

砂梨新品种金花早的选育

王文明¹, 贾 兵^{2*}, 朱立武², 刘文琴³, 张均明⁴, 童秋云⁵, 吴宗政⁶, 鲍利平⁶

(¹歙县科技实验站, 安徽黄山 245200; ²安徽农业大学园艺学院, 合肥 230036; ³歙县郑村镇为民服务中心, 安徽黄山 245200; ⁴歙县农业技术推广中心, 安徽黄山 245200; ⁵黄山综合试验站, 安徽黄山 245200; ⁶歙县宏林华家庭农场, 安徽黄山 245200)

摘 要:金花早属砂梨(*Pyrus pyrifolia*)品种, 为安徽歙县上丰乡徽州雪梨地方梨优良品系。果实呈扁圆形, 硬度中等, 果肩部有褐色锈斑, 果肉乳白色, 果心中等大, 为5心室, 肉质紧密; 果皮绿色, 平均单果质量350.6 g, 可溶性固形物含量(w, 后同)为10.8%, 有机酸含量为0.05%。与主栽梨品种秋黄、丰水相比, 其果实贮藏性良好, 常温下贮藏30 d左右, 适应性强, 抗早期落叶病。在歙县地区3月10日萌芽, 3月20日初花, 3月24日盛花, 3月30日末花, 落叶期为11月2日, 成熟期为8月下旬。嫁接苗第5年平均每株产量可达25.3 kg, 每666.7 m²产量高达2 125.2 kg, 产量高而稳定。鲜食与加工兼用。适合长江流域和皖南山区栽培。

关键词:梨; 新品种; 金花早

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Breeding of a new sand pear cultivar Jinhuaazao

WANG Wenming¹, JIA Bing^{2*}, ZHU Liwu², LIU Wenqin³, ZHANG Junming⁴, TONG Qiuyun⁵, WU Zongzheng⁶, BAO Liping⁶

(¹Science and Technology Experimental Station of She County, Huangshan 245200, Anhui, China; ²College of Horticulture, Anhui Agricultural University, Hefei 230036, Anhui, China; ³Service Center of Zhengcun Town, She County, Huangshan 245200, Anhui, China; ⁴Agro-Tech Extension and Service Center of She County, Huangshan 245200, Anhui, China; ⁵Huangshan Comprehensive Experimental Station, Huangshan 245200, Anhui, China; ⁶Honglinhua Family Farm in She County, Huangshan 245200, Anhui, China)

Abstract: Jinhuaazao is an excellent strain of local sand pear (*Pyrus pyrifolia*) cultivars in Shangfeng town, She county, Anhui province. In 2008, we surveyed the sand pear germplasm resources in Anhui province and discovered five distinct self-rooted mother trees with moderate fruit size, round fruit shape and outstanding fruit quality, as well as tolerance to early defoliation disease and long storage period. During the preliminary selection, it was temporarily named as Jinhuaazao pear. To confirm the hypothesis that these five plants were unprecedented local pear cultivars, we re-investigated the local sand pear germplasm resources during 2009—2010 and successfully constructed a SRAP genetic map for them. According to the phylogenetic tree analysis and DNA electrophoresis results, we revealed that these five plants were distinctive from other surveyed pear strains. Therefore, we subsequently consulted the relevant information and conducted fruit quality evaluation and genetic molecular identification on them, and two of them were selected for further study. After that, we monitored and comparatively analyzed the biological and physiological characteristics and resistance to abiotic stresses between the two selected strains and other pear strains. Fortunately, we obtained a new excellent local sand pear cultivar, which was early maturing, highly yielding, strongly adaptable and more tolerant to early defoliation disease. These support our assumption that Jinhuaazao was a characteristic local pear variety that was unrecorded before in Anhui province. A regional evaluation was performed from 2015 to 2020 in Anhui

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作者简介: 王文明, 男, 高级农艺师, 研究方向为园艺技术推广。Tel: 0559-6527670, E-mail: 465034053@qq.com

