

# ‘Jinyu’ and ‘Jinhe’: Two New High-quality, Very Early-ripening Apricot (*Prunus armeniaca* L.) Cultivars from China

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Apricot (*Prunus armeniaca* L.) is one of the important fruit trees originating from China, and it is highly appreciated by consumers because of its early ripening, gorgeous colors, and nutritional content (Zhang and Zhang, 2003). Apricot cultivation area and yield in China rank first in the world. In 2016, the total cultivation area of apricots grown for the fresh market and processed in China reached 360,000 hm<sup>2</sup>, with a yield of 2,700,000 t (Sun et al., 2019). In recent years, the apricot cultivation area and yield have shown a steady growth trend in Hebei Province, the second-largest apricot-growing area in China. The fresh apricot-growing area in Hebei Province was 63,000 hm<sup>2</sup> and the yield was 289,000 t in 2015 (Wu et al., 2018a). Historically, the main apricot cultivars grown in Hebei have been mostly local cultivars, with a large proportion of medium- and late-ripening cultivars and a small proportion of high-quality early-ripening cultivars. Driven by the consumer market, the earlier the apricot ripens, the greater the commodity value. Therefore, it is common practice to pick the fruit early, yet the fruit quality can decline, which restricts the development of the apricot industry.

To provide high-quality fruit to the commercial market, very early-ripening apricots with high yield, good fruit quality, strong disease resistance, and wide adaptability can be obtained through cultivar improvement. Indeed, many programs have focused on the

breeding of very early-ripening apricot, resulting in the successful release of new apricot cultivars such as ‘Zaojinyan’ from the Zhengzhou Fruit Research Institute and ‘Chunhua’ from the Shandong Institute of Pomology in China (Huang et al., 2019; Yuan et al., 2019). However, the ecological regions across China vary considerably, and each cultivar has its own adaptability; thus, these cultivars still cannot fully meet the market demand. Currently, very early-ripening apricot cultivars suitable for cultivation in Hebei Province are still lacking. Therefore, the Shijiazhuang Fruit Research Institute at the Hebei Academy of Agriculture and Forestry Sciences (SFRI-HAAFS; Shijiazhuang, Hebei Province, China) established a cross-breeding program with the aim of obtaining high-yielding, high-quality, very early-ripening apricot cultivars. The collection and evaluation of apricot germplasm resources began in 1981. Currently, SFRI-HAAFS has conserved genetic resources of 120 significant apricot cultivars.

The botanical and biological characteristics of the apricot cultivars, including their ripening time, productivity, fruit shape, skin color, flesh color, fruit weight, flesh adherence to the stone, aroma, total soluble solids content, titratable acidity, reducing sugar content, and protein content, have been determined by comprehensive and systematic analyses of the available genetic resources at SFRI-HAAFS (Chai and Zhao, 2002). Many cultivars are selected as parents, such as ‘Zihe’ and ‘Ganyu’ (Chai and Zhao, 2002), ‘Xinshiji’ (Chen et al., 2001), and ‘Luotuo-huang’ and ‘Chuanzhong’ (Liu et al., 2012). We found that when early-ripening apricot cultivars were used as the female parent, they were more likely to transfer the early-ripening trait to their offspring (Wu et al., 2018b). However, the seeds of very early-ripening apricot are unable to germinate by means of winter sand storage. To solve this problem, we proposed two seed treatment methods: 1) soaking fresh seed kernels in gibberellin and 2) sand storage of fresh seeds (Zhao and Liu, 2013). The work of cross-breeding with very early-ripening apricot cultivars as the female parent began in

