

晚熟白肉枇杷新品种迎雪的选育

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摘要:迎雪是由宁海白×解放钟杂交选育出的晚熟白肉枇杷新品种。该品种果实近圆形,果皮淡黄色,果面光滑,果实较大,平均单果质量为42.0 g,最大单果质量为58.5 g;每果实含种子4.8粒。果肉乳白色,肉质细嫩,酸甜适口,风味浓郁,品质上等。可溶性固形物含量(w,后同)为14.5%,总糖含量为13.5%,可滴定酸含量为0.35%,维生素C含量为13.3 mg·g⁻¹。在嘉兴市海宁市(东经120.42°,北纬30.32°)6月上旬成熟;花序花朵69朵·穗⁻¹,成枝力强。该品种花期晚且长、抗冻、抗栓皮、抗裂果、抗日灼,优质果率高。常温货架期7 d,冷藏1个月。适合浙江省及周边枇杷产区栽培,嫁接苗第3年开花结果,丰产性好,商品果率高。

关键词:枇杷;新品种;迎雪;晚熟;白肉;抗逆

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Breeding report of a new loquat variety Yingxue

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Abstract: Yingxue is a late-season, table loquat with excellent appearance. The seedling was derived from a cross between Ninghaibai and Jiefangzhong in 2011 at experimental field. Through artificial pollination, 450 hybrid seeds were obtained. The strain named A208 was initially selected as the superior line in 2017 for its late flowering time, strong stress resistance, large fruit, and excellent quality, and then was named Yingxue in 2018. After regional adaptability testing at three sites (including Yuhang, Haining and Lanxi) for three years from 2020 to 2022, the new variety exhibited stable comprehensive traits such as excellent stress resistance, high yield, as well as good fruit quality in various regions, and the characteristics were consistent with the performance of the mother tree. In May, 2022, it was approved by the Zhejiang Provincial Forestry Variety Certification Committee (Improved number: Zhejiang S-SV-EJ-008-2022). The tree was tall, vigorous with semicircular crown and open tree gesture. The young branches were densely pubescent, then glabrous, dull grey-brown in color. The leaves were lanceolate, apical acuminate and wedge-shaped leaf bases. The leaf edges were curled and sharp, with shallow serrations and moderate density. The flowering period was from early December to early January, the inflorescence was long and conical, with an average length of 9.7 cm and a width of 8.5 cm. The average number of branches was 8.5, with drooping branches and moderate tightness. The petals were yellow-white, the fruit was relative large, and late ripening. The fruit was nearly round, with light yellow surface, easy peeling. The average fruit weight was 42.0 g, and the maximum fruit weight was 58.5 g. The average number of seeds per fruit was 4.8 and the average weight of seeds per fruit was 7.8 g. The flesh was milky white, with moderate hardness, medium juice, and a pleasant sour and sweet taste. The content of soluble solid was 14.5%, the content of total sugar was 13.5%, the content of reducing sugar

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was 13.4%, the content of titratable acid was 0.35%, the content of vitamin C was $13.3 \text{ mg} \cdot \text{g}^{-1}$, and the edible rate was 71.2%. The quality is excellent. The fruit matured in early June in Haining, Jiaxing area, the number of flowers was 69 per inflorescence. The branching ability was strong. It was resistant to frost, cork, fruit cracking, and sunburning. The cold storage life of fruit was 1 month and shelf life was over 7 days. The suitable cultivation areas would be Zhejiang Province and surrounding loquat producing areas. This variety could bear fruits three years after grafting, and had high yield potential and high commercial fruit rate. Orchards should choose mountainous or flat areas with an average annual temperature over $15 \text{ }^{\circ}\text{C}$ and a minimum temperature not lower than $-9 \text{ }^{\circ}\text{C}$. Sandy soil was preferred, the spacing would be $4 \text{ m} \times 4 \text{ m}$. The evacuation layered tree type would be recommended, and the tree height should be controlled within 3.0 meters.

