

**A****B**

Hybrid variety	Symbol	Female parent	<i>SD1</i> allele	Male parent	<i>SD1</i> allele	Samples
Liangyoupei9	LYP9	PA64s*	<i>p<sup>del</sup>p<sup>wt</sup></i>	93-11	<i>N<sup>wt</sup>N<sup>stop</sup></i>	26
Longliangyou1353	LLY	Longke638s	<i>p<sup>del</sup>p<sup>wt</sup></i>	R1353	<i>N<sup>wt</sup>N<sup>stop</sup></i>	4
C-Liangyou -huazhan	CLYH	C815s	<i>p<sup>del</sup>p<sup>wt</sup></i>	Huazhan	<i>N<sup>wt</sup>N<sup>stop</sup></i>	7
Huiliangyou996	HLY	1892s	<i>p<sup>del</sup>p<sup>wt</sup></i>	R996	<i>N<sup>wt</sup>N<sup>stop</sup></i>	10
Huiliangyou -huazhan	HLYH	Longke638s	<i>p<sup>del</sup>p<sup>wt</sup></i>	Huazhan	<i>N<sup>wt</sup>N<sup>stop</sup></i>	3

**S2 Fig.** Summary of sampling of all hybrid varieties.

**(A)** Field display of differences in plant height among hybrid individuals. A few LYP9 F<sub>1</sub>s were significantly taller than others. Two middle photos are taken by Prof. Dacheng Tian with tall progeny

of high recombinant LYP9 individuals (left one) and normal (non-recombinant) LYP9 F<sub>1</sub> individuals (right one).

**(B)** A total of 50 F<sub>1</sub> individuals which presented exceptionally tall statures, were sampled in summer of 2017. Specifically, 26 tall individuals from ~1,100,000 LYP9 individuals with plant height > 130 cm were collected, and among them, 24 samples harboring the wild-type *SD1* gene ( $N^{wt}P^{wt}$ ) (Supplementary table S2) and two samples were determined to be false positives. In the other four crosses, a total of 24 tall individuals with plant height > 150 cm were sampled, and all of them were confirmed to be recombinant lines (Supplementary table S6). \*: Lowercase “s” means sterile line, similarly for other parental lines.