2006. Currently, SFRI-HAAFS has more than 10,000 hybrid apricot seedlings under evaluation.

‘Jinyu’ and ‘Jinhe’ are two new very early-ripening apricot hybrids developed by the Plum and Apricot Laboratory of SFRI-HAAFS. They were released in Hebei in 2015 and 2017, respectively. ‘Jinyu’ has high fresh-fruit quality with a sweet taste and a high vitamin C content. ‘Jinhe’ ripens earlier than other very early-ripening cultivars grown in Shijiazhuang, and it has large fruit with good appearance and high flesh quality. The cultivation of these two cultivars has been demonstrated and promoted in the main apricot-producing areas in Hebei, and their high productivity has been recognized. ‘Jinyu’ and ‘Jinhe’ produce apricot fruit that can be supplied to the market earlier, especially in the south-central part of North China and other similar ecological regions. The release of these two cultivars in the future is expected to increase the choice of apricot cultivars available for the major production areas in China.

## Origin

‘Jinyu’ resulted from a cross of ‘Yuzhou-hong’ as the female parent and ‘Sungold’ as the male parent in 2005 (Fig. 1). ‘Yuzhou-hong’ is a very early-ripening apricot cultivar from China. The fruit is ovoid, with an average weight of 38.6 ± 4.9 g and a maximum weight of 70.0 g. The skin is bright orange with red spots on the surface, and the flesh is orange with a soluble solids content of 11.6% ± 1.2%. ‘Yuzhouhong’ is a freestone cultivar with bitter kernels. The fruit has a flesh hardness of 2.7 ± 0.3 kg·cm<sup>-2</sup>. Because the fruit can be stored for 5 to 7 d at room temperature and can withstand storage and transport, this cultivar is referred to as “long-legged apricot” by local fruit farmers. ‘Sungold’ is an early-ripening cultivar from America that is highly productive and amenable to long-term storage. Consequently, ‘Sungold’ has been widely planted in China. The fruit is nearly round, with an average weight of 59.6 ± 0.6 g and a maximum weight of 83.0 g. The skin is orange with a smooth surface. The flesh is orange, fine in texture, and tough. The flesh contains little fiber, with a high juice content and no aroma. The soluble solids content of the fruit is 14.0% ± 0.8%. The kernels are bitter. The fruit can be eaten either fresh or processed.

‘Jinhe’ resulted from a cross made in 2008 between the apricot cultivars ‘Zihe’ (female parent) and ‘Xinshiji’ (male parent; Fig. 1). ‘Zihe’ is a traditional apricot cultivar from China. The fruit is oblate with a concave apex. The average weight of single fruit is 46.8 ± 7.5 g and the maximum fruit weight is 60.0 g. The ground color of the fruit skin is green–yellow, with small fruit dot size and no pubescence. The fruit flesh is orange, juicy, and sweet, with a soluble solids content of 14.2% ± 0.6%. The flesh is freestone with no browning or softening near the stone. The fresh stone weight is 1.13 ± 0.04 g, and the

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fruit edible rate is  $97.3\% \pm 0.2\%$ . The kernel is bitter. The flesh hardness is  $0.9 \pm 0.3 \text{ kg}\cdot\text{cm}^{-2}$  and the fruit can be stored for  $\approx 3$  to 5 d at room temperature. ‘Xinshiji’ is a cultivar obtained by crossing ‘Erhuacao’ (female parent) with ‘Honghebao’ (male parent) at the Shandong Agricultural University (Tai’an, Shandong Province, China). The fruit has an elongated, circular shape, with an average weight of  $71.5 \pm 7.7 \text{ g}$  and a maximum weight of 160.5 g. The sutures are deep and distinct, and the flesh slices are asymmetrical. The ground color is orange-red, with pink patches on the side exposed to the sun. The flesh is orange with coarse fiber, a high juice content, and a sour taste. The soluble solids content is  $13.0\% \pm 0.6\%$ . The flesh is cling stone. The stone is large, with a fresh weight of  $3.22 \pm 0.05 \text{ g}$ , and the fruit edible rate is  $94.5\% \pm 0.4\%$ . The kernel is bitter. The fruit has a flesh hardness of  $2.0 \pm 0.3 \text{ kg}\cdot\text{cm}^{-2}$  and can be stored for  $\approx 3$  to 5 d at room temperature.