Key words: Loquat; New cultivar; Yingxue; Late-maturing; White flesh; Stress-resistant

枇杷(*Eriobotrya japonica* Lindl.)是一种原产于我国的重要亚热带果树,培育果实品质优良、抗性强、稳产性好的新品种一直是枇杷育种者追求的目标。近年来,陆续有通过杂交选育获得性状优良的新品种的报道,如特早熟白肉品种白雪早^[1]和三月白^[2]、早熟白肉品种早佳8号^[3]、中熟白肉品种西蜀3号^[4]、特晚熟白肉品种香妃^[5]、早熟红肉品种黔早1号^[6]以及晚熟红肉品种黔光2号^[7]等。

枇杷在浙江等北亚热带地区秋冬季开花坐果,花和幼果易发生冻害。已有研究发现枇杷花抗冻能力优于幼果^[8],花能抗 $-6 \text{ }^{\circ}\text{C}$ 低温,而幼果 $-3 \text{ }^{\circ}\text{C}$ 就受冻。枇杷第一批花在10—11月开放,这批花在温度

最低的次年1月份刚好形成幼果,最易受冻害。因此,延迟花期是减轻幼果冻害发生的重要措施^[9]。白肉枇杷因品质好、口感佳,备受消费者欢迎,但是,现有的白肉品种普遍存在花期早、抗性差等问题,幼果冻害以及果实成熟期易日灼和裂果是白肉枇杷产量不稳与种植效益不高的主要原因。因此,培育晚花抗逆白肉枇杷品种是促进白肉枇杷产业发展的有效途径之一。

迎雪是浙江省农业科学院园艺研究所通过人工杂交选育的枇杷新品种,该品种植物学性状表现稳定,经济性状良好,具有晚熟、品质优良、抗性强等优点(图1)。



图1 晚熟白肉枇杷新品种迎雪

Fig. 1 A new late-maturing white loquat cultivar Yingxue

1 选育过程

迎雪是从以宁海白为母本、解放钟为父本的杂交后代中选育出的晚熟优质白肉枇杷新品种。2011

年11月选取健壮的解放钟花穗,在花朵露白前将整个花穗进行套袋,待露白后采集未开放花苞,收集花粉,置于烘箱内 $25 \text{ }^{\circ}\text{C}$ 干燥后转 $4 \text{ }^{\circ}\text{C}$ 冷藏备用。2011年12月,选取健康的已露白的宁海白花穗,去除雄

蕊,用保存的解放钟花粉进行授粉,并立即套袋。2012年5月下旬收获杂交果,取得450粒杂交种子,播种于营养钵中。2013年春将450株杂交实生苗定植于浙江省农业科学院海宁杨渡创新基地。2017年杂交后代首次结果,经2017年和2018年对450株杂交后代进行植物学特性、果实品质性状和抗性观察,代号为A208的株系因其花期迟、抗逆性强,果型大、品质优,初选为优系,定名为迎雪,同时进行嫁接扩繁,在余杭、海宁、兰溪3个地方进行规模试验示范,并以当地种植宁海白为对照品种,调查该优系的植物学特征、物候期、抗逆性、果实品质、产量等指标,经过2020—2022年连续3 a(年)观察,该品种在各地的抗逆性、丰产性、稳产性、果实品质等综合性

状表现稳定,特征特性与母树表现一致。2022年5月通过浙江省林业品种审认定委员会审定(良种编号:浙S-SV-EJ-008-2022)。

2 主要性状

2.1 果实主要经济性状

迎雪果实近圆形,平均单果质量为42.0 g,果面淡黄色,易剥皮,果肉乳白色,质地细嫩、化渣,可溶性固形物含量(w ,后同)为14.5%,总糖含量为13.5%,还原糖含量为13.4%,可滴定酸含量为0.35%,维生素C含量为13.3 $\text{mg}\cdot\text{g}^{-1}$,可食率为71.2%(表1)。与对照品种宁海白相比,迎雪果型更大,可滴定酸含量和维生素C含量更高,风味更浓郁。