*通信作者 Author for correspondence. E-mail: jb1977@ahau.edu.cn

province, and the biological characteristics, phenological period and main economic traits of Jinhuaazao were systematically investigated. The results showed that Jinhuaazao was a kind of strong and upright pear tree, which was recognized by its strong branching potential but weak branching power in the field. Jiangzaohua sprouted on March 10, and the flowers began to open on March 20, full bloom occurred on March 24, and flowering ended on March 30. Their flowers consisted of 5–6 white petals, where the internal stamens were date-red or red, with 20–22 individual whorled filaments. In addition, corymb-shaped clusters were observed in full bloom, which was composed of 5–7 flowers. At the same time, we found that the 1-year-old branches of Jinhuaazao were brown, and were spirally attached by green and oblong oval-shaped leaves, which were distinguishable by their long and acute leaf tips, rounded leaf bases, and bluntly serrated leaf margins. Moreover, we noticed that the leaf surface was smooth and glossy, slightly curved inward on both sides, and the pedicels were thin. The transverse and the vertical diameters of the leaves were approximately 12.59 cm and 7.52 cm, respectively, while the petiole length of them was roughly 4.22 cm. Beyond those, we discovered that Jinhuaazao was highly fruit-setting, whose fruits matured earlier than other local pear varieties in Anhui province, and in the Huangshan region of Anhui province, the fruit maturity occurred in late August. The fruit of Jinhuaazao was round, and the flesh was creamy white and compact with a 5-ventricle-denoted medium fruit core. It displayed medium hardness and exhibited a green pericarp accompanied by brown rust spots on the shoulder. According to our analysis, the average fruit weight was 350.6 g, the soluble solid content of the fruit was 10.8%, and the organic acid content was 0.05%. Importantly, compared to the local pear cultivars Chuwhangbae and Housui, Jiangzaohua seemed to be more tolerant to the early defoliation disease that arose on November 2 in the field, and the fruit was equipped with a better storage property, with a storage period of approximately 30 days at room temperature. Jinhuaazao could be grafted on the Duli rootstock to achieve greater economic value. The planting density in the orchard should be set as 2 m between trees and 4 m between rows. The trees should be trained into sparsely-layered or open-central system. To guarantee the yields of the coming year, the structure of the canopy and the composition of the branches should be strictly controlled through winter pruning, which ought to be performed between 20–25 days after leaf drop. If available, bees can be released at full bloom period to promote pollen dispersal, hence improving the fruit set. As for fertilizer management, sufficient fertilizer must be applied to the trees in the juvenile period, with a single-use of fast-acting fertilizer before the emergence of new shoots. During this period, foliar fertilizer can be sprayed to promote the growth of branch tips. Upon entering adulthood, special attention should be paid to the application of basal, pre-flowering and fruit-harvesting fertilizers, where organic manure should be the main fertilizer, and its reasonable combination with medium-, and trace-elements is needed. Noteworthily, the amount of organic manure application should account for more than 70% of the annual amount of fertilizer. However, despite the strong resistance of Jinhuaazao to multiple diseases, more attention should still be paid to prevent it from disease in the field in the southern rainy season, with an emphasis on the governance towards the black spot, anthracnose and *Gymnosporangium asiaticum* of pear. To reduce the rate of pests and diseases, prediction and forecasting should be strengthened, and agricultural, biological, physical and chemical control should be integrated and adopted under the principle of “prevention first, green governance”. The grafted trees of Jinhuaazao could bear abundant fruit in the fourth year and harvested in the fifth year after grafting, the yield of grafted trees was consistent and highly productive, and it reached more than 2 125.2 kg per 666.7 m², which is higher than that of Chuwhangbae and Housui. It is appropriate for cultivation in the Yangtze River basin and mountainous area of southern Anhui, and it can grow well

in any area where it is warm and humid with cool summers. In 2021, it was approved by the Anhui Forest Variety Approval Committee (Accession No.: Wan S-SV-PP-004-2021).

