Table S1. Measurement method and the type of twelve traits.

	PH (cm)	**DBH (mm)**	**LCD (cm)**	**SCD (cm)**	**HUB (cm)**	**LMB (cm)**	**NLB (piece)**	**NLBY (piece)**	**LN (cm)**	**WN (mm)**	**LLS (mm)**	**NFW (mm)**
Measurement methods	tree altimeter	vernier calliper	tower ruler	tower ruler	tree altimeter	ruler	count	count	ruler	vernier calliper	ruler	vernier calliper
Trait type	quantitative	quantitative	quantitative	quantitative	quantitative	quantitative	quantitative	quantitative	quantitative	quantitative	quantitative	quantitative

Phenotypic trait abbreviations are shown in Figure 2.

Table S2. Comprehensive scoring assessment criteria for each trait of *P. yunnanensis*.

Scores	PH (cm)	DBH (mm)	LCD (cm)	SCD (cm)	HUB (cm)	LMB (cm)	NLB (piece)	NLBY (piece)	LN (cm)	WN (mm)	LLS (mm)	NFW (mm)
1	37.5-50.2	28.2-37.5	83.7-92.4	20.3-32.4	0.0-5.6	5.0-13.6	0.0-0.1	0.0-0.1	1.2-4.8	0.6-0.7	2.2-4.1	0.0-0.4
2	50.2-62.9	37.5-46.9	92.4-101.1	32.4-44.5	5.6-11.3	13.6-22.1	0.1-0.2	0.1-0.2	4.8-8.5	0.7-0.8	4.1-6.0	0.4-0.8
3	62.9-75.6	46.9-56.2	101.1-109.9	44.5-56.6	11.3-16.9	22.1-30.2	0.2-0.3	0.2-0.3	8.5-12.2	0.8-0.9	6.0-7.9	0.8-1.2
4	75.6-88.2	56.2-65.5	109.9-118.6	56.6-68.7	16.9-22.5	30.2-39.3	0.3-0.4	0.3-0.4	12.2-15.9	0.9-1.0	7.9-9.8	1.2-1.6
5	88.2-100.9	65.5-74.8	118.6-127.3	68.7-80.8	22.5-28.2	39.3-47.9	0.4-0.5	0.4-0.5	15.9-19.6	1.0-1.1	9.8-11.7	1.6-2.0
6	100.9-113.6	74.8-84.1	127.3-136.1	80.8-92.9	28.2-33.8	47.9-56.4	0.5-0.6	0.5-0.6	19.6-23.3	1.1-1.2	11.7-13.6	2.0-2.4
7	113.6-126.2	84.1-93.4	136.1-144.8	92.9-105.0	33.8-39.4	56.4-65.0	0.6-0.7	0.6-0.7	23.3-27.0	1.2-1.3	13.6-15.5	2.4-2.8
8	126.3-139.0	93.4-102.7	144.8-153.5	105.0-117.1	39.4-45.0	65.0-73.6	0.7-0.8	0.7-0.8	27.0-30.7	1.3-1.4	15.5-17.4	2.8-3.2
9	139.0-151.6	102.7-112.0	153.5-162.2	117.1-129.2	45.0-50.7	73.6-82.1	0.8-0.9	0.8-0.9	30.7-34.4	1.4-1.5	17.4-19.3	3.2-3.6
10	151.6-164.3	112.0-121.3	162.2-171.0	129.2-141.3	50.7-56.3	82.1-90.7	0.9-1.0	0.9-1.0	34.4-38.1	1.5-1.6	19.3-21.2	3.6-4.0

Phenotypic trait abbreviations are shown in Figure 2.

Table S3. The principal component scores and ranking of superior individuals of *P. yunnanensis*.

Codes	F1	F2	F3	Scores	Ranking
SB29	1.14	0.39	-0.11	1.42	1
SB18	1.54	-0.20	-0.02	1.33	2
HZ2	0.89	0.11	0.33	1.32	3
LF17	0.73	0.51	0.06	1.29	4
SB25	0.89	0.40	0.00	1.29	5
LF7	1.08	0.32	-0.11	1.29	6
LF16	0.59	0.51	0.16	1.26	7
CH7	0.61	0.48	0.16	1.25	8
LF15	1.04	0.35	-0.14	1.24	9
LF18	0.69	0.50	0.04	1.24	10
LF24	0.87	0.48	-0.13	1.22	11
CY24	1.15	-0.15	0.21	1.21	12
HZ1	0.78	0.02	0.41	1.21	13
LF19	0.51	0.53	0.13	1.17	14
LF3	0.70	0.20	0.27	1.16	15
XP6	1.43	-0.28	0.01	1.16	16
LF23	0.72	0.40	-0.01	1.11	17

LF8	0.76	0.29	0.04	1.09	18
LF14	0.34	0.56	0.18	1.08	19
LF9	0.57	0.34	0.16	1.07	20
SB10	1.21	-0.06	-0.11	1.04	21
CH18	0.38	0.49	0.16	1.03	22
LF27	0.44	0.61	-0.03	1.02	23
CH8	0.81	0.21	-0.01	1.01	24
CH1	0.30	0.57	0.10	0.96	25

Population abbreviations are shown in Table 1.

Table S4. The mean values and realized gains for growth and form quality traits of families of *P. yunnanensis* based on comprehensive scoring and principal component analysis.

Traits	Comprehensive scoring		Principal component analysis	
	Mean	ΔG%	Mean	ΔG%
PH	137.06	26.89	130.84	23.42
DBH	55.57	16.75	56.62	18.29
LCD	144.25	17.19	140.51	14.99
SCD	117.67	16.55	115.69	15.10
HUB	13.28	33.50	11.72	24.66
LMB	68.56	23.35	69.04	23.88
NLB	0.82	0.04	7.03	1.58
NLBY	0.90	1.11	4.39	1.22
LN	31.48	13.57	32.14	15.35
WN	1.32	18.34	1.34	19.19
LLS	15.26	14.15	15.99	18.06
NFW	2.44	15.84	2.54	19.36

Phenotypic trait abbreviations are shown in Figure 2.