

优质抗逆黄肉枇杷新品种漫山虹的选育

李晓颖,徐红霞,葛航,陈俊伟*

(浙江省农业科学院园艺研究所,杭州 310021)

摘要:漫山虹是以白肉枇杷品种宁海白为母本、黄肉枇杷品种解放钟为父本杂交选育而成的中熟黄肉枇杷新品种。该品种树姿开张,树冠半球形,树势强。盛花期为12月下旬至翌年1月上旬,较黄肉主栽品种大红袍晚30~40 d,花期晚且长。在浙江嘉兴地区,露地果实成熟期为5月下旬,较大红袍提前3~5 d。果实近圆形,果皮橙黄色,韧性好;果肉橙黄色,硬度中等,平均单果质量48.9 g,可溶性固形物含量(w,后同)14.9%,可滴定酸含量0.31%,可食率75.8%,肉质致密细嫩,汁液多,品质佳。抗寒性、抗裂果及抗日灼能力强。丰产性好,露地栽培6年生树每666.7 m²平均产量979.9 kg。

关键词:枇杷;新品种;漫山虹;优质;抗寒

中图分类号:S667.3

文献标志码:A

文章编号:1009-9980(2026)02-0470-05

Breeding report of Manshanhong, a new yellow-fleshed loquat cultivar with high quality and stress resistance

LI Xiaoying, XU Hongxia, GE Hang, CHEN Junwei*

(Institute of Horticulture, Zhejiang Academy of Agricultural Sciences, Hangzhou 310021, Zhejiang, China)

Abstract: Manshanhong is a new high-quality loquat cultivar with medium maturing and yellow flesh, obtained from a cross between the female parent Ninghaibai and the male parent Jiefangzhong. Hybridization was carried out in December 2011, hybrid fruits were harvested in late May 2012, and seeds were collected and germinated in nutrient pots. In spring 2013, 450 hybrid seedlings were transplanted to the same base for field evaluation. The offspring of the hybrid began to blossom in 2016 and initiated fruiting in 2017. After 3 years of continuous analysis and evaluation, a superior genotype (temporarily numbered A207) was finally selected from the 450 hybrids, exhibiting delayed flowering, strong stress resistance, uniform fruit appearance, high fruit-setting rate, and superior fruit quality. From 2017 to 2019, three consecutive years of phenotypic evaluations confirmed the stability of its botanical and agronomic traits. It was provisionally named Zhehong 1, and in 2020, it was granted national plant variety rights under the official denomination Manshanhong. To validate its adaptability and commercial potential, 200 grafted seedlings were propagated in 2018 and introduced to demonstration orchards, including Yuhang District and Lanxi City, through a technology transfer agreement. These trial plantings began fruiting in 2022, with consistent trait performance observed over three consecutive years, confirming its stability across diverse environments. Manshanhong is a vigorous, semi-spherical, open-canopy tree with a distinct central leader. The trunk exhibits a grayish-white hue, sparse lenticels, and moderate pubescence. Mature one-year-old branches are brown, with an average length of 57.0 cm and a diameter of 1.4 cm for central branches, while lateral branches measure 44.5 cm in length and 1.3 cm in diameter. The tree produces five lateral branches per central branch on average, with medium branching capacity. Leaves on one-year-old spring shoots are dark green, thick, and rigid, with an elliptic in shape

收稿日期:2025-06-10

接受日期:2025-09-02

基金项目:浙江省“十四五”果品新品种选育专项(2021C02066-3);浙江省三农九方项目(2022SNJF028)

作者简介:李晓颖,女,副研究员,博士,主要从事枇杷育种与分子生物学研究。Tel:0571-86417302,E-mail:muzixiaohaitun@126.com