Key words: Pear; New cultivar; Jinhuaazao

中国是世界梨的重要发源地,有悠久的栽培历史,拥有丰富的品种资源和深厚的文化根基,是世界第一梨果生产国。各梨产区具有许多特色的地方优良品种,对中国梨种质创新与产业发展起到重要作用^[1]。梨树适应性强,除海南省、港澳地区外其余各省(自治区、直辖市)均有栽培,且形成具有地方特色和地域特征的优势生产区域,在农业种植业结构调整和农民增收致富中具有重要意义^[2-3]。据罗愿《新安志》记载:歙县上丰乡为徽州雪梨的原产地,栽培始于南宋,已有近千年的历史,并形成了独特的栽培技术,如传统果袋制作工艺和套袋技术。据民国《歙县志》(1937)载:“雪梨”旧产文公舍(今五村东南),今

北乡丰源一带及东乡之汪岔皆产之;名金花早者为早梨,味美,吾邑梨初结实时,用柿漆纸就树上色裹之,故色白,不裹则青而皮粗。徽州雪梨的传统品系有30多个,选育耐贮藏、抗早期落叶的优良地方品种对种质资源的保存和利用具有重要意义。

1 选育过程

2008年,徽州雪梨种质资源调查时,通过初选,发现金花早优良实生母株5个,其果个适中,果形圆整,品质优,且其早期落叶病抗性和贮藏周期均较当地主栽品种秋黄和丰水有所改善(表1)。

2009—2010年,进行复选,构建了徽州雪梨种

表1 金花早与当地主栽梨品种秋黄和丰水的经济性状比较

Table 1 Comparison of the economic characteristics among Jinhuaazao and local pear cultivars Chuwhangbae and Housui

品种 Cultivar	成熟期 Maturity	抗早期落叶病特性 Resistance to early defoliation disease	常温贮藏期 Storage period at room temperature/d	666.7 m ² 产量 Yield per 666.7 m ² /kg
金花早 Jinhuaazao	8月下旬 Late Aug.	强 Stronger	30	2 125.2
秋黄 Chuwhangbae	8月中下旬 Mid to late Aug.	较强 Comparatively strong	20	1 752.5
丰水 Housui	8月上旬 Early Aug.	弱 Weaker	10~12	1 688.4

质资源SRAP遗传图谱,其分析结果表明,金花早的DNA遗传物质与其雪梨品种有明显差异(图1),最终通过查阅资料、果实品质测定、遗传分子鉴定,确定优良实生母株2个。2013—2014年,进行了决选,通过生物学特性、性状稳定性连续观察,经济性状比较,田间抗早期落叶病调查,确定优良品系1个。2015—2020年,进行区域试验,对其生物学特性、物候期进行观察,对果实主要经济性状进行测定分析(图2)。2021年通过了安徽省林木品种审定委员会审定(编号:皖S-SV-PP-004-2021)。

2 主要性状

2.1 植物学特征

金花早树势强旺,萌芽力强,成枝力弱。1年生枝棕褐色;叶片呈长椭圆形,叶尖长,急尖,叶基圆形,叶全缘、叶缘有钝锯齿,叶梗细。叶长12.59 cm,叶宽7.52 cm,叶柄长4.22 cm。花瓣为白色、5~6枚,雄

