

超软籽石榴新品种‘中石榴5号’的选育

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摘要:‘中石榴5号’是以‘中石榴1号’为母本,‘突尼斯软籽’为父本杂交选育而成的超软籽新品种。果实近圆形,特大果型,平均单果质量494.7 g,纵径89.30 mm,横径96.6 mm;果皮光洁明亮,果面鲜红色,果皮厚度3.52 mm;籽粒红色,汁多味甜酸,百粒重53 g,核仁超软(硬度1.22 kg·cm⁻²);可溶性固形物含量17%,可溶性糖13.74%,抗坏血酸含量18.0 mg·100g⁻¹,总酸(以柠檬酸计)2.26 g·kg⁻¹,氨基酸总量7.30 g·kg⁻¹,品质优良。河南郑州9月下旬成熟,容易成花结果。该品种树势强健,树姿开张,树冠半圆形,枝条半直立,主干灰褐色。

关键词:石榴;新品种;‘中石榴5号’;超软籽;红皮

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A new super soft-seed pomegranate cultivar ‘Zhongshiliu 5’

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Abstract: ‘Zhongshiliu 5’, selected by Zhengzhou Fruit Research Institute of Chinese Academy of Agricultural Sciences, is a new super soft-seed pomegranate variety. We selected it from cross-fertilize between ‘Tunisiranzi’ which was introduced to China in 1986 and ‘Zhongshiliu 1’ which was selected in 2000. Cross-fertilize were proceeded in 2004. Hybrid fruits were obtained on September 2004, and then seeds of fruits were hid in sand for the winter. Seeds were germinated and sowed in April 2005. 1 163 hybrid seedlings were obtained eventually. The hybrid seedlings were planted in resources nursery of Zhengzhou Fruit Research Institute of Chinese Academy of Agricultural Sciences with 0.5 m × 2 m distance between plants in March 2006. They were managed under conventional management. Fruits were observed firstly in 2008, The plant growth characteristics and fruit traits were investigated in 2008—2010. One pomegranate superior stain numbered ‘03-01-103’ was selected which has the advantage of super soft-seed, high yield and other aspects of outstanding performance temporarily named ‘Zhongshiliu 5’ officially. In 2011 more than 2 000 seedlings were obtained by grafting and rapid propagation technology. The experimental orchard of ‘Zhongshiliu 5’ superior line was established. In the spring of 2013, 170 pomegranate trees were grafted in Gaochun town of Xinyang city. The distance between them was 3 m × 4 m. Then regional adaptability testing of this optimal system was at Xinan district in Luoyang city, Shanyang district in Jiaozuo city, and Xichuan district in Nanyang city with more than 300 strains, spacing 2.5~3 m × 4 m. Moreover, ‘Tunisiranzi’ was cultured as control. After con-

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tinuous observation for many years, the characters of ‘Zhongshiliu 5’ were fruit large, super soft-seed, high yield, and perfect appearance. Fruit average weight was 494.7g. The appearance of the strain was pretty. The fruit was nearly round, and the fruit peel was bright and clean. The fruit surface was red. The coloring rate was over 85%, and fruit cracking was not obvious. The juicy flavor was sweet and sour, and the juice rate was 83.8%. Besides, the nucleolus super soft-seed (hardness $1.22 \text{ kg} \cdot \text{cm}^{-2}$) was edible. The basic trait data of each component of fruit like this: soluble solid content 17%, soluble sugar 13.74%, ascorbic acid content $18.0 \text{ mg} \cdot /100\text{g}^{-1}$, total acid (calculated as citric acid) $2.26 \text{ g} \cdot \text{kg}^{-1}$, total amino acid $7.30 \text{ g} \cdot \text{kg}^{-1}$. ‘Zhongshiliu 5’ was a small shrub, which performance showed open and grew strong. Young tree’s acupuncture was slightly, and adult tree’s acupuncture was underdeveloped. Annual branches were green in sunny side but brown in night side. Perennial branches showed grayish green with rare lenticel. The leaves were long oval with dark green. The average leaf length was 5.7 cm, and width was 2.4 cm. Petiole was red with average length 3.2 mm. There are two kinds of flowers on the same plant: bisexual flowers and functional male flowers. Flowers can appear clusters, pairs and solitary. Most of them were clusters. In Zhengzhou, it germinated at the end of March, and the first stubble flowers opened in early May. The flowering period began from May 10 to early June, and the flowering period lasted about 25 days. The period of fruit drop lasts 2-3 days, and the fruit begins to ripen in late September. Then leaves fall in late November, the annual growth period is about 210 days. Fruits mainly bore on long branches in saplings, but can bore on either long or short branches in adult pomegranate trees. The average yield of 3-year-old tree was 13.2 kg, 26.0 kg in 4-year-old tree, eventually up to 35.6 kg in 5-year-old tree. ‘Zhongshiliu 5’ was an adaptable variety, which behaved perfect in growth and fruiting in Zhengzhou, Luoyang and Nanyang city Henan province. ‘Zhongshiliu 5’ was selected from the hybrids of ‘Tunisiruanzhi’ and ‘Zhongshiliu 1’ pomegranates, and its cold tolerance was basically the same as that of ‘Tunisiruanzhi’. From the south of the Yellow River to the north of the Qinling-Huaihe line is the second suitable cultivation area, winter protection measures must be adopted in special year, and the dry and hot valley area of 1300-1800 meters above sea level on the Yunnan-Guizhou Plateau is suitable cultivation area.