From the cross ‘Yuzhouhong’  $\times$  ‘Sungold’, 485 hybrid seeds were initially harvested. Of these, 205 seedlings germinated successfully and survived transplantation in 2006. The seedlings began to bear fruit in 2008. From the cross ‘Zihe’  $\times$  ‘Xinshiji’, 419 hybrid seeds were initially harvested. Of these, 240 seedlings germinated successfully and survived transplantation in 2009. The seedlings began to bear fruit in 2012. All plants were grown using conventional management and pest control techniques. The primary agronomic traits of the fruit and trees

were determined according to the standards described by Liu and Liu (2006). Among the descendants of the two crosses, hybrids 2005YJ-134 (‘Yuzhouhong’  $\times$  ‘Sungold’) and Z08-7-34 (‘Zihe’  $\times$  ‘Xinshiji’) exhibited the best performance. These two hybrids were selected as the most advanced accessions. The evaluation of hybrids 2005YJ-134 and Z08-7-34 was conducted using top-grafting tests from 2013 to 2015 and 2014 to 2017, respectively. The following the botanical and biological characteristics were examined in the tests: date of full blooming, date of open leaf, date of harvest maturity, date of defoliation, internode length, taper, leaf length, leaf width, self-pollination rate, fruit-set rate, fruit development, fruit size, fruit shape, soluble solids content, ground color, cover color, flesh color, titratable acid content, flavor, flesh firmness, edible rate, vitamin C content, low-chilling requirement, productivity, and so on. After 3 to 4 years of continuous observation, the agronomic traits of the two hybrids were excellent and stable. Finally, in 2015 and 2017, accessions 2005YJ-134 and Z08-7-34 were approved by the Approval Committee for Improved Varieties of Forest Tree of Hebei Province. Accession 2005YJ-134 was named ‘Jinyu’ and accession Z08-7-34 was named ‘Jinhe’.

### Description

#### Tree characteristics

*Trees.* Trees of ‘Jinyu’ have a high growth potential, a crown with a round head shape,

and a semicircular canopy with a semiopen growth habit. The trunk of mature trees is purplish brown, and the perennial branches are brown. The annual branches are strong and oblique, with a smooth surface. The annual branches have a medium density, and they are brownish red on the sunny side and yellowish brown on the back. The lenticels are transverse and small. The length-to-diameter ratio of the annual branches is 182:1.24, and the average panel length is  $2.20 \pm 0.33 \text{ cm}$ . The vegetative growth of ‘Jinyu’ continues for  $\approx 220 \text{ d}$  per year (Table 1).

‘Jinhe’ trees also have a high growth potential, a crown with a round head shape, and a semicircular canopy with a semiopen growth habit. The trunk of mature trees is coarse, and the bark is split longitudinally with a yellowish brown surface color. The perennial branches are greenish brown. The annual branches have a moderately rough surface and are oblique. The sunny side of the annual branches is tawny and smooth. The lenticels are circular and dense, and of medium size. The internode length is  $2.27 \pm 0.29 \text{ cm}$ , and the taper is  $0.74 \pm 0.03$ . The vegetative growth period of ‘Jinhe’ is  $\approx 220 \text{ d}$  per year (Table 1).

*Leaves.* The leaves of ‘Jinyu’ are broadly rounded, thick, dark green, glossy, and smooth. The angle of the blade tip is acute; the leaf base is heart shaped. The leaf margin is neat and serrated whereas the leaf blade undulates. The average length and width of the leaves are  $(8.5 \pm 0.6) \times (8.0 \pm 1.1) \text{ cm}$  (Table 1). The main veins are light green. The petiole has an average length of 3.1 cm and is purplish red. The average number of nectaries in the petiole is two to three.

