

# 优质大果黄果百香果新品种福农金元的选育

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**摘要:** 福农金元是由台湾省引进的两种黄果百香果优良单株MR16与MR26杂交选育而成的黄果百香果新品种。果实近圆形, 果皮黄色, 果面光滑, 果肉黄色或橘黄色, 口感甜中带酸, 具风味, 果形指数1.08, 平均单果质量91.2 g, 可食率51.23%, 可溶性固形物含量(w, 后同)19.2%, 总酸含量2.37%, 固酸比8.1, 维生素C含量15.4 mg·100 g<sup>-1</sup>。种子卵状三角形, 黑褐色。在闽南(漳州, 北纬23.8°~25°)地区, 富农金元于4月中下旬始花, 花发育时间约25 d, 开花时间为12:30—14:00; 两性花, 自花结实; 夏季果实发育期为50~60 d, 且随着温度降低而延长。抗炭疽病和病毒病, 较耐高温和低温。适宜在福建、广西、云南等百香果产区种植, 当年开花结果, 丰产性好。

**关键词:** 百香果; 新品种; 福农金元; 优质; 黄果

中图分类号: S667.9

文献标志码: A

文章编号: 1009-9980(2026)05-1322-05

## Breeding report of a new high-quality and large-fruited yellow passion fruit variety Funong Jinyuan

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**Abstract:** Funong Jinyuan is a new cultivar of passion fruit with excellent appearance. The seedling was derived from a cross between MR16 and MR26 in 2016 at an experimental field. It was initially selected in 2016 for its excellent characteristics. Through artificial hybridization pollination in 2016, 142 plants of the F<sub>1</sub> generation were obtained. After regional adaptability testing at five sites (including Pinghe, Zhangpu, Huaan, Liancheng, Shaowu) over six years from 2018 to 2023, it was finally selected in 2024. The climbing vines of this passion fruit that exhibit a dark green coloration. The leaves are papery and green, displaying unlobed, two-lobed, or three-lobed palmate forms. The leaf margins are serrated, and the two nectaries located on the petiole are positioned adjacent to the base of the leaf. The flower is bisexual, consisting of three bracts, five sepals, five petals, five stamens, three styles, and one ovary. The bracts are serrated and have an average length of 20.3 mm. The sepals are green with an average length of 31.5 mm and a width of 10.6 mm. The petals have an average length of 30.8 mm and a width of 8.0 mm; their primary color on the front surface is white. The color intensity of the spotted ring pattern at the corolla throat is deep. The filaments within the external corolla display two colours, either white or purple. Additionally, there are purple rings present on these filaments. The filamentous corolla measures approximately 70.2 mm on average in length while individual filaments measure about 35.6 mm in length. The seeds are ovate-triangular in shape and exhibit a dark brown hue with an average length of 5.92 mm, an average width of 3.73 mm, and an average thickness of 1.83 mm. Mature fruits are gen-

收稿日期: 2025-10-13 接受日期: 2026-01-07

基金项目: 福建省公益类科研院所专项(2024R1011004、2025R1011001); 福建省现代农业产业技术体系建设项目(闽财指【2025】593号)

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erall round. The yellow peel surface is smooth and features star-shaped white spots. Meanwhile, the peel thickness is moderate, and its hardness is comparatively high. Its flesh is yellow or orange with a sweet and sour flavor and a pleasant aroma. The average fruit weight is 91.2 g and fruit shape index is 1.08. The edible rate is 51.23%, the content of soluble solids is 19.20%, the content of total acid is 2.37%, the soluble solids-acid ratio is 8.1, Vitamin C content is 15.4 mg · 100 g<sup>-1</sup>. The fruit quality is excellent. It is resistant to anthracnose and viral diseases, and has outstanding resistance to stem base rot. It can set fruit at a temperature of 38.5 °C. At 1 °C, the new leaves exhibit symptoms of frost damage. Its cold resistance is superior to that of Qin Guo NO. 9, while its heat resistance is slightly inferior compared to Qin Guo No. 9. The suitable cultivation area is southern Fujian (Zhangzhou, 23.8°–25° N). The flowering period of this variety begins in mid to late April, lasting approximately 25 days. The optimal time for flowering occurs between 12:30 and 14:00 hours. The bisexual flowers are self-pollinating and can set fruit successfully. In summer, the fruit development period spans from 50 to 60 days. In the northern region of Fujian Province (Nanping City, located at a latitude of 26°55'–27°36' north), as temperatures decrease, the growth and development period of the fruit is extended to around 70–80 days. This cultivar is well-suited for cultivation in passion fruit production regions, including Fujian, Guangxi, and Yunnan. It exhibits the ability to flower and bear fruit within the same year of planting, demonstrating high yield potential.

