

## 软籽石榴新品种桔美人的选育

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**摘要:**桔美人是从红如意×Wonderful杂交后代中选育出的软籽、红皮石榴新品种。果实近圆球形, 果皮红色, 平均单果质量452 g, 平均百粒质量44.6 g。籽粒紫红色, 籽粒硬度2.12 kg·cm<sup>-2</sup>; 平均可溶性固形物含量(w, 后同)15.9%, 总糖含量15.20%, 总酸含量3.04 g·kg<sup>-1</sup>, 糖酸比49.3, 风味酸甜, 综合品质优异。果实发育期120 d左右, 在云南蒙自地区7月中下旬成熟, 5年生树平均产量27 000 kg·hm<sup>-2</sup>。适宜在云南、四川等南方石榴产区栽培, 在北方石榴产区需采取设施栽培。

**关键词:**石榴; 新品种; 桔美人; 软籽; 鲜食

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### A new soft-seed pomegranate cultivar Jumeiren

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**Abstract:** Jumeiren is a new soft-seed and red-skin variety derived from a cross between Hongruiyi and Wonderful. In 2007, Hongruiyi was used as a female parent and Wonderful as a male parent to cross, and hybrid seeds were obtained in the same year. Seed stratification was made in winter. Sowing was carried out in 2008, and 518 hybrid seedlings were obtained. A small number of hybrid seedlings bore fruits in 2011. In 2012, 26 hybrid seedlings with good fruit quality were selected for regional trials by using grafting and cuttage methods in experimental gardens of Yicheng District and Shizhong District, Zaozhuang City, Shandong province, and Shangqiu City, Henan province. In 2013, Zj2007-26 individuals with excellent performance were propagated by cuttage. After 6 years of systematic observation, it was found that the superior plant had large fruit size, soft seed, sweet and sour flavor, and high soluble solid content. Jumeiren had characteristics of distinctness, uniformity, stability and fine comprehensive characteristics. This cultivar is a small tree, attaining a height of 2.5–3.0 m. The growth vigour of trees is moderate, and the crown is naturally rounded. The colour of trunk is taupe, young branches are green-gray, and branch-forming force is strong. It has more branch thorns. The leaf shape is long elliptic, with 6.44 cm in length and 2.1 cm in width. Flowers are dark red and single, with higher proportion of bisex-

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ual flowers. The fruit is nearly spherical, with an average longitudinal diameter of 10 cm, an average transverse diameter of 11.85 cm, and a fruit shape index of 0.84. The fruit surface is smooth, the skin is dark red, the calyx tube is closed, and the ribbed ribs are not obvious. This cultivar is early maturing, and fruit surface is light red. The average fruit weight is 452 g, the average weight per 100 arils is 44.6 g, the seed hardness is  $2.12 \text{ kg} \cdot \text{cm}^{-2}$ , the total sugar content is 15.20%, and the ratio of sugar to acid is 50.0. The seeds are purplish red with a sweet and sour flavor. The fruit development period is 120 d and it matures in mid-to-late July in Mengzi city, Yunnan province. It is suitable to be cultivated in Yunnan province, Sichuan province, and other pomegranate producing areas in South China. Using facilities for cultivation can prevent tree freezing injury in northern pomegranate producing areas. Orchards should be chosen on the deep soil layer, good topography and water irrigation. This cultivar likes sufficient light and warm climate. The absolute minimum temperature should be above  $-10 \text{ }^{\circ}\text{C}$ . Spacing in the row and spacing between rows are  $(2.0-2.5) \text{ m} \times 4.0 \text{ m}$ . Fertilization period includes fertilizer in autumn and topdressing before flowering, young fruit swell stage, and fruit color turning stage. The fertilizer should be applied deep into 30–40 cm. Watering period includes pre-germination, pre-fruit expansion and pre-freezing. Pomegranate is afraid of waterlogging, and one should pay attention to drainage in rainy season. Training should be chosen as the main sparse layer system, spindle system, “Umbrella” system or “Inverted pyramid” system, setting trunk height at 80–100 cm. Pruning is mainly applied in spring, summer and autumn, the main methods are thinning out, removing water sprouts, pinching and rubbing branches, cutting back is only used in tree rejuvenation. In the growing season, it is necessary to take agricultural and physical prevention and control as the basis, biological prevention and control as the core, and chemical prevention and control as the supplement, to comprehensively prevent and control the occurrence and spread of diseases and insect pests. After defoliation and before bud break, the whole garden should be sprayed with 3–5 °Be lime sulfur mixture. It is necessary to put on white paper bags in time after physiological fruit drop and spray with insecticide and fungicide before bagging. And it is also important to lay black light lamp and frequency-vibratory insect light for controlling peach borer, yellow thorn moth and other pests.