蕊20~22枚,分离轮生,枣红色或红色;伞房花序,每花序一般为5~7朵花;花序坐果率高。

2.2 果实经济性状

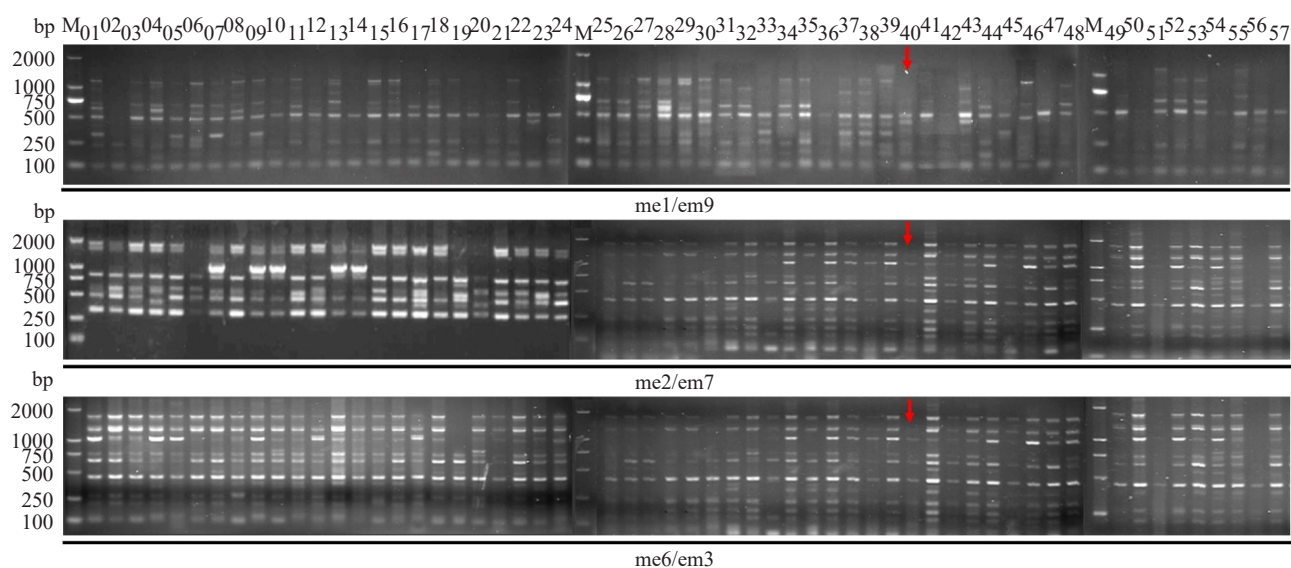
金花早果实扁圆形,平均单果质量350.6 g,纵径8.5 cm,横径10.0 cm,果皮绿色、套袋黄白色,果肩部有褐色锈斑;果心中等,5心室;果肉乳白色,肉质致密、较硬,汁液中等,味甜,无香气;可溶性固形物含量(*w*,后同)10.8%,可滴定酸含量0.05%,8月下旬成熟。

2.3 物候期

在安徽歙县地区,金花早萌芽期3月10日,初花期3月20日,盛花期3月24日,终花期3月30日,果实成熟期8月30日,落叶期11月2日。金花早嫁接苗第4年可大量结果,5年生嫁接苗平均株产可达25.3 kg,每666.7 m²产量可达2 125.2 kg。