Key words: Pomegranate; New cultivar; ‘Zhongshiliu 5’; Super soft-seed; Red skin

石榴(*Punica granatum* L.)属石榴科(Punicaceae)、石榴属(*Punica*)果树,它具有较高的经济、生态和社会效益,深受世界各国人民喜爱^[1]。截至2019年,中国石榴栽培总面积约9.33万 hm^2 (140万亩),其中,软籽石榴面积约4万 hm^2 (60万亩),约占总面积的43%,且软籽石榴果品市场价格目前仍处于相对高位^[2]。籽粒硬度是软籽石榴的重要指标之一,以往对石榴的籽粒硬度区分为:通过质构仪测定,籽粒硬度 $<3.67 \text{ kg} \cdot \text{cm}^{-2}$ 为软籽石榴,籽粒硬度介于 $3.67\sim 4.20 \text{ kg} \cdot \text{cm}^{-2}$ 的为半软籽石榴,籽粒硬度 $>4.20 \text{ kg} \cdot \text{cm}^{-2}$ 的为硬籽石榴。基于此,随着对软籽品种认识的增加和育种要求,我们对籽粒硬度 $<3.67 \text{ kg} \cdot \text{cm}^{-2}$ 的范围进一步细分为极(特)软籽($<1.0 \text{ kg} \cdot \text{cm}^{-2}$)、超软籽($1.0\sim 1.5 \text{ kg} \cdot \text{cm}^{-2}$)、软籽($1.5\sim 3.67 \text{ kg} \cdot \text{cm}^{-2}$)。实践发现,目前已知的软籽石榴品种抗寒性都很差,软籽性状和抗寒性表现出一定的正相关性,影响软籽石榴栽培和增产的主要因子有抗寒性、坐果率、茎

腐病等^[3-4]。因此,中国农业科学院郑州果树研究所充分利用现有石榴品种资源,通过长期杂交育种和品种评价,选育出超软籽、易形成花芽、坐果率高、品质优的石榴品种—‘中石榴5号’(图1)。2020年3月4日通过河南省林木品种审定委员会审定(良种编号:豫S-SV-PG-010-2019)。

1 选育过程

2004年,以‘中石榴1号’为母本,以‘突尼斯软籽’为父本,通过人工套袋、授粉、套袋、去袋等操作,按照正常管理,于当年9月份获得杂交果实11个,剥籽后清洗、晾晒获得杂交种子。2004年冬沙藏处理,2005年4月经催芽后播种在营养钵中,获得杂种苗1163株。2006年将小苗定植于中国农业科学院郑州果树研究所石榴选种圃。2008年开始开花结果,发现编号为03-01-103的单株所结果实品质优异,被选为优良单株。经过3a(年)连续观察,03-01-



图1 超软籽石榴新品种‘中石榴5号’

Fig. 1 A new super soft-seed pomegranate cultivar ‘Zhongshiliu 5’

103果实籽粒超软(籽粒硬度 $2.5\text{ kg}\cdot\text{cm}^{-2}$ 以下),可溶性固形物高(15%以上),果面光洁,红色,味甜酸,早期丰产性强,综合性状优良、遗传性状稳定,被复选为优系。2011年秋通过硬枝扦插和光雾化快繁技术繁育苗木,2013年在浙川、荥阳、焦作和洛阳等地进行区试,综合性状表现遗传稳定、优良,2019年被确定为石榴优良新品系,命名为‘中石榴5号’。