表1 迎雪与宁海白的主要经济性状比较

Table 1 Comparison of main economic traits of Yingxue and Ninghai Bai

| 品种 Cultivar | 果形 Fruit shape | 平均单果质量 Average fruit mass/g | w (可溶性固形物) Soluble solids content/% | w (总糖) Total sugar content/% | w (还原糖) Reducing sugar content/% | w (可滴定酸) Titratable acid content/% | w (维生素C) Vitamin C content/($\text{mg}\cdot\text{g}^{-1}$) | 可食率 Edible rate/% |
|--------------------|------------------------|--------------------------------|--|-----------------------------------|---------------------------------------|---|---|----------------------|
| 迎雪 Yingxue | 近圆形 Nearly circular | 42.0 | 14.5 | 13.5 | 13.4 | 0.35 | 13.3 | 71.2 |
| 宁海白 Ninghai Bai | 近圆形 Nearly circular | 31.1 | 14.3 | 13.6 | 13.1 | 0.18 | 8.6 | 70.9 |

2.2 植物学特征

该品种树姿开张,树冠为半圆球形,树势中等;叶姿斜向上,叶片为披针形,叶尖渐尖,叶基楔形,叶缘外卷、锐尖,锯齿浅,密度中等;花期晚,花序为长圆锥形,花序平均长9.7 cm,宽8.5 cm,平均花序支轴数8.5个,支轴下垂,紧密度中等,花瓣颜色为黄白色,平均每穗花朵数69朵;果实较大,果肉乳白色,硬度中等,汁液中多,风味酸甜适口;平均每果含种子4.8粒,平均每果种子质量7.8 g;晚熟。

2.3 物候期

在浙北地区,迎雪1年抽梢3次,即春梢、夏梢和秋梢,春梢始于3月上旬,与宁海白同期;花期迟而且长,初花时间为12月上旬,盛花期12月中旬至1月上旬,较宁海白等主栽品种迟30~40 d。果实6月

上旬成熟,比宁海白晚10 d左右。

2.4 抗逆性

2020年12月至2021年1月浙江省经历多次强寒潮天气,各区枇杷也不同程度地遭遇低温冻害。2021年3月对余杭示范基地的迎雪和宁海白冻害情况进行调查,结果显示迎雪第一批幼果存活率为42.2%,第二批幼果存活率为83.5%,第三批幼果存活率为91.8%;而对照品种宁海白第一批幼果存活率为0,第二批幼果存活率为2.3%,第三批幼果存活率为10.3%(表2)。因此,迎雪3个批次幼果的成活率均较对照宁海白高,具备丰产稳产特性。幼果历经冬季低温,部分幼果会被冻伤,主要表现为果皮出现木栓层,俗称“金刚圈”,虽然不影响果实可食性,但是严重影响果实的外观和商品性。2021年4月对

表2 迎雪与宁海白的抗逆性比较

Table 2 Comparison of stress resistance of Yingxue and Ninghai Bai

| 品种 Cultivar | 存活率 Survival rate/% | | | 栓皮率 Cork rate/% | 裂果率 Cracking rate/% | 日灼率 Sunburn rate/% |
|-----------------|---------------------------------|----------------------------------|---------------------------------|--------------------|------------------------|-----------------------|
| | 第一批幼果 The first young fruits | 第二批幼果 The second young fruits | 第三批幼果 The third young fruits | | | |
| 迎雪 Yingxue | 42.2 | 83.5 | 91.8 | 3.4 | 1.5 | 13.3 |
| 宁海白 Ninghai Bai | 0.0 | 2.3 | 10.3 | 26.1 | 22.4 | 49.6 |