**Key words:** Pomegranate; New cultivar; Jumeiren; Soft seeds; Fresh food

软籽石榴(种子硬度 $<4.5 \text{ kg} \cdot \text{cm}^{-2}$ )<sup>[1]</sup>,种仁退化变软,食之无渣,适口性强,可食率高。与硬籽石榴相比,在中国软籽石榴深受广大生产者、经营者和消费者的欢迎与认可,生产与消费市场潜力巨大<sup>[2-3]</sup>。据笔者课题组详细调查统计,截至2022年,中国石榴栽培面积约8万 $\text{hm}^2$ ,其中,软籽石榴约6.67万 $\text{hm}^2$ ,约占83%。主栽品种突尼斯软籽石榴占软籽石榴的95%以上,“一品独大”。突尼斯软籽石榴“优点很突出,缺点很致命”,优点是种仁柔软可食;缺点是树体抗寒性差,籽粒风味寡淡,果实不耐贮藏(30 d)、货架期短(15 d)<sup>[4]</sup>。因此,选育籽粒大、风味浓郁、酸甜可口、耐贮运、适采期长、免套袋、易管理、早产、丰产、稳产的软籽石榴新品种,加快软籽石榴品种更新换代步伐,是目前中国石榴产业发展中亟待解决的问题<sup>[5]</sup>。

## 1 选育经过

2007年以红如意作母本、Wonderful(酸)作父本杂交,同年9月获杂交种子,冬季层积处理。2008年春播种,获杂交苗518株。2011年少量杂交苗结果。2012年,选择26株果实品质较好的杂交苗,利用嫁接、扦插两种繁育方法,在山东省枣庄市峄城区、山亭区和河南省商丘市试验园进行区域试验。2013年春,对表现优异的zj2007-26单株进行扦插繁殖。连续6 a(年)系统观察测定,发现该单株果个大、籽粒软、风味酸甜、可溶性固形物含量高,具备特异性、一致性、稳定性,综合性状优良,发展前景广阔。该品种在云南蒙自7月中下旬成熟,充分成熟时,果皮橘红色,故命名桔美人(图1)。2023年4月国家林业和草原局授予植物新品种权证书,品种权号:20230119。

## 2 主要性状

### 2.1 植物学特征

该品种为小乔木,树势中庸,树姿不开张,树冠为自然圆头形,成龄树高2.5~3.0 m。主干灰褐色,1年生枝青灰色,成枝力较强,枝刺较多。叶片长椭圆形,全缘,有波状纹,幼叶黄绿色,成叶深绿色。叶长6.44 cm、叶宽2.1 cm,叶柄淡红色。花深红色,单瓣,

两性花比例较高。果实近圆球形,平均纵径10 cm,平均横径11.85 cm,果形指数0.84,果面光洁,果皮深红色,萼筒闭合,果实棱肋不明显(图1)。

参照石榴属DUS测试指南和石榴品种种质资源植物学特征描述项目及标准<sup>[6-7]</sup>,桔美人与其亲本相比,主要存在5项植物学性状指标差异,分别是:宿存萼片姿态,果实横切面,叶长,叶宽,叶片长宽比(表1)。其中,桔美人叶宽介于红如意与Wonderful