*通信作者 Author for correspondence. Tel:0571-86417302,E-mail:chenjunwei@zaas.ac.cn

(32.9 cm × 12.1 cm, and length-to-width ratio 2.7). The leaf is slightly wrinkled, with a tapered apex, cuneate base, and flat margins. Leaf thickness averages 0.43 mm, with a concave cross-sectional profile. The adaxial surface is light green and pubescent, while the abaxial surface is gray-yellow with moderate pubescence and prominent reticulate venation. Leaf margins bear shallow, medium-density serrations covering half of the edge, with 16–18 pairs of lateral veins. Petioles are short (1.1 cm) and thick (5.5 mm), with deciduous stipules averaging 13.5 mm in length. Manshanhong flowers in late autumn to winter, with a delayed phenology: initial flowering occurs in early December, full bloom from late December to early January, and terminal flowering in late January to early February. Inflorescences are conical, averaging 9.5 cm in length and 10.5 cm in width, with eight horizontally spreading rachises per cluster. Each inflorescence bears approximately 106 flowers, characterized by yellow-white petals (26.6 mm in diameter), five pistils, and 22–24 stamens per flower. Fruits ripen around May 25 in Haining City, Zhejiang province, and a near-spherical shape with closed calyx cavities. Post-thinning fruits average 48.9 g in weight. The peel is orange-yellow, resilient, and easy to separate from the flesh. The orange-yellow pulp has medium firmness, tender texture, high juiciness, and excellent melts in the mouth. Biochemical analysis reveals soluble solids content (SSC) of 14.9%, titratable acidity (TA) content of 0.31%, and an edible rate of 75.8%. Each fruit contains 5.8 seeds on average. This variety exhibits strong resistance to fruit cracking and sunscald, coupled with excellent fruit quality. Under open-field cultivation, the average yield reaches 979.9 kg per 666.7 m² for six-year-old trees. Manshanhong represents a significant advancement in yellow-fleshed loquat breeding, combined with delayed phenology, robust adaptability, and superior fruit traits, marking it a promising leading cultivar for commercial loquat production.

Key words: *Eriobotrya japonica*; New cultivar; Manshanhong; High-quality; Cold resistance

枇杷是浙江省特色水果,栽培历史悠久,因风味佳美、质地细嫩、鲜甜适口而久负盛名^[1]。浙江省统计年鉴数据显示,2023年全省枇杷面积约1.40万hm²,年产量10.93万t,产值突破17亿元^[2]。枇杷已成为浙江省部分地区效益农业和休闲观光采摘的主要果树种类之一,在乡村振兴、共同富裕、农民增收中发挥了重要作用。

黄肉类枇杷品种种植面积约占浙江省种植总面积的40%,主栽品种有大红袍、洛阳青等^[3-4]。这些品种的花期相对较晚,抗逆性较白肉品种好,主要缺点是果型小、肉质粗硬、化渣性差、糖分低、酸度高,难以满足消费者对高品质枇杷的需求^[5]。因此,亟须培育大果型、品质优、抗逆性强、丰产性好的黄肉枇杷新品种。杂交育种是枇杷新品种选育的重要手段^[6]。浙江省农业科学院园艺研究所通过种质资源筛选,基于表型性状互补原则,选用优质白肉品种宁海白为母本、福建大果晚花抗逆品种解放钟为父本构建杂交群体,开展枇杷杂交育种。历经13a(年)培育成品质、果形、抗性均优于现有主栽黄肉品种大红袍的新品种漫山虹。漫山虹可为黄肉枇杷品种结

构调整提供支撑,将促进浙江省乃至全国枇杷产业高质量发展。

1 选育经过

2011年12月,浙江省农业科学院园艺研究所枇杷育种团队从福建省果树研究所国家枇杷资源圃采集解放钟花粉,在浙江省农业科学院海宁杨渡创新基地与母本宁海白进行杂交,2012年5月下旬收获195个杂交果实,获得541粒种子,将其播种于营养钵获得450株杂交实生苗,2013年春季将实生苗定植于海宁杨渡创新基地,2016年冬季开花,2017年初结果。其中一株因花期迟、抗逆性强、果实外观圆整、坐果率高、品质优,2017年被作为优株从杂交后代中选出,编号为A-207。2017—2019年连续3a观察其叶、花、果等植物学性状以及单果质量、品质、抗逆性等农艺性状,其性状表现稳定,暂定名为浙红1号,2020年申报国家植物新品种权,命名漫山虹(图1)。2018年繁殖种苗,并在余杭区仁辰语家庭农场和兰溪市果香家庭农场等示范基地进行区域试验,区试点于2020年起相继开花结果。根据2022—



图1 枇杷新品种漫山虹花穗与果穗及果实对比

Fig. 1 The flowers and fruits of loquat cultivar Manshanhong and fruit comparison