2.4 适应性及抗逆性

该品种适应性强,其耐旱、耐涝性也较秋黄和丰

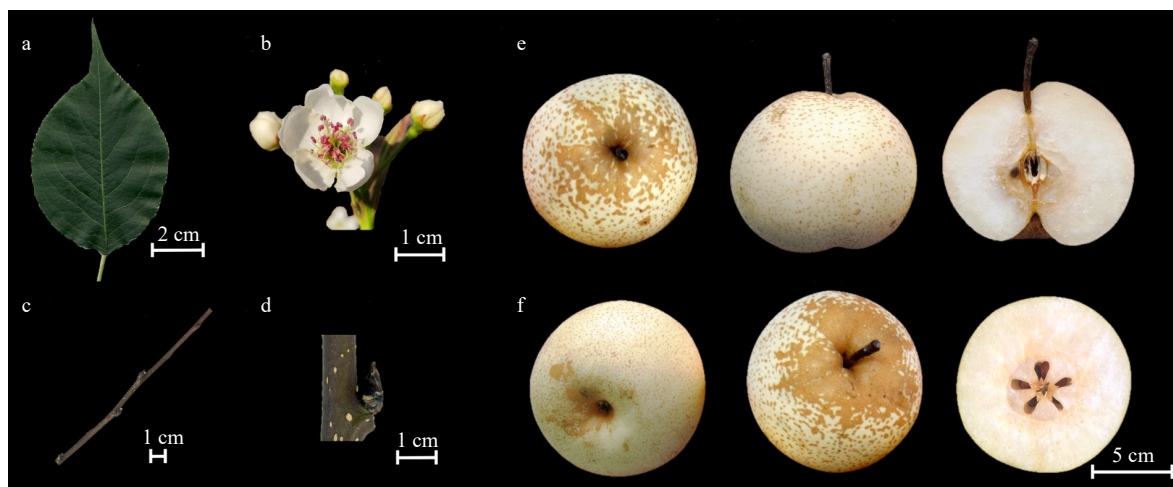


M. 分子质量 2000 DNA marker; 01~57 号泳道分别为杜梨、木头酥、麻梨、杏叶梨、酸砭砭、它西阿木特、长十郎、爱甘水、六月早、圆黄、金二十世纪、新高、五九香、火把、满天红、苍溪雪梨、玛利亚、意大利黑梨、花长把、兰州长把、康佛伦斯、红巴梨、三季梨、巴梨、早美酥、涩梨、鄂梨 2 号、八里香、满园香、软儿梨、花盖、库尔勒香梨、马蹄黄、鸭梨、砀山酥梨、鄂梨 1 号、吊蛋、木梨、豆梨、金花早、一点红、细皮、卢皮红、溪源白、清香、翠冠、二十世纪、雪峰、新世纪、黄花、西子绿、绿宝石、爱宕、黄金、早生黄金、七月酥、幸水; me1/em9、me2/em7 和 me6/em3 为梨 SRAP 分析的 3 对特异性引物组合。

M. 2000 DNA marker; The lane 01–57 is the DNA amplification product of 57 sand pear germplasm resources in Anhui province. They are Duli, Mutousu, Mali, Xingyeli, Suanchengtuo, Taxi' amute, Choujuurou, Aikansui, Liuyueza, Wonhwang, Gold Nijisseiki, Niitaka, Wujiuxiang, Huoba, Mantianhong, Cangxixueli, Maliya, Yidaliheili, Huachangba, Lanzhouchangba, Conference, Red Bartlett, Docteur Jules Guyot, Bartlett, Zaomeisu, Seli, Eli 2, Balixiang, Manyuanxiang, Ruanerli, Huagai, Kuerlexiangli pears, Matihuang, Yali, Dangshan Suli, Eli 1, Diaodan, Muli, Douli, Jinhuazao, Yidianhong, Xipi, Lupihong, Xiyuanbai, Qingxiang, Cuiguan, Nijisseiki, Xuefeng, Shinseiki, Huanghua, Xizilü, Lübaoshi, Atago, Whangkeumbae, Josengwhangkeum, Qiyuesu, and Kousui, respectively. me1/em9, me2/em7 and me6/em3 are the three specific primer pairs for SRAP analysis in pear.

图 1 57 个徽州雪梨品系的 SRAP 图谱分析

Fig. 1 SRAP mapping analysis of 57 sand pear germplasm resources in Anhui province



a. 叶, 标尺为 2 cm; b. 花, 标尺为 1 cm; c. 枝条, 标尺为 1 cm; d. 芽, 标尺为 1 cm; e. 金花早梨果和其横切面, 标尺为 5 cm; f. 金花早梨果和其纵切面, 标尺为 5 cm。

a. Leaves, scale bar is 2 cm; b. Flowers, scale bar 1 cm; c. Branches, scale bar is 1 cm; d. Buds, scale bar is 1 cm; e. Jinhuaazao pear fruit and its transverse section, scale bar is 5 cm; f. Jinhuaazao pear fruit and its longitudinal section, scale bar is 5 cm.