The leaves of ‘Jinhe’ are circular and smooth. Mature leaves are green; younger leaves are reddish brown. The angle of the blade tip is acute; the leaf base is round. The leaf margin is coarsely serrated; the leaf blade is slightly rolled up. The average length and width of the leaves are  $(11.1 \pm 0.9) \times (9.1 \pm 0.9) \text{ cm}$  (Table 1). The main veins are light green. The average length of the petiole is 3.7 cm and is purplish red. There are three to four nectaries on the petiole on average.

In Shijiazhuang, the apricot cultivars Jinyu and Jinhe begin pushing leaf buds in late March to the beginning of April, and leaves begin to expand in early April. The

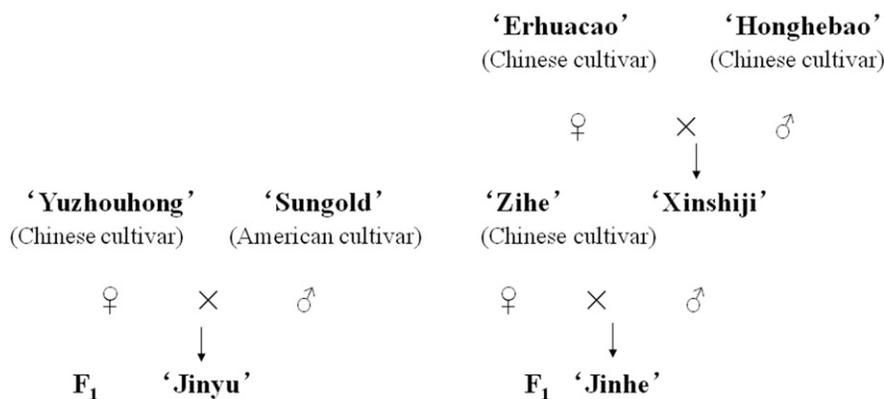


Fig. 1. Pedigrees of the new very early-ripening apricot cultivars Jinyu and Jinhe.

Table 1. Description of apricot trees of the new cultivars Jinyu and Jinhe, their parents’ cultivars, and the reference cultivars under experimental conditions in Shijiazhuang, 2015 to 2017.

Cultivar	Full blooming date	Open leaf date	Harvest maturity date	Defoliation date	Internode		Leaf length (cm)	Leaf width (cm)	Complete flowers (%)	Rate of fruit set (%)
					length (cm)	Taper				
Jinyu	23 Mar.	3 Apr.	20 May	2 Nov.	$2.3 \pm 0.2 \text{ ab}$	$0.59 \pm 0.02 \text{ a}$	$8.5 \pm 0.6 \text{ a}$	$8.0 \pm 1.1 \text{ ab}$	$85.1 \pm 12.3 \text{ cd}$	$68.3 \pm 8.4 \text{ d}$
Jinhe	24 Mar.	1 Apr.	18 May	30 Oct.	$2.2 \pm 0.5 \text{ ab}$	$0.74 \pm 0.03 \text{ b}$	$11.1 \pm 0.9 \text{ b}$	$9.1 \pm 0.9 \text{ b}$	$43.5 \pm 6.8 \text{ b}$	$36.1 \pm 4.2 \text{ b}$
Yuzhouhong	23 Mar.	1 Apr.	20 May	1 Nov.	$1.9 \pm 0.4 \text{ a}$	$0.61 \pm 0.03 \text{ a}$	$9.5 \pm 0.9 \text{ ab}$	$7.0 \pm 0.9 \text{ a}$	$77.3 \pm 7.9 \text{ c}$	$55.0 \pm 3.6 \text{ c}$
Sungold	23 Mar.	2 Apr.	1 June	5 Nov.	$2.2 \pm 0.1 \text{ ab}$	$0.56 \pm 0.06 \text{ a}$	$8.2 \pm 0.8 \text{ a}$	$7.8 \pm 1.0 \text{ ab}$	$91.2 \pm 11.1 \text{ d}$	$85.0 \pm 6.9 \text{ e}$
Zihe	25 Mar.	3 Apr.	22 May	3 Nov.	$1.8 \pm 0.4 \text{ a}$	$0.78 \pm 0.09 \text{ b}$	$9.8 \pm 1.1 \text{ ab}$	$7.9 \pm 0.8 \text{ ab}$	$70.2 \pm 9.8 \text{ c}$	$48.3 \pm 3.3 \text{ c}$
Xinshiji	23 Mar.	1 Apr.	26 May	30 Oct.	$2.5 \pm 0.6 \text{ bc}$	$0.54 \pm 0.06 \text{ a}$	$11.7 \pm 0.9 \text{ b}$	$8.0 \pm 0.9 \text{ ab}$	$48.9 \pm 7.5 \text{ b}$	$36.4 \pm 4.1 \text{ b}$
Luotuojuang	23 Mar.	3 Apr.	22 May	1 Nov.	$2.8 \pm 0.5 \text{ c}$	$0.63 \pm 0.05 \text{ a}$	$10.0 \pm 0.9 \text{ ab}$	$7.9 \pm 1.2 \text{ ab}$	$21.4 \pm 3.3 \text{ a}$	$12.6 \pm 1.9 \text{ a}$

