

冰糖橙新品种‘锦秀’的选育

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摘要: ‘锦秀’是从普通冰糖橙芽变中选育出的冰糖橙新品种。果实扁圆, 果面橙色, 果面光滑, 果肉浅橙色, 果实平均纵径 62.99 mm, 横径 72.33 mm, 果形指数为 1.08, 单果质量 188 g, 果皮厚 5.57 mm, 每果实含种子 0.2 粒, 出汁率 64.52%, 可溶性固形物含量(w , 后同)为 12.0%, 总糖含量 10.89%, 可滴定酸含量 0.2%, 固酸比 60, 维生素 C 含量(ρ) 为 58.08 mg · 100 mL⁻¹, 可食率为 76.53%。果实生育期 210 d, 在湖南省麻阳县 11 月下旬成熟。抗寒、抗旱和抗病性与普通冰糖橙类似。采用 SSR 标记对‘锦秀’的遗传鉴定表明, 其与普通冰糖橙在 DNA 水平存在差异, 具有遗传特异性。适合全国甜橙优势栽培区和其他甜橙种植区。

关键词: 冰糖橙; 新品种; ‘锦秀’; 芽变

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Breeding report of a new Bingtang Orange cultivar ‘Jinxiu’

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Abstract: ‘Jinxiu’ is a new sweet orange variety selected from bud mutation of common Bingtang Orange plants in Hongjiang county. It was initially selected in 2007 for its low acid, soft flesh and high juice in Mayang county. To further observe the propagation and characteristics of the cultivar, in 2008, the cultivars were grafted and propagated in their progeny, and using 2-year-old seedlings of *Poncirus trifoliata* Raf. with similar diameter as rootstock. To evaluate regional adaptability, the new variety was tested respectively at five sites, such as: Pinlin village, Changtanxi village, Tongziliang village, Xiangyang village and Tongyoupo village, from 2009 to 2015. Through years of investigation on botanical/biological characteristics and fruit quality during the citrus bearing seasons, it was showed that genetic traits of ‘Jinxiu’ with high grafting had good genetic stability and fruit quality. Finally, in 2015, it was selected as the common Bingtang Orange excellent bud variant variety for promotion and has applied for and obtained the protection of new plant varieties, as well as the registration of non-major crops. The ‘Jinxiu’ tree growth potential is strong, tree appearance opens, branch density is big. The average spring leaf length, leaf width, and leaf shape index is 69.8 mm, 34 mm and 2.1, respectively; the length and width of autumn tip leaf is 89 mm and 54 mm, the leaf shape index is 1.6. The fruit is flat and round with no mastoid process at the top, then with a smooth orange color peel. The longitudinal diameter and transverse diameter of the fruit are 62.99 mm and 72.33 mm respectively. The weight of single fruit is 188g and the thickness of the peel is 5.57 mm. Also, the flesh is orange, the core is full, and the

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sacs are neat. According to fruit quality test, it has 0.2 seed per fruit, 76.53 % edible rate, 64.52 % juice yield, 12.0 % TSS, 0.20 % TA, and 58.08 mg · mL⁻¹ vitamin C. In Mayang county, the fruit ripening period of ‘Jinxiu’ was about 210 d, and the varieties entered the germination stage in March and the flowering stage in April, physiological fruiting was performed twice from May to June, and ripened at the end of November. Its cold resistance, drought resistance and disease resistance are like the common, so the suitable cultivation regions of ‘Jinxiu’ are the same as ‘Bingtang Orange’. It is suitable for cultivation in loam and sandy loam, cohesive soil should be improved to increase the permeability, and should be planted in the sunny place and sparse planting, the fruit quality is reduced when there’s too much shadow. Spacing in the rows and spacing between rows are (3-4) m × 5 m. The fruit setting rate should be checked, the abnormal small fruits, deformed fruits, and thick-skinned fruits should be removed in time to improve the commercial nature of the fruits. Strengthen the comprehensive prevention and control of diseases and insect pests, especially the prevention of citrus canker. Using 362 pairs of SSR primers for PCR amplification, SSR analysis revealed that 2 pairs of SSR primers had significant genetic difference in ‘Jinxiu’ and common ‘Bingtang Orange’.

Key words: Bingtang Orange; New cultivar; ‘Jinxiu’; Bud mutation

冰糖橙原产湖南洪江市(原黔阳县),又名冰糖包,是上世纪60年代从普通甜橙的优良实生变异中选出地方良种^[1]。该品种因品质优良、味浓香甜、肉质脆嫩等优良特性而倍受市场欢迎。20世纪80年代开始在全国柑橘产区迅速推广,在湖南麻阳县、洪江市、芷江县和永兴县,云南玉溪市和文山州,广西桂林市和湖北宜昌市有大面积栽培。该品种原有1号、2号2株母树,1号单株果小,果肉酸度极低,约0.3%左右;2号单株果实较大,皮稍厚,较粗糙,果肉酸度略高,约在0.6%左右。当时笼统繁殖,造成现有大量商品果在果色深浅、果汁多少、风味甜酸程度等方面严重混杂,导致消费者购买到的冰糖橙果实口感偏差较大。