2024年连续3 a的区域试验观测数据,表明该品种树势强,花期晚,盛花期为12月下旬至翌年1月上旬;果肉细腻、糖度高、品质优;抗寒、抗裂果、抗栓皮;结果性与丰产性好,在特异性、一致性和稳定性方面与母树表现一致。2024年获得国家新品种权(证书号:CNA20201005544),2024年12月通过浙江省林木良种审定委员会审定(编号:浙S-SV-EJ-005-2024)。

2 主要性状

2.1 植物学特征

该品种树姿开张,树冠呈半圆球形,中心干明显,树势强。树干皮孔少,主干灰白色;1年生老熟枝条棕褐色,茸毛量中等;中心枝平均长度57.0 cm,粗度1.4 cm;侧枝5个,平均长度44.5 cm,粗度1.3 cm,枝梢质地中等。1年生春梢叶片深绿色,质地厚硬;老熟叶片椭圆形,浅绿色,质地厚硬,叶姿斜向上;叶长32.9 cm,叶宽12.1 cm,长宽比2.7,叶片厚度0.43 mm;叶尖渐尖,叶基楔形,叶缘平展,锯齿浅且密度中等,占叶缘长度的1/2;叶面稍皱,横切面呈凹形;叶背灰黄色、茸毛中等,叶脉16~18对,叶背中

脉凸起明显,网脉明显,侧脉直出,叶脉茸毛较多;叶柄长度1.1 cm,粗度5.5 mm。花序圆锥形,疏散至中等密集,平均长度9.5 cm,宽度10.5 cm,花序支轴姿态平展,平均支轴8个;平均每穗106朵花,花直径26.6 mm,花瓣黄白色,平均花柱5个,雄蕊22~24个。该品种于秋冬季开花,花期迟。始花期为12月上旬,盛花期为12月下旬至翌年1月上旬,终花期为1月下旬至2月上旬。在浙江省农业科学院海宁杨渡基地,该品种成熟期为5月25日左右。

2.2 果实经济性状

果实整齐、近圆形,萼孔闭合。疏果后平均单果质量48.9 g。果皮橙黄色,韧性好,易剥皮;果肉橙黄色,硬度中等。平均可溶性固形物含量(w ,后同)14.9%,最高达28.6%,可滴定酸含量0.31%,可食率75.8%;肉质细腻、糖度高、风味浓郁,遗传了优质白肉枇杷的品质风味。花穗抗寒性极强,在 -9°C 的强低温下坐果率较高,平均每穗坐果11.6个(不疏果),同时具备较强的抗裂果、抗日灼等能力(表1)。

2.3 生长结果习性

漫山虹树势强,花穗坐果率高。该品种在浙江兰溪、余杭、海宁等地的成熟期为5月中下旬,平均

表1 漫山虹和大红袍(疏果后)的果实经济性状比较

Table 1 Comparison of fruit economic traits between Manshanhong and Dahongpao (after fruit thinning)

性状 Trait	成熟期 Ripening period	平均单果 质量 Average single fruit mass/g	果实纵径 Vertical diameter/ cm	果实横径 Horizontal diameter/cm	可食率 Edible rate/%	w(可溶性 固形物) Soluble sol- ids content/ %	w(可溶性 总糖) Total sugar content/%	w(还原糖) Reducing sugar/%	w(抗坏血酸) Ascorbic acid content/ (mg·100 g ⁻¹)	w(可滴定酸) Titratable acid content/%
漫山虹 Manshanhong	5月下旬 Late May	48.9	44.6	41.4	75.8	14.9	10.76	9.8	3.13	0.31
大红袍 Dahongpao	5月底至6月初 Late May to early June	35.0	41.2	38.0	67.2	10.4	9.67	9.6	2.76	0.28

单果质量为48.9 g,平均每株结果穗为66个,经疏果后每穗坐果6~8个,平均株产12.33~29.73 kg,折合每666.7 m²产量为505.53~1 218.93 kg。露地栽培6年生树每666.7 m²种植41株,平均产量为979.9 kg·666.7 m⁻²。