Data are the means  $\pm$  SD. Different lowercase letters in each column indicate a significant difference between cultivars at the 0.05 level by Duncan’s multiple range test.

Table 2. Economically important traits of apricot fruit of the new cultivars Jinhe and Jinyu, their parents' cultivars, and the reference cultivars in Shijiazhuang, 2015 to 2017.

Cultivar	Fruit development			Fruit			Soluble			Titratable			Flesh			Vitamin		Low-chill requirement (h)
	period (d)	size (g)	shape	solid content (%)	color	ground color	cover color	flesh color	acid content (%)	flavor	firmness (kg·cm <sup>-2</sup> )	edible rate (%)	C content (mg/100 g)	low-chill requirement (h)				
Jinyu	57.7 ± 0.6 b	55.4 ± 1.1 bc	Ovate	14.2 ± 0.8 a	Orange	Orange	Mot	Orange	0.42 ± 0.22 a	Sweet	1.7 ± 0.1 ab	96.2 ± 0.1 c	15.5 ± 0.2 e	890–920				
Jinhe	54.7 ± 1.5 a	66.0 ± 1.4 cd	Round	14.2 ± 1.5 a	Yellow	Yellow	Red	Yellow	0.70 ± 0.10 ab	Acidic-sweet	1.8 ± 0.2 ab	97.2 ± 0.2 d	6.3 ± 0.1 bc	900–920				
Yuzhouhong	58.0 ± 1.0 b	38.6 ± 4.9 a	Ovate	11.6 ± 1.2 a	Orange	Orange	Red	Orange	0.46 ± 0.06 a	Acidic-sweet	2.7 ± 0.3 d	94.1 ± 0.6 ab	15.8 ± 0.1 e	890–920				
Sungold	67.3 ± 2.1 d	59.6 ± 0.6 cd	Ovate	14.0 ± 0.8 a	Orange	Orange	Mot	Orange	0.93 ± 0.05 b	Acidic-sweet	2.0 ± 0.5 c	95.7 ± 0.3 c	6.5 ± 0.1 c	600–650				
Zihe	59.0 ± 1.0 bc	46.8 ± 7.5 ab	Oblate	14.2 ± 0.6 a	Green-yellow	Green-yellow	Mot	Orange	0.46 ± 0.14 a	Sweet	0.9 ± 0.3 a	97.3 ± 0.2 d	5.50 ± 0.0 a	860–880				
Xinshiji	61.0 ± 1.0 c	71.5 ± 7.7 d	Elliptic	13.0 ± 0.6 a	Orange	Orange	Red	Orange	0.99 ± 0.03 b	Acidic	2.0 ± 0.3 cd	94.5 ± 0.4 b	9.1 ± 0.3 d	800–830				
Luotuo Huang	59.7 ± 0.6 bc	62.3 ± 1.1 cd	Round	12.1 ± 2.1 a	Orange	Orange	Red	Orange	0.77 ± 0.03 b	Acidic-sweet	1.1 ± 0.1 ab	93.6 ± 0.1 a	6.1 ± 0.0 b	890–910				