2 主要特性

2.1 果实主要性状

‘中石榴5号’平均单果质量 494.7 g ,特大果型。该品种果实近圆形或圆球形,外观漂亮,果面呈红色,果皮光洁明亮,着色率超过85%,无明显裂果。籽粒红色,汁多风味甜酸,出汁率83.8%(籽粒榨汁重/籽粒重),核仁超软(硬度 $1.22\text{ kg}\cdot\text{cm}^{-2}$)可食用,嚼后残渣少。可溶性固形物含量17.0%,风味甜酸可口,品质极佳。‘中石榴5号’石榴与对照品种‘突尼斯软籽’石榴果实性状对比见表1。

表1 ‘中石榴5号’石榴与‘突尼斯软籽’‘中石榴1号’石榴主要性状对比

Table 1 Comparison of main traits ‘Tunisiranzi’ ‘Zhongshiliu 1’ and ‘Zhongshiliu 5’

| 品种 Cultivar | 成熟期 Mature period | 平均单果质量 Average fruit mass/g | 形状 Shape | 皮色 Skin color | 皮厚 Skin depth/ mm | 百粒重 100-seed weight/g | 核仁硬度 Nucleolus hardness/ ($\text{kg}\cdot\text{cm}^{-2}$) | w(可溶性固形物) Soluble solid content/% | 出汁率 Juice yield/% | 风味 Flavor |
|------------------------|----------------------|--------------------------------|------------------|-------------------|-------------------------|-----------------------------|---|---|-------------------------|------------------|
| 中石榴5号 Zhongshiliu 5 | 9月28日 Sept. 28 | 494.7 | 近圆 Near-round | 鲜红 Bright red | 3.52 | 53.0 | 1.22 | 17.0 | 83.8 | 甜酸 Sweet-sour |
| 突尼斯软籽 Tunisiranzi | 9月30日 Sept. 30 | 455.0 | 近圆 Near-round | 条红 Striped red | 4.40 | 53.2 | 2.40 | 14.2 | 85.6 | 甘甜 Sweet |
| 中石榴1号 Zhongshiliu 1 | 9月15日 Sept. 15 | 470.0 | 近圆 Near-round | 深红 Deep red | 1.56 | 45.2 | 1.77 | 15.5 | 91.4 | 甜 Sweet |

2.2 植物学特征

‘中石榴5号’为灌木或小乔木,树势强健,树冠半圆形,枝条半直立。主干灰褐色,多年生枝灰色,幼树针刺稍多,成年树针刺不发达,皮孔稀而少,一年生枝条绿色,阳面紫红色。萌芽力较强。成枝力中等。叶片绿色,长椭圆形,大而肥厚,平均叶长 5.7 cm ,宽 2.4 cm 。叶柄红色,长度 3.2 mm ,基部绿色;成熟叶片叶色浓绿,幼叶叶色绿色,叶面光滑,有光泽,叶尖渐尖,叶全缘,叶柄茸毛中等。叶芽大,圆锥形,贴伏,红褐色,茸毛较多。顶花芽呈圆锥形,中大,鳞片较松,茸毛较多。雌雄同花,单瓣,每瓣1轮(花瓣数量5~7枚),花蕾红色,花冠直径 4.4 cm ,花瓣圆形,红色,开花整齐,花期较长,为 24 d 。幼树以中、长果枝

结果为主,成龄树中、长、短果枝均可结果,花量中等。

2.3 物候期

‘中石榴5号’石榴在郑州地区9月下旬至10月初成熟,与‘突尼斯软籽’石榴成熟期基本一致;在河南郑州地区3月底开始萌芽,5月初头茬花开放,5月10日至6月上旬进入盛花期,盛花期持续约 25 d ,6月中旬进入末花期,花后1周开始生理落果,一般生理落果持续2~3d,果实生育期约 130 d ,9月下旬果实开始成熟,11月下旬落叶,全年生育期约 210 d 。