**Key words:** Passion fruit; New variety; Funong Jinyuan; High quality; Yellow fruit

百香果(*Passiflora edulis* Sims.)又名西番莲,是一种极具加工开发潜力的热带亚热带优质水果,因丰富的营养和独特的风味深受消费者喜爱。百香果当年种植当年挂果,具有短、平、快的特点,是福建省重点发展的特色水果,也被称为致富果,后在广西、广东、海南、贵州、云南等地发展迅速,由2012年的666.67 hm<sup>2</sup>迅速上升到2025年的约10万 hm<sup>2</sup>,产量突破202万t,为乡村振兴发展起到一定推动作用<sup>[1-2]</sup>。

福建山地多、平地少,农业产业规模优势不明显,但福建气候横跨南亚热带和中亚热带,生态环境优越。利用优势种植区域,结合品种特性适地适种<sup>[3]</sup>,走优质精品的品牌路线是福建百香果产业战略发展方向。近年来百香果新品种的报道日益增多,如长势强旺、口感纯甜的黄果品种钦果(蜜)9号<sup>[4]</sup>,大果优质的黄果品种雅蜜<sup>[5]</sup>,风味浓郁的紫果品种金都3号<sup>[6]</sup>,耐寒的紫果品种贵寒1号<sup>[7]</sup>,可鲜食、加工的黄果品种福蜜1号<sup>[8]</sup>等,为福建百香果产业的可持续发展提供了品种支撑。尽管百香果产业发展势头良好,但产业仍存在突出问题,如夏季高温不结果、连作障碍、冷害、易感病、雨季等<sup>[9-10]</sup>是影响福建省百香果产区品质与产量不平衡性的共性问题,也是导致百香果种植面积持续波动的主要原因。因此,选育适应性强、品质优良、大果、丰产的优秀品种,是进一步稳定百香果品质与产量的关键,也

是福建省百香果种质资源创新的重要目标。

## 1 选育过程

福农金元是福建省热带作物科学研究所从台湾省引进的两种黄果百香果优良单株MR16与MR26为亲本,采用常规杂交育种技术选育而成的黄果百香果新品种,具有果大、口感酸甜、丰产性好、适应性强的特点。母本MR16,长势强、连续成花能力好、果大、果皮硬度高、丰产;父本MR26,连续开花能力强、果实甜度高、香气浓郁。2016年,项目组在平和县大溪镇江寨村进行人工杂交,收集种子后于2016年下半年进行播种繁殖,获得142株F<sub>1</sub>代。2017年经群体混选,淘汰长势弱、连续成花能力差的植株,对筛选的4株果个大、高产、抗逆性强的株系分别编号01~04,并进行跟踪观测。综合比较结果表明,03号株系表现突出,不仅植株长势强壮、抗性好、坐果率高,而且果大、品质优、株产高,初步标记为F1-03。2017年秋季,对F1-03株系进行扦插扩繁。2018年,开展为期2年的无性子代遗传稳定性测定。此后,陆续在平和、漳浦、华安、连城、邵武等地进行区域性和生产性试验,证实该品种的农艺性状在不同地区均能保持稳定。2021年,该优系定名为金元;2023年更名为福农金元(图1)。2024年,通过福建省非主要农作物品种认定(认定编号:闽认果2024002)。

MR16 黄金西番莲(♀) × MR26 黄金西番莲(芭乐味)(♂)

MR16 Golden passion fruit (♀) × MR26 Golden passion fruit with guava flavor (♂)

F<sub>1</sub>-03(优株)  
F<sub>1</sub>-03(Superior hybrid)

福农金元  
Funong Jinyuan

图1 福农金元谱系图

Fig. 1 The pedigree chart of Funong Jinyuan

## 2 主要性状

### 2.1 植物学特征

根据NY\_T 2517—2013植物新品种特异性、一致性和稳定性测试指南<sup>[1]</sup>,福农金元藤菱形,深绿色。叶片纸质,绿色,具有不裂、2裂和掌状3裂等类型,叶缘