Data are the means ± sd. Different lowercase letters in each column indicate a significant difference between cultivars at the 0.05 level by Duncan's multiple range test.

leaves begin to fall at the end of October to early November, and defoliation ends in mid-November (Table 1).

**Flowers.** The proportion of complete flowers of 'Jinyu' and 'Jinhe' is 85.1% ± 12.3% and 43.5% ± 6.8%, respectively. The entire 'Jinyu' petal is pure white, whereas the upper part of the 'Jinhe' petal is white and the lower part is pink. The self-pollination rates of 'Jinyu' and 'Jinhe' trees are all zero; therefore, these cultivars are considered to be self-incompatible. The fruit-set rate is 68.3% ± 8.4% and 36.1% ± 4.2%, respectively (Table 1). In Shijiazhuang, the floral buds of both cultivars break in late February, and the full bloom dates for 'Jinyu' and 'Jinhe' are ≈23 Mar. and ≈24 Mar., respectively. The flowering period of both cultivars is 4 to 6 d.

### Fruit characteristics

**Ripening time.** Trees of the two new cultivars Jinyu and Jinhe), and their parent cultivars and two reference cultivars (Yuzhouhong, Sungold, Zihe, Xinshiji, and Luotuo Huang) were grown in the same apricot orchard in Shijiazhuang using standard management practices. Based on a 3-year investigation (2015–17), the fruit of 'Jinhe' ripens in mid-May. The average fruit development period of 'Jinhe' is 54.7 ± 1.5 d, ≈12 d earlier than that of 'Sungold', and 5 d earlier than that of 'Luotuo Huang'. The ripening date of 'Jinyu' is May 20, 3 d later than that of 'Jinhe' but 9 d earlier than that of 'Luotuo Huang' and 2 d earlier than that of 'Sungold' (Table 2). Fruit of both 'Jinyu' and 'Jinhe' ripen uniformly. At that time in the season, there are few cultivars of very early-ripening apricots. Of all the apricot cultivars grown in Shijiazhuang, 'Jinhe' is considered to be an extra-early cultivar, with the earliest date of ripening.

**Fruit.** Based on observations made over 3 consecutive years (2015–17), the fruit of 'Jinyu' is ovate, with an average weight of 55.4 ± 1.1 g and a maximum weight of 75.0 g. The average vertical, transverse, and lateral diameters of the fruit are 4.89 ± 0.55, 4.47 ± 0.48, and 5.02 ± 0.62 cm, respectively. The fruit has a round, flat top; shallow but distinct sutures; and asymmetrical flesh. The ground color of mature fruit skin is orange, without any over color. The fruit has a bright, clean surface, with an attractive appearance (Fig. 2). The flesh is orange, with less fiber, more juice, and is delicate in texture. The soluble solids content is 14.2% ± 0.8%, the titratable acid content is 0.42% ± 0.22%, with a high sugar-to-acid ratio (13.3), so the fruit tastes very sweet. The content of vitamin C can reach 15.5 ± 0.2 mg/100 g, almost twice that of 'Jinhe' and the reference cultivars. The flesh hardness is 1.7 ± 0.1 kg·cm<sup>-2</sup> (Table 2). There is no browning and softening of the flesh near the stone. 'Jinyu' is a freestone cultivar. The stone is ovoid and smooth, with an average

weight of 2.11 ± 0.06 g, comprising up 3.8% of the fruit weight. The edible rate is 96.2% ± 0.1%. The kernel has a bitter flavor. The fruit can be stored for 5 to 7 d at room temperature.