迎雪和宁海白的栓皮发生率进行了调查统计,发现迎雪因花期迟,幼果受冻比例较低,所以果实发育后栓皮率也较低,为3.4%;而对照品种宁海白抗冻性差,花果受冻率高,果实发育后栓皮果率较高,为26.1%(表2)。2021年5月浙江省各地遭遇多次暴雨和高温,果实成熟期对迎雪和对照品种宁海白进行裂果率和日灼发生率进行调查,发现迎雪在余杭示范基地裂果率为1.5%,而宁海白裂果率达22.4%;迎雪的日灼发生率为13.3%,而宁海白日灼发生率达49.6%(表2)。因此迎雪抗性更强,商品果率更高。

3 繁殖方法及栽培技术要点

3.1 繁殖方法

迎雪枇杷繁殖主要通过小苗嫁接繁殖以及大树高位嫁接繁殖。其中小苗嫁接繁殖以春季枝接为主,高位嫁接繁殖则以春季切接、切腹接等枝接为主。嫁接苗移栽后及时遮阳,防止干旱。

3.2 建园定植

建园选择年平均气温高于15℃、最低气温不低于-9℃、小气候条件优的山地或平地,以pH值5.5~7.5、有机质含量 $\geq 15 \text{ g}\cdot\text{kg}^{-1}$ 、土层深厚、土质疏松、保水保肥力强、排水良好的砂质壤土为佳。栽植密度4 m×4 m,2—3月份移栽为宜,种前挖1 m×1 m、深80 cm的定植穴,施足腐熟有机肥并与土拌匀。

3.3 肥水管理

幼年果园施肥应薄肥勤施,在各次梢抽发前后施好促梢肥和壮梢肥,速效化肥和腐熟农家肥配合施用。2—10月每隔2个月施1次,7—8月夏季不施肥,株施含0.2%~0.3%尿素、0.1%~0.2%复合肥(N、P₂O₅、K₂O质量比为15:15:15)的水肥3~5 kg;10月—翌年2月施冬肥1次,株施有机肥10~20 kg。结果树春季肥2月下旬至3月上旬施入,以速效肥为主。挂果少、春梢抽发多而旺的树可以不施;4月初可追施钾肥,促进果实膨大;5—6月在采果后、夏梢抽发前施入采果肥,以速效肥为主,适当搭配有机肥。9月中下旬施花前肥,以有机肥为主,适当搭配速效肥,施肥量占全年总施肥量的50%左右。花期可以分多次加施高氮复合肥,延长开花时间^[10]。花果生长期缺水和采果后7—8月高温干旱季节应及时灌水或喷水,并在树盘下覆草防旱。多雨季节或果园积水时应及时排水。

3.4 整形修剪及花果管理

树形一般采用疏散分层形,树高控制在3.0 m以内,主干高度40~60 cm,3~4层主枝群,各层留3~4个结果枝,层间间隔50~60 cm。该品种侧枝数量平均2.5根,生产上无需过多人工整枝与疏花疏果,省工省力。修剪主要疏除细弱枝、重叠枝、交叉枝、病虫枯枝。

3.5 疏花疏果与套袋

10—11月间,可将多余花穗摘除,树冠顶部上部多疏,树冠内膛、中下部少疏,留穗总梢数占全树总梢数的60%~70%。疏果一般在3月中旬—4月中旬进行,一个果穗留2~4个果,疏果后采用内黑外黄果袋进行套袋防止鸟害与日灼,套袋前宜喷1次杀菌与杀虫剂,在喷药后5 d内完成套袋。

3.6 病虫害防治

开春前注意清园与地面、树体杀菌;春季疏果后喷1次杀虫与杀菌剂;采后防天牛与拟木蠹蛾等枝干害虫以及黄毛虫和舟形毛虫等叶片害虫^[11];11月—翌年2月间,在花蕾期、谢花后和幼果期,分别喷施代森猛锌、啞霉胺和异菌脲等防控花腐病,减轻花穗腐烂病发生,增强抗冻能力,提高坐果率^[12]。

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