图 2 梨品种金花早的各组织特征及其果实横、纵切面

Fig. 2 Characteristics of the various tissues of Jinhuaazao and the cross section of its fruits

水强,抗火疫病,特别是抗早期落叶病。

区域试验结果表明,金花早适宜长江流域、皖南山区栽培。常温下可贮藏30 d左右。与引种的其他日韩梨品种相比,明显抗早期落叶病。生产上最好选用杜梨作为砧木,适宜有机质含量高、微酸性土壤,土层深厚、排水良好的地块建园。

3 栽培技术要点

3.1 整形修剪

该品种生长势旺、成枝力较强,栽植密度以2 m×4 m为宜,可采用“开心形”“Y形”树形。定干高度50~60 cm,“Y形”在基部选出2个主枝,方向与行向垂直,“开心形”3个主枝,向3个不同方向生长,主枝间水平夹角以120°为宜,树高一般控制在3.0 m以内。幼树要轻剪,多采用摘心、扭梢、拿枝、拉枝、以果压枝的方法培养树形,控制树体旺长,调节叶果比,促进果实膨大和花芽分化。除延长枝外,以疏枝、长放为主,促使形成花芽,提早结果,尽量少短截。落叶后至萌芽前可进行冬季修剪,以培养结果枝组,调整花芽量,促进通风透光。

3.2 肥水管理

幼树施肥需薄肥勤施,适当增施氮肥,增加根外追肥。生长季节每隔20 d追施尿素或复合肥20~50 g·株⁻¹,也可叶面喷施0.3%尿素和0.1%磷酸二氢钾。成年树施肥以有机肥(主要为农家肥)为主,注重有机肥与中微量元素合理搭配,有机肥的施入量占全年的70%以上。秋季,可在株间或行间围开挖平行沟或环状沟,向外深翻扩穴50~60 cm,深度以60 cm为宜。土壤回填时混以有机肥,表土放在底层,底土放在上层。可在行间套种三叶草、紫云英和毛叶苕子等绿肥作物。通过定期翻压、覆盖等方法将其转变为梨园有机肥培肥土壤,或采用自然生草定期割草覆盖树盘。

3.3 花果管理

栽植该品种时,按照(3~4):1配置授粉树,要求花期相遇,授粉品种花粉量大,以徽州雪梨品系的细皮和回溪为佳。盛花期进行花期放蜂,能显著提高坐果率,且果个大、果形圆整。

一般在落花后20 d进行疏果,25 d内完成疏果工作。留果的标准为每隔20~30 cm留1果,其余全部疏除。可选用外黄内黑双层专用袋或本地自制的柿漆袋进行套袋,一般在落花后25~30 d内完成,套

袋前1~3 d,全园要细致喷洒1遍杀虫剂和杀菌剂,药剂一般选择70%甲基托布津1000倍液加10%吡虫啉2500倍液,雨后要及时补喷。

3.4 病虫害防治

坚持“预防为主、防治为辅、综合防治”原则。采取农业防治、生物防治、物理防治和化学防治相结合的综合防治方法。做好病虫害预测预报,提高防治效果。

农业防治采取剪除病虫枝、清除枯枝落叶、刮除树干翘裂皮、深翻树盘等农业栽培措施,达到增强树势、提高抗病虫能力、减轻病虫基数的目的。

生物防治通过施放性诱剂、悬挂糖醋液,诱杀梨小食心虫,并结合使用频振式杀虫灯等物理防治措施诱杀吸果夜蛾、梨小食心虫等害虫。

化学防治重点做好冬季清园工作,萌芽前用5°Bé石硫合剂全园消毒,生长季节可用80%全络合态代森锰锌800倍液,配合70%甲基托布津800~1000倍液、50%多菌灵600倍液、40%福星乳油8000~10 000倍液等药剂分别防治轮纹病、炭疽病、黑斑病等主要病害;用2.5%功夫3000倍液、0.3%苦参碱800~1000倍液、1.8%阿维菌素2500倍液、10%吡虫啉5000倍液等药剂防治梨大食心虫、梨小食心虫、梨木虱、蚜虫和叶螨等主要虫害。

4 综合评价

金花早适合于长江流域和皖南山区栽培。其他温暖湿润、夏季阴凉、适宜砂梨生长的地区均可栽培金花早。该品种适应性强,耐旱耐涝,抗早期落叶病和火疫病,果实洁白、汁多味甜,鲜食与加工兼用。

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