The fruit of 'Jinhe' is round, with an average weight of 66.0 ± 1.4 g and a maximum weight of 115.0 g. This means that 'Jinhe' fruit are substantially larger than fruit of the very early-ripening cultivars Jinyu and Luotuo Huang, as well as fruit of the early-ripening cultivar Sungold. The average vertical, horizontal, and lateral diameters of 'Jinhe' fruit are 4.81 ± 0.39, 4.80 ± 0.52, and 4.85 ± 0.33 cm, respectively. The fruit has a concave top, deep suture, and asymmetrical flesh. The ground color of the fruit skin is yellow, overlaid with a little red blush on the sunny side (Fig. 2). Fruit flesh is yellow, with a soft, fine texture. The flesh contains little fiber and is juicy, with a strong fruit aroma. The flavor is a pleasant mix of sweetness and sourness. The fruit has a soluble solids content of 14.2% ± 1.5%, titratable acid content of 0.70% ± 0.10%, vitamin C content of 6.3 ± 0.1 mg/100 g, and flesh hardness of 1.8 ± 0.2 kg·cm<sup>-2</sup> (Table 2). There is no flesh browning or softening near the stone. The stone is smooth, ovoid, and relatively small, making up 2.9% of the fruit weight, and the fruit edible rate can reach 97.2% ± 0.2%. The flesh is freestone. The kernel has a bitter taste. The fruit can be stored for 3 to 4 d at room temperature.

**Growth and fruiting habits.** In Shijiazhuang, the height of 6-year-old 'Jinyu' and 'Jinhe' trees ranges from 3.2 to 3.6 m, with a crown diameter of 3.3 to 3.9 m and a trunk perimeter of 32 to 36 cm. The fruits of the two cultivars are primarily produced on bouquets and short fruiting branches. Grafted 'Jinyu' and 'Jinhe' apricot seedlings begin to flower in the second year, and the high-yield period begins in the fourth year after planting. The average fruit yield of a 6-year-old tree is ≈20,000 kg·ha<sup>-1</sup> at a density of 4 × 5 m. The low-chill requirement of the two cultivars is 890 to 920 h and 900 to 920 h, respectively.

**Cultivation techniques.** Trees of 'Jinyu' and 'Jinhe' have a high growth potential. The appropriate plant spacing is 3 to 4 × 5 to 6 m in the loam soil, with a thick soil layer and good water conservancy conditions, and the suitable plant spacing is 2 to 3 × 4 m for constructing gardens in barren hills, and in hills and mountains in arid areas. The suitable planting time is from the end of defoliation until the soil freezes in the fall, or from the time soil thaws to the beginning of bud burst in the spring. Suitable pollinizers, such as 'Luotuo Huang' and 'Katy' apricots, are required at a ratio of one pollinizer to three to four cultivars.

The tree shape includes evacuation layered shape, natural round head shape, or delayed open heart shape. Proper tree training is required to reduce the number of skeleton branches, ensuring sufficient air circulation and light penetration. Summer pruning of the trees is performed mainly to



Fig. 2. Photographs of 'Jinyu' (left) and 'Jinhe' (right) apricot fruit on the tree (top), after harvest (middle), and sections (bottom).

cut the water sprouts, competitive branches, and densely packed branches, which facilitates the control of plant growth and improves ventilation and light conditions. Flowering branches that are weak or too long should be pruned before flowering in winter, and attention should be paid to control and balance tree potential.

To obtain good fruit quality and achieve continuous high yield, fruit thinning is carried out  $\approx 15$  d after flowers fall, and one fruit should be retained per  $\approx 10$  cm on branches of mature trees (Liu and Liu, 2006).