2.4 物候期

2022—2024年,在海宁许村镇杨渡村基地、杭州仁和街道辰语家庭农场、兰溪市果香家庭农场等3处示范基地,通过露地种植,定树、定枝对漫山虹进行物候期观察,以大红袍作为对照,常规管理。结果表明,漫山虹在海宁和仁和示范基地的物候期与大红袍相近,春梢抽芽期为2月下旬至3月上旬。漫山虹现蕾期为10月中下旬,露白期为11月中下旬,始花期为11月下旬至12月上旬,盛花期为12月中

下旬至翌年1月上旬,而对照品种大红袍盛花期在11月下旬至12月上旬,漫山虹花期较对照晚30~40 d。漫山虹果实于5月下旬成熟,而大红袍在5月底6月初成熟。在兰溪市示范基地,漫山虹的春梢抽芽期为2月中下旬,现蕾期为10月上中旬,露白期在11月中旬,始花期在11月下旬,盛花期在12月上中旬,而对照品种大红袍盛花期在11月上中旬,花期较对照晚30~40 d。漫山虹果实成熟期约为5月中旬,而大红袍为5月中下旬(表2)。

2.5 抗逆性与栽培适应性

2022—2024年连续3年对漫山虹进行区试试验,结果表明,漫山虹适应性强,具体表现为树势强健,花期晚,抗寒性强,3个批次的花穗抗寒性明显优于对照品种大红袍。此外,漫山虹果实栓皮率显

表2 漫山虹与大红袍的主要物候期比较

Table 2 Comparison of main phenological stages between Manshanhong and Dahongpao

示范区 Demonstra- tion zone	品种 Cultivar	春梢抽生期 Spring shoot growth stage	现蕾期 Bud emergence stage	露白期 Bud break stage	始花期 Anthesis initiation stage	盛花期 Full bloom stage	成熟期 Maturation phase
海宁 Haining	漫山虹 Manshanhong	2月下旬至 3月上旬 Late-Feb. to early Mar.	10月中下旬 Mid-late-Oct.	11月中下旬 Mid-late-Nov.	11月下旬至 12月上旬 Late-Nov. to early Dec.	12月下旬至 翌年1月上旬 Late-Dec. to next year early Jan.	5月25—31日 May 25 to 31
	大红袍 Dahongpao	2月下旬至 3月上旬 Late-Feb. to early Mar.	9月下旬至 10月上旬 Late-Sept. to early Oct.	10月中下旬 Mid-late-Oct.	11月上中旬 Early-mid-Nov.	11月下旬至 12月上旬 Late-Nov. to early Dec.	5月27日至 6月2日 May 27 to Jun. 2
仁和 Renhe	漫山虹 Manshanhong	2月下旬至 3月上旬 Late-Feb. to early Mar.	10月中下旬 Mid-late-Oct.	11月中下旬 Mid-late-Nov.	11月下旬至 12月初 Late-Nov. to early Dec.	12月中下旬至 翌年1月初 Mid-late-Dec. to next year early Jan.	5月23—30日 May 23 to 30
	大红袍 Dahongpao	2月下旬至 3月上旬 Late-Feb. to early Mar.	9月下旬至 10月上旬 Late-Sept. to early Oct.	10月中下旬 Mid-late-Oct.	10月下旬至 11月上旬 Late-Oct. to early Nov.	11月中下旬至 12月初 Mid-late-Nov. to early Dec.	5月26日至 6月1日 May 26 to Jun. 1
兰溪 Lanxi	漫山虹 Manshanhong	2月中下旬 Mid-late-Feb.	10月上中旬 Early-mid-Oct.	11月中旬 Mid-Nov.	11月下旬 Late-Nov.	12月上中旬 Early-mid-Dec.	5月15—20日 May 15 to 20
	大红袍 Dahongpao	2月中下旬 Mid-late-Feb.	9月中下旬至 10月上旬 Mid-late-Sept. to early Oct.	10月中旬 Mid-Oct.	10月下旬至 11月初 Late-Oct. to early Nov.	11月上中旬 Early-mid-Nov.	5月18—24日 May 18 to 24

著低于大红袍,商品性更高。

3 栽培技术要点

3.1 建园

园地宜选择年平均气温 $\geq 15\text{ }^{\circ}\text{C}$ 、极端最低温度 $\geq -9\text{ }^{\circ}\text{C}$ 、具有良好小气候环境的区域;山地建园以东南向或南向坡地为宜,坡度控制在 $15^{\circ}\sim 25^{\circ}$,避开风道、山脊突出及地势低洼区域。土壤以土质疏松、排水良好的壤砂土或透水性好的黄壤土为宜,在定植前施入有机肥进行深翻改土。