锯齿状,叶柄具2个蜜腺,邻近叶基。花为两性花,白花结实,具苞片3枚、萼片5枚、花瓣5枚、雄蕊5枚、花柱3枚、子房1个;花苞片具锯齿,平均长度20.3 mm;花萼片绿色,平均长度31.5 mm,宽10.6 mm;花瓣平均长度30.8 mm,平均宽度8.0 mm;花瓣正面白色,外副花冠花丝为白色、紫色两种类型,具紫色环纹;丝状副花冠平均长度70.2 mm,副花冠花丝平均长度35.6 mm(图2)。种子卵状三角形,黑褐色,平均长度5.92 mm,平均宽度3.73 mm,平均厚度1.83 mm。

### 2.2 果实品质及经济性状

福农金元果皮表面具星状白色果点,成熟时果皮黄色(图2)。果皮光滑、厚度中等,硬度较高。成熟时果实近圆形,果肉黄色或橘黄色,果实平均纵横径6.32 cm×6.33 cm,果形指数1.08,平均单果质量、可溶性固形物含量(w,后同)、总酸含量、维生素C含量、可食率分别比福建主栽黄果品种钦果(蜜)9号提



图2 百香果新品种福农金元的藤蔓、花、果实及叶片

Fig. 2 Vine, flowers, fruits and leaves of Funong Jinyuan passion fruit

高了4.23%、4.92%、30.2%、14.7%、3.98%。其中,总酸含量和维生素C含量显著高于钦果(蜜)9号,而固酸比则降低了19.8%,这可能是钦果(蜜)9号口感偏甜的主要原因。福农金元在平均单果质量、可溶性固形物含量、总酸含量、维生素C含量、可食率等方面均具有一定优势,果实口感甜中带酸(表1)。

福农金元在漳州漳浦县佛山镇、平和县大溪镇、华安县仙都镇、南平市、邵武市、龙岩市连城朋口镇等地进行多年多点区域试验(图3),平均产量为1759 kg·666.7 m<sup>2</sup>,与主栽品种钦果(蜜)9号(1 676.6 kg·666.7 m<sup>2</sup>)相比增产4.9%,但差异未达到显著水平。2024年9月19日,经现场产量测定,该品种在邵武基地的单季产量为857.7 kg·666.7 m<sup>2</sup>,与

钦果(蜜)9号(899.8 kg·666.7 m<sup>2</sup>)相比减产4.7%,差异未达到显著水平,两者产量表现相当。

### 2.3 物候期

在福建闽南(漳州市,北纬23.8°~25°)低海拔地区,植株于3月上旬进入迅速生长期;4月中下旬开始成花,成花时间约25 d,开花时间主要集中在12:30—14:00;夏季果实发育期为50~60 d,且随种植区域温度下降而延长。如在福建闽北(南平市,北纬26°55'~27°36')地区,果实发育期延长为70~80 d。

### 2.4 植株根系生长发育规律

福农金元在福建闽南低海拔地区,3月上旬植株生长速度明显增加,株高(枝条长度)平均生长量5.82 cm·d<sup>-1</sup>,茎粗(主蔓粗度)平均生长量0.07 mm·d<sup>-1</sup>;

表1 福农金元与MR16、MR26及主栽品种的果实品质比较

Table 1 Comparison of fruit traits among Funong Jinyuan, MR16, MR26 and the main cultivated varieties

品种 Variety	果色 Fruit color	平均单果质量 Average single fruit mass/g	w(可溶性固形物) Soluble solid content/%	w(总酸) Total acid/%	固酸比 Soluble solids-acid ratio	w(维生素C) Vitamin C/ (mg·100 g <sup>-1</sup> )	可食率 Edible rate/%	风味 Flavor
福农金元 Funong Jinyuan	黄色 Yellow	91.2±1.24 a	19.2±0.42 a	2.37±0.13 a	8.1±0.38 b	15.4±1.22 ab	51.23±1.26 a	甜中带酸,具风味 Sweet with acidity and flavorful
MR16	黄色 Yellow	91.6±1.58 a	17.8±0.36 b	2.51±0.12 a	7.1±0.26 c	16.3±0.92 a	48.35±1.08 c	酸甜偏酸,具风味 Sour-sweet, sour-dominant, flavorful
MR26	黄色 Yellow	83.2±1.65 b	19.8±0.41 a	2.36±0.16 ab	8.4±0.31 b	14.2±1.17 bc	51.52±0.95 a	酸甜,风味浓 Sweet and sour, strong flavorful
钦果(蜜)9号 Qin Guo No. 9	黄色 Yellow	87.5±1.31 ab	18.3±0.46 ab	1.82±0.14 c	10.1±0.43 a	13.5±0.86 c	49.27±1.12 ab	纯甜 Pure sweet