图1 石榴新品种桔美人

Fig. 1 A new pomegranate cultivar Jumeiren

表1 桔美人与其亲本的主要植物学性状比较

Table 1 Comparison of main botanical characters between Jumeiren and its parent fruits

品种 Cultivar	宿存萼片姿态 Persistent sepal attitude	果实横切面 Cross section shape of fruit	叶长 Leaf length/cm	叶宽 Leaf width/cm	长宽比 Ratio of length to width of leaf
桔美人 Jumeiren	闭合 Close	圆 Round	6.44 a	2.10 b (中等 Medium)	高 High
红如意 Hongruiyi	直立 Stand upright	圆 Round	5.10 b	3.12 a (宽 Width)	中 Middle
Wonderful	闭合 Close	圆到有棱 Round to ribbed	6.02 a	1.84 c (窄 Narrow)	高 High

注:不同小写字母表示在  $p < 0.05$  水平上差异显著。下同。

Note: Different small letters indicate significant difference at  $p < 0.05$ . The same below.

之间,且差异显著。

### 2.2 生长结果习性

桔美人1~2年生枝柔软易下垂,故生产上以嫁接苗建园为主,在云南蒙自石榴试验园,以3年生平邑花石榴为砧木嫁接桔美人,成活率在95%以上,采用3 m×4 m株行距栽植,第2年开始结果,平均单株

产量3.8 kg,3年生树平均单株产量15.6 kg,4年生树平均单株产量26.2 kg,5年后开始进入盛果期,盛果期平均单株产量32.7 kg,表现出早产、丰产、稳产特性。

### 2.3 果实主要经济性状

桔美人为早熟品种。平均单果质量452 g。百

粒质量44.6 g,籽粒硬度 $2.12 \text{ kg} \cdot \text{cm}^{-2}$ ,平均可溶性固形物含量( $w$ ,后同)15.9%,总糖含量15.2%,总酸含量 $3.04 \text{ g} \cdot \text{kg}^{-1}$ ,糖酸比50.0,籽粒紫红色,风味酸甜。在云南蒙自地区7月中下旬成熟。综合性状优异。

参照石榴属DUS测试指南和石榴品种种质资源植物学特征描述项目及标准<sup>[6-7]</sup>,桔美人与其亲本

相比,主要存在8项果实经济性状指标差异,分别是:平均单果质量,百粒质量,籽粒硬度,籽粒风味,可滴定酸含量,总糖含量,糖酸比,成熟期(表2)。其中,桔美人百粒质量比Wonderful提高了13.2%,差异均达显著水平。桔美人籽粒风味酸甜,红如意籽粒风味纯甜,Wonderful籽粒风味特酸。在云南省

表2 桔美人与亲本果实主要经济指标比较

Table 2 Comparison of main economic indexes between Jumeiren and its parent fruits

品种 Cultivar	平均单果质量 Average single fruit mass/g	百粒质量 100-grain mass/g	籽粒硬度 Grain hardness/ ( $\text{kg} \cdot \text{cm}^{-2}$ )	w(可滴定酸) Titrateable acid content/( $\text{g} \cdot \text{kg}^{-1}$ )	w(总糖) Total sugar content/%	糖酸比 Ratio of sugar to acid	籽粒风味 Flavor of seeds	成熟期 Ripening date
桔美人 Jumeiren	452 a	44.6 a	2.12	3.04b	15.20a	50.0	酸甜 Sour-sweet	7月下旬 Late July
红如意 Hongruiyi	408 b	42.5 ab	2.08	1.89c	12.89b	68.2	甜 Sweet	7月上旬 Early July
Wonderful	416 b	39.4 b	8.10	6.7a	14.20a	21.2	特酸 Special sour	7月中旬 Mid July

