.8	843.0	878.0	870.8	881.8	870.5	890.0	819.5	831.0	843.0
	O	867.3	869.0	874.0	818.5	833.3	843.8	828.5	832.0	865.5	864.0	874.0
	<i>P-value</i>	ns	ns	ns	*	ns	ns	ns	*	ns	ns	ns
	PVE (%)				8.3				9.7			
TW (g/l)	K	806.1	804.9	809.3	809.4	810.4	816.5	810.8	817.2	805.3	804.1	809.3
	O	801.4	802.0	809.4	800.8	799.5	805.3	797.2	802.4	802.2	802.8	809.4
	<i>P-value</i>	ns	ns	ns	*	**	**	***	***	ns	ns	ns
	PVE (%)				9.0	13.9	14.8	19.5	24.1			
TKW (g)	K	41.2	40.4	41.1	40.6	40.0	39.9	38.9	38.5	41.5	40.6	41.1
	O	38.3	38.1	37.7	39.6	39.0	39.1	39.8	40.2	38.3	38.1	37.7
	<i>P-value</i>	***	***	***	ns	ns	ns	ns	*	***	***	***
	PVE (%)	27.7	19.2	31.6					9.5	29.5	19.3	31.6
YD (kg/10a)	K	442.4	438.4	436.8	426.3	424.5	423.2	438.4	436.8	441.5	438.9	436.8
	O	436.1	432.5	433.4	447.1	442.5	443.3	434.3	434.8	436.4	431.7	433.4
	<i>P-value</i>	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	PVE (%)											

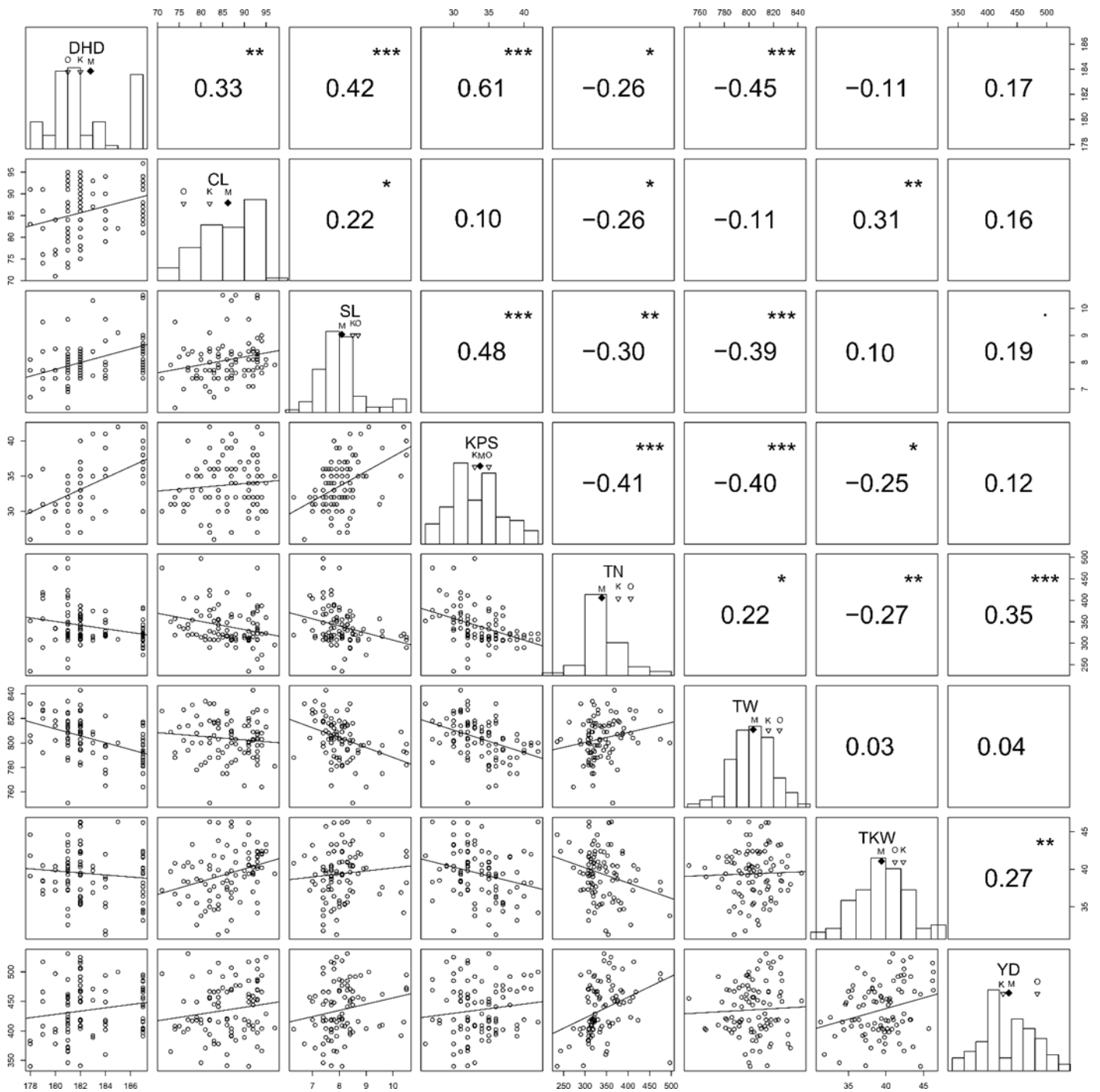
<sup>2)</sup> DHD, days to heading date; CL, culm length; SL, spike length; KPS, kernels per spike; TN, number of tillers; TW, test weight; TKW, thousand kernel weight.

