果 树 学 报 2026,43(8):2302-2306
Journal of Fruit Science

DOI:10.13925/j.cnki.gsxb.20250730

中熟甜樱桃新品种春煦的选育

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摘 要:为缓解我国甜樱桃主栽品种老化、生态适应性差、裂果严重等问题,以先锋自然杂交实生后代为育种群体,经连续单株优选、高接扩繁及多年多点区域试验,决选出优系25-37。该品系果实肾形,完全成熟时果皮紫红色,色泽亮丽,平均单果质量9.5 g,果实可溶性固形物含量(*w*,后同)19.90%,总糖含量14.48%,可滴定酸含量0.69%,维生素C含量为16.23 mg·100 g^{-1},果肉硬度0.69 kg·cm^{-2}。25-37基因型为*S1S3*,自花不实,种植时需配置授粉品种;树姿半直立,成枝力中等,早果丰产。在郑州地区,该品种于5月18日成熟,畸形果率低,抗裂果,商品果率高。2010—2020年在河南、山东、甘肃等不同生态区进行评价,其生物学性状、果实品质及丰产稳定性表现一致。该品种适宜在我国中西部暖温带地区种植推广,为甜樱桃品种结构优化与高效栽培提供了新的种质支撑。

关键词:甜樱桃;新品种;春煦;中熟

中图分类号:S662.5 **文献标志码:**A **文章编号:**1009-9980(2026)08-2302-05

Breeding report of a new mid-ripening sweet cherry cultivar Chunxu

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Abstract: Chunxu is a high-quality and mid-maturing sweet cherry cultivar characterized by strong resistance to cracking and a low rate of malformed fruit, originating from the open-pollinated progeny of the commercial sweet cherry cultivar Van. In May 2002, more than 800 open-pollinated seeds were collected from Van and stratified at 4 ℃. In spring 2003, the seeds were sown in greenhouses and nurseries, producing about 200 seedlings. These seedlings were transplanted to the cherry breeding nursery of Zhengzhou Fruit Research Institute, Chinese Academy of Agricultural Sciences, in spring 2004. In 2007, when the seedlings started flowering and fruiting, the superior individual coded as 25-37 was initially selected and top-grafted in the variety resource nursery for propagation. After continuous phenotypic and pomological evaluations from 2008 to 2010, 25-37 showed excellent fruit quality, early fruiting, high and stable yield, and strong stress resistance. In 2010, it was identified as an elite line, propagated by grafting onto ZY-1 rootstock, and planted in regional trials at five key sweet cherry production sites: Xinzheng of Zhengzhou, Tangyin of Anyang, Mianchi of Sanmenxia, Tianshui of Gansu and Yuncheng of Shanxi. For years, its biological traits, fruiting habits, yield capacity, and fruit quality remained consistent and stable across all trial locations. In May 2021, it was officially approved and named Chunxu by the Henan Provincial Forest Tree Variety Examination and Approval Committee, with the registration code Yu S-SV-PV-007-2021. Chunxu exhibits a semi-upright tree habit, moderate branching, and robust tree growth. The branches from the previous year are sturdy, and perennial branches show a reddish-brown color. The leaves are flat, featuring a broad cuneate base, an acuminate

收稿日期:2025-12-24 **接受日期:**2026-01-08

基金项目:河南省重点研发与推广专项(科技攻关)项目(242102111153);中国农业科学院科技创新工程专项(CAAS-ASTIP-2020-ZFRI);中国农业科学院中原研究中心全重实验室“新翼”青创计划项目(ZYZX20240305)