3.2 种植时间

种植以带土移栽为宜,可在2—3月萌芽前春植或11—12月秋梢停长后种植。栽植前挖长宽各1 m、深80 cm的定植穴,每穴施入50 kg腐熟有机肥,并与土壤充分拌匀。

3.3 种植密度

株行距为4 m \times 4 m,每666.7 m²种植40~41株。

3.4 肥水管理

每年施肥4次,2月下旬施以高钾复合肥为主的春肥;4月初施以硫酸钾为主的壮果肥;6月上旬施采后肥;9月下旬施有机肥作为基肥。应注意氮、磷、钾等大量元素和钙镁硼等中微量元素的配合施用。水分管理应根据叶花果生长需求均衡供水,切忌忽干、忽湿和积水。

3.5 疏花疏果

该品种花期晚,抗冻性强。冬季低温频发地区可不疏花;无冻害地区头批花可不疏,对第2、3批花进行适当疏花,以减少后续疏果次数。浙江产区于3月下旬至4月初进行疏果,根据枝条的粗细和树体的承载能力确定留果量。主枝或者粗壮结果枝每穗可保留4~6个果;细弱枝或侧枝可适当保留2~4个果;如果侧枝结果过多,需适当疏除部分果实。

3.6 病虫害防治

以农业防治与绿色防控为主,通过加强肥水管

理和整形修剪,保持园地通风透光,培养健康强壮树体。冬季剪除减虫枝并进行清园。春季疏果后喷施1次杀虫杀菌剂;采后喷施杀虫剂,防治黄毛虫、天牛与拟木蠹蛾等害虫;在花期(11月至翌年2月)每月喷施杀菌剂防治花腐病,确保正常坐果。

参考文献 References:

- [1] 邱武陵, 章恢志. 中国果树志·龙眼枇杷卷[M]. 北京: 中国林业出版社, 1996: 90-95.
QIU Wuling, ZHANG Huizhi. China Fruit Records-Longan and Loquat (in Chinese)[M]. Beijing: China Forestry Press, 1996: 90-95.
- [2] 浙江省统计局, 国家统计局浙江调查总队. 浙江统计年鉴2024[M]. 北京: 中国统计出版社, 2024: 230.
Zhejiang Provincial Bureau of Statistics, Survey Office in Zhejiang of National Bureau of Statistics. Zhejiang Statistical Yearbook 2024[M]. Beijing: China Statistics Press, 2024: 230.
- [3] 庞法松, 何娟, 王朝丽. 塘栖枇杷种质资源的保护与创新[J]. 浙江农业科学, 2015, 56(5): 731-733.
PANG Fasong, HE Juan, WANG Zhaoli. Conservation and innovation of Tangqi loquat germplasm resources[J]. Journal of Zhejiang Agricultural Sciences, 2015, 56(5): 731-733.
- [4] LI X Y, XU H X, CHEN J W. Rapid identification of red-flesh loquat cultivars using EST-SSR markers based on manual cultivar identification diagram strategy[J]. Genetics and Molecular Research, 2014, 13(2): 3384-3394.
- [5] 江雪芳, 李晓颖, 鲍旭飞, 方好金, 汪末根. 千岛湖枇杷高质量发展的路径与对策研究[J]. 浙江农业科学, 2025, 66(2): 536-540.
JIANG Xuefang, LI Xiaoying, BAO Xufei, FANG Haojin, WANG Mogen. Research on the path and strategy of high quality development of loquat in Qiandao Lake[J]. Journal of Zhejiang Agricultural Sciences, 2025, 66(2): 536-540.
- [6] 朱启轩, 李晓颖, 武军凯, 葛航, 陈俊伟, 徐红霞. 枇杷 F₁ 代表果实性状遗传倾向分析及综合品质评价[J]. 园艺学报, 2024, 51(6): 1201-1215.
ZHU Qixuan, LI Xiaoying, WU Junkai, GE Hang, CHEN Junwei, XU Hongxia. Genetic tendency analysis and comprehensive evaluation of the fruit traits in loquat F₁ generation[J]. Acta Horticulturae Sinica, 2024, 51(6): 1201-1215.