<sup>y)</sup> Mean values of the doubled haploid lines carrying the Keumkang (K) allele and the Olgeuru (O) allele are indicated for each QTL. An asterisk indicates significance (\* $P < 0.05$ , \*\* $P < 0.01$ , and \*\*\* $P < 0.001$ ; ns: not significant) from the three-way factorial ANOVA with the year (2017, 2018, and 2019) as a random factor and the three QTLs as fixed factors. Phenotype variance explained (PVE) is indicated only for significant effects.

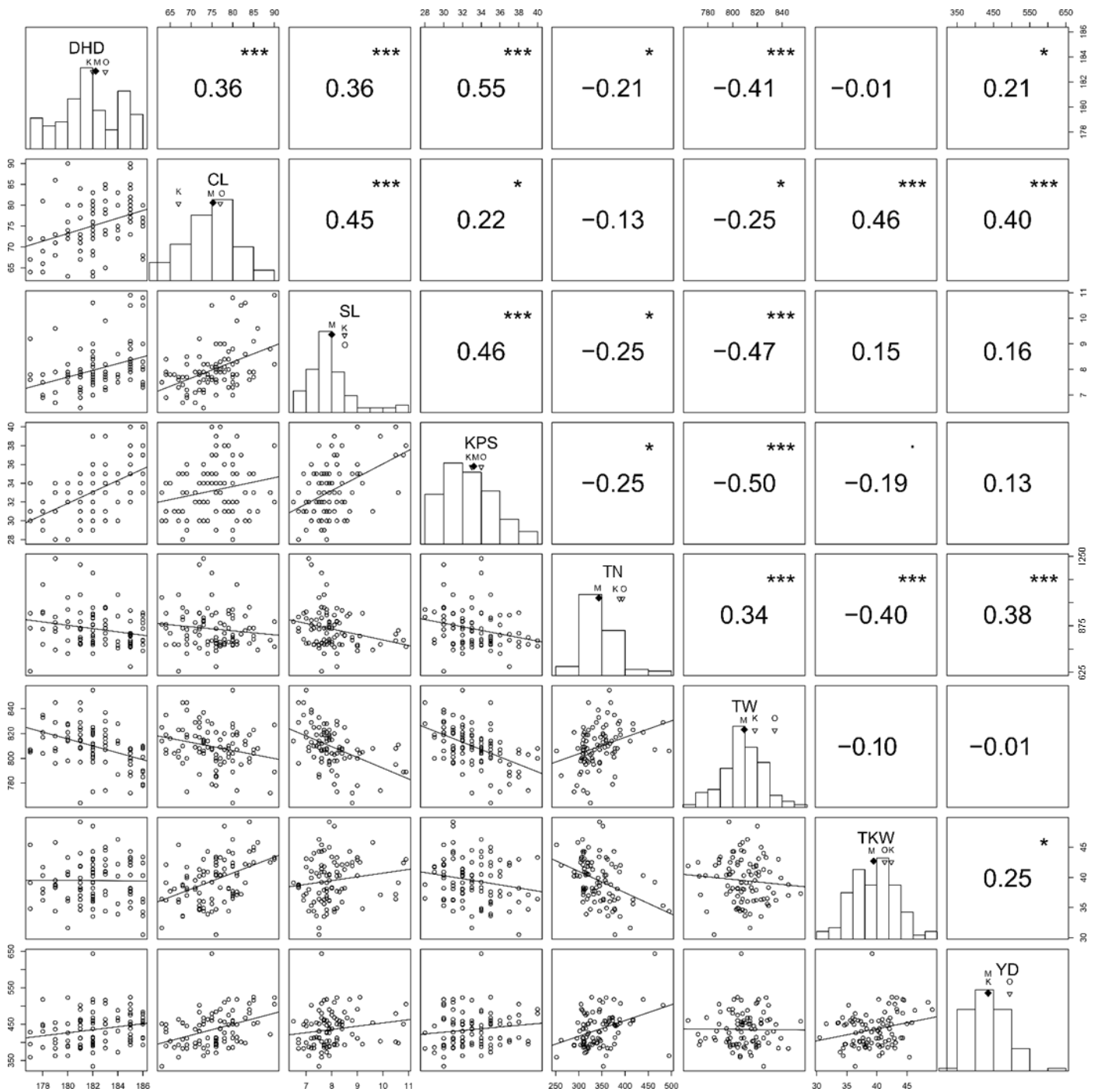
<sup>x)</sup> *QCl.jbnu-6A* was represented by the markers AX-94415763 (2017, 2018) and AX-94718756 (2019). *QKps.jbnu-3B*, *QTW.jbnu-1A*, and *QTkw.jbnu-6A* were represented by the markers AX-95147328 (2017, 2018, 2019), AX-94718756 (2017, 2018, 2019), and AX-94895904 (2018, 2019), respectively.



**Fig. S1.** Distribution and correlation of the yield-related traits in the Keumkang/Olgeuru doubled haploid population in 2017. K and O indicate Keumkang and Olgeuru, respectively. M (black diamond) indicates the average value of each trait. DHD, days to heading date; CL, culm length; SL, spike length; KPS, kernel per spike; TN, tiller number per m<sup>2</sup>; TW; test weight; TKW, thousand kernel weight; YD, yield. Asterisks indicate significance (\*, \*\*, and \*\*\* at  $P < 0.05$ ,  $P < 0.01$ , and  $P < 0.001$ , respectively).



**Fig. S2.** Distribution and correlation of the yield-related traits in the Keumkang/Olgeuru doubled haploid population in 2018. K and O indicate Keumkang and Olgeuru, respectively. M (black diamond) indicates the average value of each trait. DHD, days to heading date; CL, culm length; SL, spike length; KPS, kernel per spike; TN, tiller number per m<sup>2</sup>; TW; test weight; TKW, thousand kernel weight; YD, yield. Asterisks indicate significance (\*, \*\*, and \*\*\* at  $P < 0.05$ ,  $P < 0.01$ , and  $P < 0.001$ , respectively).



**Fig. S3.** Distribution and correlation of the yield-related traits in the Keumkang/Olgeuru doubled haploid population in 2019. K and O indicate Keumkang and Olgeuru, respectively. M (black diamond) indicates the average value of each trait. DHD, days to heading date; CL, culm length; SL, spike length; KPS, kernel per spike; TN, tiller number per  $m^2$ ; TW; test weight; TKW, thousand kernel weight; YD, yield. Asterisks indicate significance (\*, \*\*, and \*\*\* at  $P < 0.05$ ,  $P < 0.01$ , and  $P < 0.001$ , respectively).