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apex, and coarse serrated edges; the average petiole length measures 3.2 cm, with 2−3 medium-sized light red nectaries. The flower buds are pink, the petals are white and oval-shaped, and the corolla has a medium to large diameter. The fruit is kidney-shaped, featuring a bright purplish-red peel and flesh when fully ripe. The average weight of a single fruit is 9.5 grams, significantly higher than that of the control cultivars Zaodaguo (7.5 grams) and Hongdeng (7.3 grams). The fruit stalk measures 3.2 centimeters in length and detaches from the fruit with moderate difficulty. The rate of malformed fruit is nearly 0, which is considerably lower than the 20%−40% rates seen in Zaodaguo and Hongdeng, ensuring a high commercial fruit yield. The fruit quality is exceptional: the soluble solid content reaches 19.9%, the total sugar content is 14.48%, the titratable acid content is 0.69%, the vitamin C content is 16.23 $mg \cdot 100\ g^{-1}$, and the flesh firmness is 0.69 $kg \cdot cm^{-2}$. Compared to control varieties, its soluble solids content is 5.5% higher than that of Zaodaguo and 4.4% higher than Hongdeng, resulting in a delightful sweet-sour flavor. In Zhengzhou, Chunxu blossoms germinate in early March, begin initial flowering on March 27, and reach full bloom from March 28 to April 3, with a flowering duration of 6−8 days. The fruits mature around May 18, after a development period of approximately 48 days, and the plant enters dormancy in late November, with a total growth period of about 270 days. It is self-incompatible, having an *S*-genotype of *S*1*S*3, thus necessitating pollinizers. Young trees start to bear fruit in the third year after planting and enter the full fruiting stage in the fifth year, yielding over 1200 kg per 666.7 square meters. Young trees primarily bear fruit on medium-long fruiting branches, whereas mature trees mainly produce fruit on spurs and axillary flower buds of medium-long branches. It possesses strong resistance to cracking and can tolerate high temperatures during the differentiation of flower buds, resulting in a low rate of malformed fruit. Additionally, it exhibits some resistance to common diseases; however, precautions should be taken against gummosis, root collar rot, and crown gall. The firm flesh ensures good storability and transportability, with a long shelf life, and fruit quality remains stable during storage. It is suitable for planting in warm-temperate regions of central and western China, such as Henan, Shandong, and Gansu provinces, where it has shown stable performance in regional trials. Orchards should be established in sunny, wind-protected areas with access to irrigation, using a planting density of 2 to 2.5 meters by 4 to 4.5 meters. Suitable rootstocks include ZY-1, Gisela 6, Mahaleb, and Daqingye, with grafting is performed in spring or autumn for high survival rates. Tree shapes can be central leader, modified spindle, or slender spindle. Young trees require light pruning and branch spreading to encourage early fruiting; mature trees need pruning of old branches to prevent fruiting position migration. Base fertilizer, such as rotten organic fertilizer, is applied in autumn, with additional nitrogen and trace elements after flowering and before harvest. Irrigation should be coordinated with fertilization: young trees need frequent and light watering, while mature trees require water at pre-germination/flowering, stone-hardening, and fruit enlargement stages; overwintering water must be ample. Micro-sprinkler irrigation is recommended during high-temperature flowering to lower orchard temperatures.

Key words: Sweet cherry; New cultivar; Chunxu; Mid-ripening

甜樱桃（*Prunus avium* L.）因具有果个大、色泽艳丽、耐贮运、风味佳等特性，深受中国消费者喜爱，具有较高的经济价值。甜樱桃于19世纪70年代第一次引入我国山东地区，近年来栽培面积和产量呈稳定增长趋势[1]。然而，目前主栽品种多数为国外引进品种，不适宜中国本土复杂多样的生态条件，产量和品质方面具有一定劣势，且品种老化严重，缺乏新优品种[2]。近年来，我国一直致力于选育具有自主知识产权并适宜我国甜樱桃产业发展的优良新品种，育种目标除具有果个大、品质佳、丰产稳产等传统优良性状外，还具有品种特性，如畸形果率低、硬肉耐贮运、抗裂果等，以实现甜樱桃的本土化推广种

植和高效栽培[3]。

1 选育过程

春煦是从先锋的自然杂交实生后代中选育的优良品种。由分子鉴定结果可知，春煦从先锋获得了半数遗传基因（表1）。2002年5月，采集先锋自然杂交种子约800粒，随后在4 ℃冰箱低温层积处理；2003年春季，播种于温室和苗圃培育，获得实生苗约200株；2004年春季，定植于中国农业科学院郑州果树研究所樱桃育种圃。2007年，编号为25-37的单株少量开花结果，初选为优良单株，并在品种资源圃进行了高接繁殖。经过2008—2010年的连续观察，其果品优质、早果丰产稳产性好、抗性强、树体生长健壮。2010年被选为优系，开始采用ZY-1砧木进行嫁接繁殖，并在郑州新郑、安阳汤阴、三门峡渑池、甘肃天水和山西运城等地布点进行区域试验观察。经过连续多年对各试验点进行观察，其生物学性状、结果习性、丰产性能、果实品质等性状表现一致、稳定。25-37不仅具有母本先锋的早果、丰产稳产、硬肉等优良性状，而且成熟期早、果个大、畸形果率低、抗裂果性强，综合性状明显优于先锋。2021年5月，通过河南省林木品种审定委员会品种审定（良种编号：豫S-SV-PV-007-2021），定名为春煦（图1）。