自普通冰糖橙选育以来,一直在对其进行芽变选种工作,先后选育登记了冰糖橙新品种‘锦红’^[2]、‘锦玉’^[3]和‘黔阳冰糖脐橙’^[4],目前还在逐步推广。这3个冰糖橙新品种各具特色,‘锦玉’果实比较大,‘锦红’外果皮为红色,‘黔阳冰糖脐橙’是有脐冰糖橙变异,兼具脐橙和冰糖橙的特色,但这些冰糖橙新品种酸度依然比较高,整体品质提高不显著,因此,培育出果肉柔软多汁、甜而不酸且口感一致的冰糖橙优良新品种,既可以满足市场对品种新颖和果实新鲜的要求,也将进一步丰富我国柑橘种质资源,推动柑橘产业的发展。‘锦秀’是从普通冰糖橙芽变中选育出的冰糖橙新品种,该品种已获得植物新品种保护(品种权号20160573.5)和非主要农作物登记证书[登记编号:GPD柑橘(2020)430004](图1)。



图1 冰糖橙新品种‘锦秀’

Fig. 1 A new Bingtang Orange cultivar ‘Jinxiu’

1 选育经过

2007年在湖南省麻阳县舒家村乡桐坡村柑橘园的冰糖橙中发现一个优良芽变,明显表现出口感纯甜一致、果肉柔软多汁等特点。为了尽快观察子代的遗传稳定性,2008年对该株系进行了子代的高接扩繁工作,在当地高接换种10株,同时用枳壳作为砧木嫁接栽种了10株小苗。2009年扩繁,分别在文昌阁乡皮林村、长潭乡长潭溪村和岩门镇桐子凉村柑橘园中高接了5株。同年枳壳嫁接的小苗分别在舒家村乡桐坡村和长潭乡长潭溪村栽植了5株。2010年高接的子代开始挂果,其品种特性与母树完全一致。2011年从岩门镇桐子凉村橘园中采接穗在吕家坪镇向阳村橘园中高接了20株。2013年从吕家坪镇向阳村橘园中采接穗在锦河镇桐油坡村橘园中高接了20株。经过连续多年的跟踪观测并进行DUS测试,结果表明,高接换种的子一代2个果园、子二代3个果园和子三代2个果园的‘锦秀’冰糖橙以及枳砧嫁接的小苗后代遗传稳定性良好,且果实品质优良。

2 品种特性

2.1 植物学特征

‘锦秀’树姿开张,树势强,枝梢密度大。叶形阔披针形,春梢叶片平均长69.8 mm,叶片平均宽34 mm,叶形指数为2.1;秋梢叶片平均长89 mm,叶片平均宽54 mm,叶形指数为1.6。叶片颜色为深绿色,嫩叶色泽浅绿,叶缘全缘,叶尖钝尖,叶基楔形,有翼叶。花白色,花瓣4~6瓣,花丝部分联合,花药黄色,花柱直立且发育正常。

2.2 生长结果习性

‘锦秀’树势强,在湖南省麻阳县1年抽梢3次,幼树生长量大,易形成树冠。树高约2.33 m,冠幅4.60 m。成年结果树秋梢、春梢约各占总结果母枝36.7%和58.3%。在怀化市麻阳县‘锦秀’每666.7 m²

产量达2500 kg,表现丰产、稳产。

2.3 物候期

‘锦秀’在湖南省麻阳县3月初进入萌芽期,春梢抽发期3月中下旬至5月下旬,夏梢期6月上旬至7月下旬,秋梢期8月上中旬至9月上旬。4月初进入现蕾期,4月中下旬进入盛花期;5月初开始第一次生理落果,6月初开始第二次生理落果,11月下旬果实成熟,物候期与普通冰糖橙相比,基本一致。

2.4 果实性状

‘锦秀’具有单性结实能力,果形扁圆,无果颈,果基无放射沟纹且无凹陷,果顶无乳突,果面橙色,有较弱光泽,果面光滑度中等,油胞密度中,果实平均纵径62.99 mm,横径72.33 mm,单果质量188 g,果皮厚5.57 mm,难剥皮。果肉橙色,果心充实,囊瓣整齐。可食率76.53%,果实出汁率64.52%。平均每果实含种子0.2粒。可溶性固形物含量(w)为12.0%,还原糖含量(ρ ,后同)为8.44 g·100 mL⁻¹,转换糖含量11.02 g·100 mL⁻¹,蔗糖含量2.45 g·100 mL⁻¹,总糖含量10.89 g·100 mL⁻¹,可滴定酸含量(w)为0.20%,固酸比为60,维生素C含量(ρ)为58.08 mg·100 mL⁻¹,弱香,无开裂果,耐贮性一般。

‘锦秀’与普通冰糖橙的平均单果质量、果实横径、可滴定酸含量和出汁率有显著差别,而且‘锦秀’比普通冰糖橙更化渣,因果汁含酸量极低,且果汁含量更多,口感明显优于普通冰糖橙(表1)。