蒙自市,桔美人成熟期晚于2个亲本品种。

## 2.4 物候期

在云南蒙自地区,12月底至翌年1月初萌芽,1月底至2月初展叶;2月上旬为新梢生长期,2月中旬进入新梢速生期,3月初达到生长高峰,以后进入缓慢生长期,5月底出现第二次生长高峰,7月底以后枝梢生长转慢;12月上旬落叶;3月中旬为初花期,3月下旬进入盛花期,4月中旬末花期;3月底至4月初开始坐果;5月上旬果实开始着色;7月下旬果实成熟;果实发育期120 d左右。

## 3 栽培技术要点

### 3.1 园址选择

对土壤要求比较严格,以通透性较好的砂壤土、壤土为宜。栽植前按照 $30.0\sim 37.5 \text{ t} \cdot \text{hm}^{-2}$ 的标准,施入腐熟有机肥,施肥深度大于30 cm,引导根系向下延伸生长。适宜在云南、四川等南方石榴产区露地栽培,在北方石榴产区须采取设施栽培,防止冻害。性喜强光照和温暖的气候,极端最低气温高于 $-10 \text{ }^{\circ}\text{C}$ 、大于 $10 \text{ }^{\circ}\text{C}$ 活动积温 $3000 \text{ }^{\circ}\text{C}$ 以上、地下水位大于1 m、土壤pH值在6.5~7.5之间<sup>[7]</sup>。

### 3.2 建园

选用生长健壮、无病虫害、无冻害的2年生以上嫁接苗建园,地径1.2 cm以上,苗高120 cm以上。株行距 $(2.0\sim 2.5)\text{m} \times 4 \text{ m}$ 为宜。落叶到萌芽时均可栽植,以刚萌芽时栽植最为适宜。全园统一要求“放

线定点”栽植,确保横竖成行,整齐划一,相邻幼树之间呈“品”字形布局。栽植深度与根颈处的原土痕印相持平。栽后及时灌足水,覆盖黑色地膜。为防止新栽幼树倒伏,便于后期整形,将竹竿(高2.5 m、直径1.5 cm左右)贴近苗木插入土壤中(深度40 cm左右)。

### 3.3 肥水管理

一是施肥管理。在南方产区,栽后当年追肥2次:6—7月,追施复合肥1次,9—10月,施有机肥作为基肥;以后每年施肥3次:2月底—3月初施速效氮磷肥,4月底—5月初施果实膨大肥,10月底—11月初秋梢停止生长后施有机肥,肥料要深施,深度30~40 cm<sup>[7]</sup>;适时根外(叶面)追肥:花期喷施硼元素+磷酸二氢钾+尿素混合溶液1次,膨果期喷施磷酸二氢钾+钙肥混合溶液1次,注重增加叶背喷施量。二是水分管理。浇水与施肥结合进行;干旱季节不能缺水,土壤封冻前浇一遍越冬水;注意果实成熟前10~15 d内不要灌水,防止裂果;石榴怕涝,雨季注意排水,严禁积水。

### 3.4 整形修剪

整形宜采用主干疏层形、纺锤形、“伞”形或“倒金字塔”树形,定干高度80~100 cm<sup>[8]</sup>;修剪以春夏秋为主,方法以抹芽、除萌、疏枝、摘心、捋枝为主,冬季修剪为辅,方法以疏枝为主;短截只在老弱树更新复壮时使用。

### 3.5 病虫害防治

以农业防治和物理防治为基础,生物防治为核

心,化学防治为补充,全面做好病虫害综合防治工作;冬季刮树皮、树干涂白,做好清园工作;落叶后和萌芽前,全园喷布波美度3~5 °Bé石硫合剂,防治石榴干腐病、褐斑病、疮痂病,以及榴绒粉蚧、日本龟蜡蚧等病虫害;生理落果后及时套白色纸袋,防治橘小实蝇、桃蛀螟等害虫,套袋前喷施一遍杀虫、杀菌剂<sup>[8]</sup>;挂黑光灯、频振式杀虫灯防治桃蛀螟、黄刺蛾等害虫,在害虫成虫发生前1周左右挂灯,在晚上19:00—24:00和凌晨02:00—05:00这两个害虫活动高峰时间段内开灯。

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