表1 春煦与先锋亲缘关系的分子鉴定

Table 1 DNA molecular identification of the genetic relationship between Chunxu and Van

品种 Cultivar	*S*基因型 *S*-genotype	引物扩增DNA片段长度 DNA sequence length through PCR with primer/bp									
		引物1 Primer1	引物2 Primer2	引物3 Primer3	引物4 Primer4	引物5 Primer5	引物6 Primer6	引物7 Primer7	引物8 Primer8	引物9 Primer9	引物10 Primer10
春煦 Chunxu	*S*1*S*3	93/93	139/141	204/206	138/150	158/192	182/190	147/161	180/196	96/96	223/257
先锋 Van	*S*1*S*3	91/93	139/141	204/218	138/174	192/192	182/188	147/165	174/196	96/100	233/257

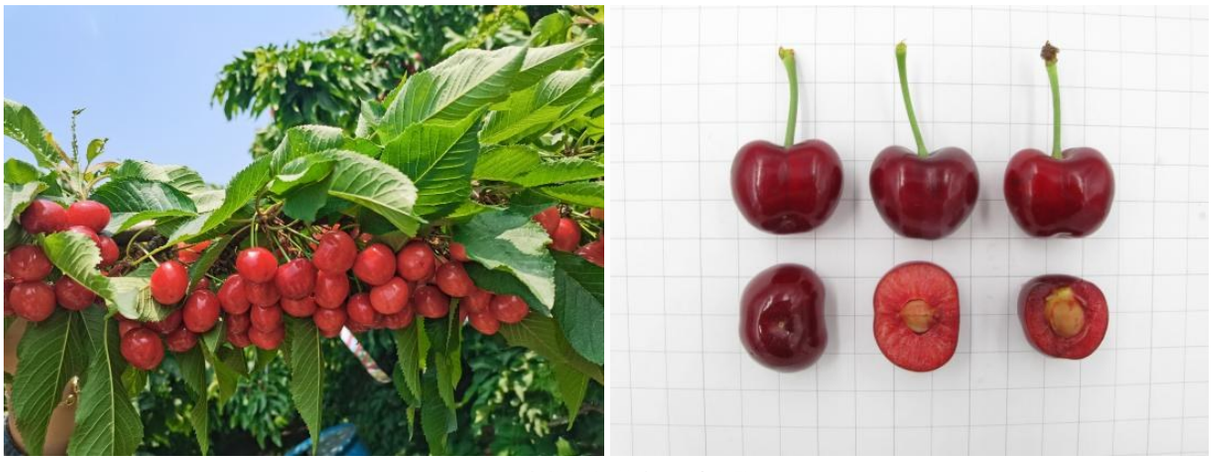

图1 中熟甜樱桃新品种春煦

Fig. 1 A new mid-ripening sweet cherry cultivar Chunxu

2 主要特征特性

2.1 果实经济性状

果实肾形，果顶凹，果柄长度短，粗度中等，果蒂离层，平均单果质量9.5 g，果实成熟时果皮紫红色，色泽亮丽，果肉硬度0.69 kg·cm^{-2}，耐贮运，果实可溶性固形物含量（*w*，后同）19.90%，总糖含量14.48%，可滴定酸含量为0.69%，维生素C含量为16.23 mg·100 g^{-1}，酸甜可口，品质佳（表2）。果核椭圆形，果核与果实相对大小中等。春煦果实品质和口感明显优于目前生产上其他早中熟主栽品种早大果、红灯、龙冠等。此外，早大果、红灯、龙冠等品种畸形果率高达20%~40%，严重降低了果实的经济效益，而春煦花芽分化时期耐夏季高温，畸形果率低，抗裂果性强，果实均匀整齐，商品果率高。春煦还具有早果、果个大、丰产、稳产等优良品质，是适宜在我国暖温带地区和中西部地区推广种植的优良中熟品种。

表2　春煦与对照早中熟甜樱桃品种果实主要性状比较（新郑）

Table 2　Comparison of main characters between Chunxu and the control cultivars (Xinzheng)