2.5 抗逆性

‘锦秀’可在山地和旱地种植,抗寒和抗旱性与普通冰糖橙相似,表现生长快,山地果园宜建蓄水池,尤其注意果实迅速膨大期的供水,长期遇干旱无灌溉时果实严重偏小。抗病性和普通冰糖橙类似,幼树易感溃疡病,通风透光条件差的果园易感沙皮病。

3 分子鉴定

利用李益等^[5]筛选的SSR标记引物,参考龙桂

表1 果实品质鉴定

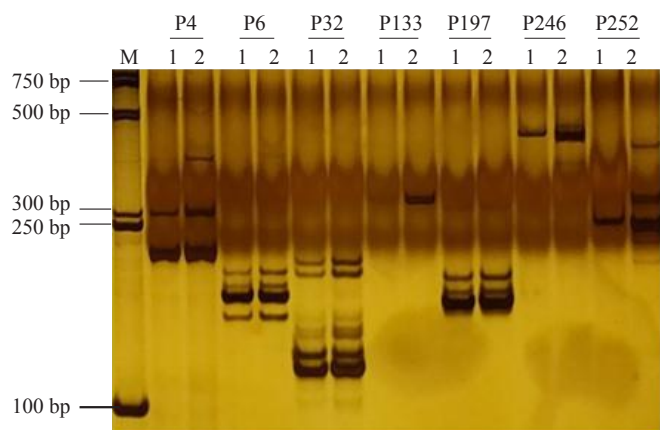
Table 1 Fruit quality analysis

品种 Cultivar	单果质量 Single fruit mass/g	纵径 Longitudinal diameter/mm	横径 Transverse diameter/mm	种子数 Seeds number	w(可溶性固形物) Soluble solid content/%	w(可滴定酸) Titratable acid content/%	ρ (维生素C) Vitamin C content/ (mg·100 mL ⁻¹)	出汁率 Juice yield/%	可食率 Edible rate/%
普通冰糖橙 Bingtang Orange	106	60.07	57.62	0.4	11.93	0.55	48.83	48.3	72.84
锦秀 Jinxu	188*	62.99	72.33*	0.2	12.0	0.20*	58.08	64.52*	76.53

注:*表示显著差异($p < 0.05$)。

Note: * indicates significant difference at $p < 0.05$.

友等^[6]的方法,分别从‘锦秀’和普通冰糖橙健康新叶片中提取DNA,进行PCR扩增,扩增产物经SDS-PAGE胶220 V垂直电泳1 h,银染。结果表明,经引物P133扩增,‘锦秀’在300~500 bp处较普通冰糖橙多1条带,经引物P252扩增,‘锦秀’在250~300 bp处较普通冰糖橙多1条带,在300~500 bp处较普通冰糖橙多2条带(图2)。由此可以区分‘锦秀’和普通冰糖橙,说明‘锦秀’在DNA水平上发生了差异,具备成为新品种的遗传基础。



1. 普通冰糖橙;2. 锦秀。

1. Common Bingtang Orange;2. Jinxiu.

图2 SSR引物筛选结果

Fig. 2 Screening results of SSR primers

4 栽培技术要点

适宜于壤土和砂壤土栽培,黏性土须改良增加通透性。宜在向阳处种植和稀植,过于荫蔽时,果实品质降低。选取无病毒容器苗在适宜的地区栽种,栽植距离(3~4 m)×5 m,每666.7 m²定植45~50株,种植防护林。深翻改土,结合增施有机肥,改良土质。全年施肥2~3次,以壮果肥和采果肥为主,壮果肥在7月中下旬施用,以增大果实,提高品质,促进早秋梢抽生。采果肥在采收前施用,以增加贮藏营养,提高花芽分化质量和树体抗寒能力。春季视不同树势适当追施速效肥促发新梢。夏秋季水分供应不足,应及时灌水或树盘覆盖防旱。树形适宜采用自然圆头形,主干高度40 cm左右,定植后任其生长,适当调整,成年树采用大枝修剪法,开天窗、侧窗,改善树冠内部光照条件,增加结果量。在加强肥水管理的基础上,重点培养10~15 cm长的春梢和早秋梢结果。采取前期保花保果、后期疏果的办法,保

证既有一定的坐果数量,又有较高的商品质量。保果以提高树体营养为主,及时疏除不正常的小果、畸形果及粗皮大果,提高果实的商品性。适时采收,保证果实达到该品种固有的色泽和内在品质。加强病虫害综合防治,特别是溃疡病和沙皮病的防治。

5 品种推广前景

‘锦秀’果实扁圆,具备普通冰糖橙所有的优点,口感更优,化渣性更好,果汁含量更多,含酸量更低,适合全国甜橙优势栽培区和其他甜橙种植区。该品种克服了口感不一致、果肉硬脆汁少的问题,填补市面上目前没有柔软多汁、口感一致的冰糖橙空白,可以丰富我国柑橘种质资源,推动柑橘品种更新换代。

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