2.4 生长结果习性及产量

‘中石榴5号’石榴树势强健,幼树干性弱,萌芽力较强,成枝力中等,幼树以中、长果枝结果为主,成龄树长、中、短果枝均可结果。多数雌蕊高于雄蕊或

与雄蕊平,自花即可结实,配置‘突尼斯软籽’石榴或‘中石榴1号’作为授粉树,坐果率更高。大小年结

果现象不明显。3 a生树平均株产13.2 kg,4 a生树平均株产26.0 kg,5 a生树平均株产35.6 kg(表2)。

表2 ‘中石榴5号’石榴与对照品种‘突尼斯软籽’石榴产量比较

Table 2 Comparison of fruit yield of ‘Tunisiranzi’ and ‘Zhongshiliu 5’

| 品种 Cultivar | 3年生 3-year-old tree | | 4年生 4-year-old tree | | 5年生 5-year-old tree | |
|---------------------|-----------------------------------|----------------------------------|-----------------------------------|----------------------------------|-----------------------------------|----------------------------------|
| | 产量 Yield/(kg·hm ²) | 平均株产 The average strain/kg | 产量 Yield/(kg·hm ²) | 平均株产 The average strain/kg | 产量 Yield/(kg·hm ²) | 平均株产 The average strain/kg |
| 中石榴5号 Zhongshiliu 5 | 10 680 | 13.2 | 21 060 | 26.0 | 28 836 | 35.6 |
| 突尼斯软籽 Tunisiranzi | 6 795 | 8.4 | 15 228 | 18.8 | 23 652 | 29.2 |

2.5 适应性及抗性

‘中石榴5号’品种适应性较好,在河南郑州、浙川、洛阳、焦作等地区生长结果情况均表现优良。该品种抗旱,耐瘠薄,抗裂果。‘中石榴5号’耐寒性与亲本‘突尼斯软籽’石榴基本一致。在黄河以南至秦岭-淮河一线以北为次适宜栽培区,冬季须采用防寒措施。在云贵高原海拔1 300~1 800 m的干热河谷地区为适宜栽培区。

3 栽培技术要点

3.1 园址的选择

在山地上建园,要选择阳坡或半阳坡的中、下腹,坡度以10°以下的缓坡地为好。在平地上建园,要选择地下水位约2 m以下的地方。建园应选择土层深厚肥沃,灌溉和排水条件良好的砂壤土地进行,全园施肥每666.7 m² 2 500 kg后深翻起垄栽培,pH值在6.5~7.5。

株行距采用2.5 m×4 m,每666.7 m²栽67株。整地可挖大沟或大穴,沟(穴)底填有机肥,栽后浇水覆膜保湿防草。

3.2 授粉树配置

石榴是雌雄同花的果树,可自花授粉,但异花授粉的坐果率更高。因此宜配置‘突尼斯软籽’做授粉树,配置比例一般以1:8~1:10为宜。

3.3 土肥水管理

首先应该重视秋季施基肥,前期以追施氮肥为主,后期以磷钾肥为主。施肥量为:幼树每株施过磷酸钙0.25 kg和有机肥2~3 kg,结果树每株施过磷酸钙1.0~1.5 kg和有机肥15~20 kg,每年可在萌芽期、开花前、幼果膨大期和果实采收后进行。

灌水包括四个关键时期,萌芽水(3—4月份萌芽前)、花后水(6月下旬—7月初)、果实膨大期(7—8月)、封冻水(10月底—11月中旬)。灌水时,以湿透根系集中分布层为宜。

3.4 病虫害防治

‘中石榴5号’石榴的病害主要有干腐病和褐斑病,主要虫害有蚜虫、桃蛀螟、绿盲蝽和石榴茎窗蛾。冬季刮除老翘树皮,清除树皮中的越冬病虫。拣拾地面、树上的虫茧、病果,清扫落叶,集中烧毁或深埋。萌芽前(3月中旬)喷1次3~5 mg·kg⁻¹石硫合剂,可有效防治石榴干腐病、褐斑病等多种病虫害发生。4月份至5月份注意防治干腐病、蚜虫、桃蛀螟等害虫;6—8月份注意防治石榴茎窗蛾、豹纹木囊蛾、桃小食心虫、石榴绒蚧和石榴干腐病等。

4 应用前景

‘中石榴5号’是中国农业科学院郑州果树研究所培育的超软籽石榴新品种。其果特大,果面光洁鲜艳,籽粒鲜红,核仁超软,晶莹剔透,风味甜酸可口,品质佳,遗传性状稳定一致,综合性状优良。可作为‘突尼斯软籽’石榴的换代品种,以及可以种植软籽石榴新地区的主栽品种。

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