品种 Cultivar	成熟期 Maturing date	果形 Fruit shape	果柄长度 Fruit stalk length/cm	果柄分离难度 Separation difficulty of fruit and stalk	果实色泽 Fruit color	果肉颜色 Flesh color	平均单果质量 Average single fruit mass/g	w（总糖） Total sugar content/%	w（可滴定酸） Titratable acid content/%	w（维生素C） Vitamin C content/（mg·100 g^{-1}）	w（可溶性固形物） Soluble solid content/%	果肉硬度 Firmness/（kg·cm^{-2}）	风味 Flavor
早大果 Zaodaguo	5月12日 May 12	扁圆形 Oblate	4.0	中等 Middle	紫红色 Purple red	紫红色 Purple red	7.5	9.27	1.04	10.72	14.4	0.53	甜酸 Sweet with sour taste
红灯 Hongdeng	5月15日 May 15	肾形 Kidney-shaped	3.6	难 Difficult	紫红色 Purple red	紫红色 Purple red	7.3	9.98	1.04	9.97	15.5	0.59	酸甜 Sour with sweet taste
春煦 Chunxu	5月18日 May 18	肾形 Kidney-shaped	3.2	中等 Middle	紫红色 Purple red	紫红色 Purple red	9.5	14.48	0.69	16.23	19.9	0.69	酸甜 Sour with sweet taste
龙冠 Longguan	5月18日 May 18	扁圆形 Oblate	4.2	中等 Middle	紫红色 Purple red	紫红色 Purple red	7.2	10.81	1.31	20.33	15.3	0.44	偏酸 More sour taste

2.2　植物学特征

树势强壮，树姿半直立，树体分枝能力中等；1年生枝条粗壮，多年生枝条红褐色；新梢花青苷显色程度弱，梢尖茸毛中等；叶片平展，叶片长宽比适中，叶基广楔形，叶尖渐尖，叶缘有粗重锯齿；平均叶柄长度3.2 cm，具有2~3个大小中等的蜜腺，颜色浅红；花蕾粉色，花瓣白色，中等椭圆形，花冠直径中大。

2.3　生长结果习性

树体成枝力中等，初果期以中长果枝结果为主；进入盛果期后，树势逐渐中庸，多以花束状果枝和中长果枝腋花芽结果。春煦自花不实，*S*基因型为*S1S3*，种植时需搭配相应的授粉树。幼树定植后第3年可少量结果，第5年进入盛果期，每666.7 m^{2}产量可达1200 kg以上。早果性、丰产稳产性强，但连续大量结果数年后，树势逐渐衰弱，从而影响果实品质，应及时短截回缩更新结果枝组，同时加强树体营养管理，以增强树势。

2.4　物候期

春煦为中熟甜樱桃品种。在郑州地区，春煦萌芽较早，通常在3月上旬萌芽；3月27日进入初花期，盛花期集中在3月28日至4月3日，花期6~8 d；5月18日果实成熟，果实发育期约48 d，11月下旬进入休眠期，生育期约270 d。

3　栽培技术要点

选择背风向阳且具备灌溉条件的地块建园，株行距设置为（2~2.5）m×（4~4.5）m。春煦嫁接可采用ZY-1、Gisela 6、马哈利、大青叶等砧木。每年可在春季或秋季嫁接，成活率均较高。春煦自花不实，花期中晚，可搭配萨米脱、美早和桑蒂娜等品种进行授粉。树形可修剪为直立中央领导干形、改良纺锤形或细长纺锤形等。在幼树整形阶段，要轻剪，多缓放，同时结合人工开张树姿，以促进提前结果；在盛果期整形阶段，为避免结果部位外移，修剪时要及时对老枝进行回缩。对于修剪细长纺锤形的树木，定植后当年5—6月应注意控制基部发育枝条生长，以确保中心领导干发育充分。施肥以基肥为主，即每年秋季施用适量腐熟的有机肥，并在落花后和采收前及时补充氮肥和微量元素。果园浇水需与施肥紧密结合，定植1~2年的幼树，应勤浇水、浇小水，保持土壤湿润；盛果期树应根据生长阶段浇水，萌芽及开

花前要及时浇水，保障萌芽及花期正常发育；硬核期和果实膨大期是果树需水关键期，需采取少量多次的浇水方式；越冬前必须浇透浇足。其他生长季节根据土壤墒情进行适当浇水。花期温度较高时，可采用微喷灌方法以降低果园温度。病害防治方面，应注意预防常见危害甜樱桃的流胶病、根颈腐烂病、根癌病等。在果实采收后或雨季来临前，应注意预防早期落叶病害，如叶片细菌性穿孔病和褐斑病等。

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