After fruit harvest, organic fertilizer is applied to the trees using the furrow applica-

tion method. In general, the rate of organic fertilizer application is 2500 to 4000 kg/667 m<sup>2</sup> and 5000 kg/667 m<sup>2</sup> for the young trees and full productive trees, respectively. Fully productive trees typically should be top-dressed twice per year using quick-acting fertilizer, once before flowering and once before fruit expansion.

The fruit of 'Jinyu' and 'Jinhe' have a short development period and very early ripening. Diseases and insect pests rarely occur during the fruit development period. Field observations indicate that the two cultivars are resistant to stressors, diseases, and pests. However, management techniques should be applied prophylactically in orchards.

#### Availability

The apricot cultivars Jinyu and Jinhe are the property of the SFRI-HAAFS. They have been approved by the Approval Committee for Improved Varieties of Forest Tree of Hebei Province (nos. Hebei S-SV-PA-006-2014; Hebei S-SV-AV-008-2017). Protection of Plant Breeders' Rights for 'Jinhe' apricot has been obtained in China until 2038 (Protection of New Varieties of Plants of the People's Republic of China; no. China 20180220). A limited quantity of bud wood is available on request for trial and research purposes as well as for commercial propagation.

#### Literature Cited

Chai, J.H. and X.P. Zhao. 2002. Advances in breeding of very early ripening apricot in China. *Acta Hort. Sinica* 29(Suppl.):635–638.

- Chen, X.S., D.S. Gao, X.L. Li, Y.M. Zhang, and L.Z. Zhang. 2001. 'Xinshiji': A new early ripening apricot variety obtained by embryo culture. *Acta Hort. Sinica* 28(5):475.
- Huang, Z.Y., L.H. Xia, L. Chen, Z.X. Cui, S. Ren, Y.B. Feng, and Y.L. Chen. 2019. 'Zao Jinyan' and 'Mei Xiang': Two early-ripening apricot cultivars from ZFRI-CAAS. *HortScience* 54:2083–2085.
- Liu, N. and W.S. Liu. 2006. Descriptors and data standard for apricot (*Prunus armeniaca* L.). China Agricultural Press, Beijing, China.
- Liu, W., N. Liu, Y. Zhang, X. Yu, M. Sun, M. Xu, Q. Zhang, and S. Liu. 2012. Apricot cultivar evolution and breeding program in China. *Acta Hort. Sinica* 966:223–228.
- Sun, H.Y., J.H. Zhang, L. Yang, F.C. Jiang, M.L. Zhang, and Y.Z. Wang. 2019. Fruit scientific research in new China in the past 70 years: Apricot. *J. Fruit Sci.* 36(10):1302–1319.
- Wu, X.H., C.J. Jing, X.F. Chen, X.P. Zhao, L.Y. Yuan, S. Liang, X.C. Zhang, H.Y. Tang, and L.Y. Li. 2018a. Studies on genetic tendency of fruit characters in F1 generation of reciprocal cross between apricot cultivars 'Sungold' and 'Chuanzhong'. *Acta Agr. Jiangxi* 30(10):13–18.
- Wu, X.H., X.P. Zhao, L.Y. Li, L.Y. Yuan, X.C. Zhang, S.N. Wang, S. Liang, and H.Y. Tang. 2018b. Development and suggestion of apricot industry in Hebei Province. *China Fruit* 2:82–85.
- Yuan, K.J., P.J. Wang, S.L. Li, Q.S. Niu, F.R. Ge, X.Y. Meng, and H.F. Dai. 2019. A new very early-ripening apricot cultivar 'Chunhua'. *Acta Hort. Sinica* 46(52):2745–2746.
- Zhang, J.Y. and Z. Zhang. 2003. China fruit–plant monographs: Apricot flora. China Forestry Press, Beijing, China.
- Zhao, X.P. and T.Z. Liu. 2013. Effect of drying time on germination rate of early maturing apricot seed. *Seed* 33(2):89–90.