



**Figure S1.** Soil tension readings in the P-water experimental field in Hwaseong (2022)

**Table S1.** Reproductive stage response of *Dasan-Pup1*, *Dasanbyeo*, and *indica* controls *IR64-Pup1* and *IR64* grown under rainfed condition in two levels of P fertilization (2022). Means with the same letters are not significantly different using DMRT at P=0.05. Values are means  $\pm$  SE.

Line	Treatment	Days to heading (DAT)	Culm length (cm)	Productive tiller number	Panicle length (mm)	Hundred Grain weight (g)	Fertility (%)	Grain yield per plant <sup>1</sup> (g)
Dasan	P non-supplied	84	56.50 $\pm$ 1.20	4.20 $\pm$ 0.20	260.02 $\pm$ 3.51	2.70 $\pm$ 0.09	90.33 $\pm$ 2.94	20.37 $\pm$ 0.80
Dasan-Pup1		91	53.20 $\pm$ 0.20	3.80 $\pm$ 0.37	261.61 $\pm$ 6.72	2.79 $\pm$ 0.08	95.43 $\pm$ 2.16	21.38 $\pm$ 1.90
IR64		100	59.10b $\pm$ 0.56	11.40a $\pm$ 0.75	262.33 $\pm$ 4.55	2.64 $\pm$ 0.03	86.62 $\pm$ 5.55	31.42a $\pm$ 2.11
IR64-Pup1		100	63.20a $\pm$ 1.20	8.80b $\pm$ 0.80	257.67 $\pm$ 1.35	2.61 $\pm$ 0.05	91.32 $\pm$ 1.92	21.18b $\pm$ 1.44
Dasan	P supplied	82	69.30a $\pm$ 0.86	7.00 $\pm$ 0.71	251.02 $\pm$ 5.88	2.63 $\pm$ 0.07	96.86 $\pm$ 1.59	28.74 $\pm$ 0.66
Dasan-Pup1		82	61.50b $\pm$ 0.32	6.20 $\pm$ 0.20	245.10 $\pm$ 3.87	2.83 $\pm$ 0.05	94.01 $\pm$ 1.84	28.12 $\pm$ 0.43
IR64		101	63.80b $\pm$ 1.66	13.60 $\pm$ 2.40	253.47 $\pm$ 1.91	2.62 $\pm$ 0.02	97.74 $\pm$ 5.75	28.18 $\pm$ 5.79
IR64-Pup1		101	72.00a $\pm$ 0.89	13.00 $\pm$ 0.01	256.00 $\pm$ 1.72	2.72 $\pm$ 0.04	96.60 $\pm$ 0.97	28.00 $\pm$ 1.54

**Table S2.** Chemical and physical properties of the soil used in the experiment in Hwaseong in 2022.

Parameter	Before Transplanting		Maximum Tillering Stage		Maturity Stage	
	P non-supplied	P supplied	P non-supplied	P supplied	P non-supplied	P supplied
Total Nitrogen	0.05	0.04	0.05	0.05	0.05	0.05
Nitrate	0.01	0.01	0.03	0.01	0.03	0.03
Ammonia	0.01	0.01	0.01	0.01	0.01	0.01
Total Phosphorus	0.03	0.03	0.03	0.03	0.03	0.03
Available Phosphorus (mg/kg)	1.20	6.10	4.50	8.60	0.90	3.00
Potassium (me/100g)	0.20	0.19	0.19	0.22	0.20	0.22
CEC(cmol/kg)	5.16	5.00	4.47	5.43	5.39	5.40
pH[1:5]	5.28	6.75	5.63	6.15	6.13	6.23
Organic Matter (%)	3.00	2.96	3.41	3.98	3.25	3.25
EC	0.68	0.67	0.99	0.89	0.80	1.37
Sand (%)	79.00	76.00	71.60	63.60	69.50	71.30
Silt (%)	11.60	14.70	15.50	20.20	17.90	16.60
Clay (%)	9.40	9.30	12.80	16.20	12.60	12.20
Calcium (me/100g)	1.99	1.95	1.62	2.02	2.02	2.01
Magnesium (me/100g)	1.24	1.26	1.18	1.53	1.35	1.52
Sodium (me/100g)	1.22	1.10	0.99	1.15	1.32	1.14
Particle size distribution (%) < 53 $\mu$ m	0.24	0.21	0.74	0.15	0.68	0.21
Particle size distribution (%) 53~105 $\mu$ m	3.42	3.50	3.88	2.07	3.21	1.11
Particle size distribution (%) 105~250 $\mu$ m	13.92	12.17	9.55	13.35	9.99	3.95
Particle size distribution (%) 250~500 $\mu$ m	10.74	8.41	7.76	9.77	8.57	3.64
Particle size distribution (%) 500 $\mu$ m~1.00mm	25.71	24.27	26.97	23.58	28.08	21.40
Particle size distribution (%) 1.00~2.00mm	19.85	21.62	24.01	21.54	25.32	30.90
Particle size distribution (%) > 2.00mm	26.12	29.82	27.09	29.54	24.15	38.79

**Table S3.** Number of polymorphic markers between *Pup1* donor (DP) parent and the three recipient lines (RP) and the genome recovery rates in the *Pup1* introgression lines

Line	Pedigree	BC <sub>2</sub> F <sub>1</sub>		BC <sub>2</sub> F <sub>12</sub>	
		Illumina 6K SNP		Axiom 580K SNP (IRGSPv1.0)	
		Number of polymorphic markers between RP and DP	Genomic similarity to the RP	Number of polymorphic markers between RP and DP	Genomic similarity to the RP
MS11-Pup1A	(MS11*3/IR64- <i>Pup1</i> )-8-24-11-5-2-1-1-1-1-4	N/A	N/A	208,634	71.68%
MS11-Pup1B	(MS11*3/IR64- <i>Pup1</i> )-17-15-8-3-5-4-1-1-1-1-4	N/A	N/A	208,634	66.50%
TR22183-Pup1	(TR22183*3/IR64- <i>Pup1</i> )-1-2-24-2-4-1-1-1-1-4	2,055	81.90%	181,124	99.75%
Dasanbyeon-Pup1	(Dasanbyeon*3/IR64- <i>Pup1</i> )-2-6-5-3-3-3-1-1-1-4	146	79.80%	149,078	92.33%