图3 百香果福农金元田间图

Fig. 3 A field picture of new passion fruit variety Funong Jinyuan

3月下旬根系生长速度明显增加,根系扩展速度为 $0.625 \text{ cm} \cdot \text{d}^{-1}$ 。根系垂直分布范围主要在深度1.5~20 cm处,最深可达30 cm;根系水平分布范围主要在0~45 cm。

## 2.5 品种分子鉴定结果

参照魏秀清等<sup>[12]</sup>的方法,选取PFSSR12、PFSSR17、PFSSR30共3对引物进行SSR分子标记鉴定。由图4可知,福农金元与MR16、MR26条带清晰,3条特异性条带分布于250~750 bp,条带较为一致,具有明显的亲缘关系。结合田间性状观察和品质测定结果,福农金元遗传了父母本优良的果实品质性状,综合表现较好。

## 2.6 嫁接亲和性及抗逆性

**2.6.1 亲和性** 福农金元与当前黄果主要砧木品种(长黄511、黄酸果、金元宝等)嫁接成活率高于95%,嫁接口愈合良好,未见大小脚现象。

**2.6.2 抗逆性** 经福建漳州漳浦、平和、华安,龙岩上杭、连城,南平邵武等地多年多点观察鉴定,福农金元具有较强的耐低温和高温能力,适应性较强。在百香果果实采收(末)期,采用田间自然发病法进

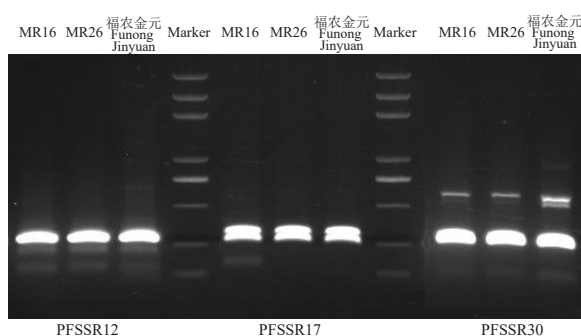


图4 SSR分子标记鉴定结果

Fig. 4 Identification results of SSR molecular markers

行病害调查。调查结果表明,福农金元的主要病害为炭疽病(果)、病毒病,其中炭疽病病情指数为4.83,病毒病株发病率为18.58%,对炭疽病(果)、病毒病的抗性较强。

## 3 栽植技术要点

### 3.1 园地建设

根据福农金元生长习性,适栽地区温度为 $0 \sim 38 \text{ }^{\circ}\text{C}$ ,适宜在福建、广西、云南等百香果产区种植。定植前30 d进行整地,每 $666.7 \text{ m}^2$ 施入基肥1500~

2000 kg, 搭配益菌、钙镁磷 100 kg 及平衡复合肥 50 kg(18-18-18、17-17-17 等)同时施用,与垄面上方约 20 cm 的表层土壤充分混匀。定植前 15 d 覆盖地膜,可采用黑膜或银灰膜覆盖种植垄,以提高地温。当日温升高到 35 °C 以上时,及时揭膜,自然生草。

### 3.2 定植技术

采用一年一植方式种植,密植密度为 150~300 株·666.7 m<sup>2</sup>。一般在春季种植,在最低温度≥3 °C 的地区,推荐秋植。定植时应注意浅种,以种植完成后隐约裸露定植苗表面土球为标准。定植苗要求主蔓粗度在 0.5 cm 以上、高度约 80 cm,具有 3 枚以上完整功能叶片。

### 3.3 植株管理

定植后及时清除主蔓侧枝,待主蔓上架后,在距离棚架 20 cm 处扭伤主蔓枝条,促发侧枝,以提早形成树冠。苗期应加强水分管理,避免干旱或过湿。补肥以氮、磷肥为主,薄肥勤施,约 10 d 一次。无需人工授粉,可通过蜜蜂辅助授粉。在果实膨大期,注意水分供给,保持通风透光,及时补充钾、磷、钙、镁等元素。

### 3.4 病虫害防治

福农金元对炭疽病、病毒病抗性较强,可结合早期防控和绿色防控措施,注意果园通透性,减少化学药剂的使用。清园后,全园撒施 100~150 kg 的生石灰,重施有机肥并高垄种植,以减少土传病害的发生。

### 3.5 采收

福农金元应在果实转黄时进行采收,以保证果实品质。

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