

# 超矮香蕉新品种‘中蕉12号’的选育

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**摘要:** ‘中蕉12号’是由香蕉主栽品种‘巴西蕉’的胚性细胞悬浮系(ECS)为材料,通过<sup>60</sup>Co-γ射线辐射诱变,经田间优选获得的后代的矮化香蕉新品种。‘中蕉12号’植株显著矮化,假茎高度仅0.82~0.95 m,较对照‘巴西蕉’矮小,叶姿较开张,青叶间距短,排列密集。果穗呈短圆柱状,结构紧凑,梳形较整齐,商品性状良好。熟果皮为黄色,果肉为黄白色。果实可食率为68.63%,果肉可溶性固形物含量19.9%,可滴定酸含量0.29%,可溶性糖含量16.2%,还原糖为13.4%,蔗糖含量为8.5%,维生素C含量达12.10 mg·100 g<sup>-1</sup>,风味香甜,与主栽品种‘巴西蕉’近似。生长周期较短,新植蕉约285~310 d,比对照品种‘巴西蕉’短60~70 d。新植蕉平均每株产量8.4 kg,每666.7 m<sup>2</sup>产量约为1 680 kg。较抗香蕉枯萎病4号生理小种;抗风性较好;不耐寒。货架期为5~6 d,低温(14~18 ℃)保存期为10~12 d。适宜在全国香蕉主产区推广种植,亦可在北方发展温室栽培,是优良的经济与观赏兼用的新树种。

**关键词:** 香蕉;新品种;‘中蕉12号’;矮生

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## Breeding report of ultra-dwarf banana cultivar ‘Zhongjiao No.12’

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**Abstract:** ‘Zhongjiao No.12’ (*Musa* spp. Cavendish ‘ZJ12’), a new dwarf banana cultivar, was obtained by <sup>60</sup>Co-γ radiation mutagenesis on embryogenic cell suspension line (ECS) of ‘Baxijiao’ (*Musa* spp. Cavendish ‘Baxi’), and the progeny with field screening process. ‘Baxijiao’ ECS was mutated by <sup>60</sup>Co-γ radiation, and mutagenic materials was sub-cultured and used for tissue culture seedlings. Biological characteristics and fruit quality of the resulting plants were investigated in field. Superior plant with comprehensive characters of dwarfing and early-fruited with stable genetic traits was screened out. From year of 2013 to 2014, a variety comparison test was carried out in Guangzhou, Dongguan, Longmen of Guangdong province, and Taian city of Shandong province. From year of 2013 to 2015, multiple regional tests and production tests were conducted in provinces of Guangdong, Guangxi, and Shandong. The new cultivar was licensed by the Ministry of Agriculture in May 2017. The plant of this species is significantly dwarfed, and the height of the false stem in the field is 0.82-0.95 m, with pressed and shorter leaves and shorter petioles compared with the cultivar of ‘Baxijiao’. The fruit panicles are short cylindrical, compact in structure, neat in comb and good in commodity character. Ripe fruit skin is yellow, the flesh is yellow white, with sweet flavor. The fruit edible rate of 68.63%. The soluble solids content of fruit is 19.9%, titratable acid content 0.29%, soluble sugar content 16.2%, sucrose content 8.5%, reducing sugar 13.4%, and vitamin C content 12.10 mg·100 g<sup>-1</sup>. The growth cycle was relatively

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short, and the new plantain was about 285-310 days, 60-70 days shorter than conventional Cavendish cultivars. The average plant yield of new plantain is 8.4 kg, and the yield per 666.7 m<sup>2</sup> is 1 680 kg. It is middle-tolerant to *Fusarium* wilt disease, resistant to wind, and no resistance to cold. The fruit has short storage-life, cold (14-18 °C) storage time is 10-12 days, and shelf life is 5-6 days, after storage the fruit aroma is quite strong. This cultivar is suitable for popularizing and planting in the main banana producing areas of south China, and also could be planted in greenhouse in north China. This variety can bear fruits next year after planted. Orchard should choose neutral sandy-red soil which is flat and has ability of moisture and fertilizer retention; spacing in the rows and spacing between rows are 1.5 m×1.5 m, and 180-200 plants per 666.7 m<sup>2</sup>. One healthy sucker per plant could be maintained for one more season and renewed every two years with healthy tissue-cultured seedlings. Scientific fertigation is suggested based on banana growth and development stage, and more potassium fertilizer is needed in flowering and fruit bearing stage. With comprehensive control technology, attention should be paid to diseases of *Fusarium wilt*, leaf spot and heart rot, and banana weevil and nematode in old banana orchard. Fruiting in low temperature period in frost area in winter should be avoided.

**Key words:** Banana; New cultivar; ‘Zhongjiao No.12’; Dwarf

香蕉属芭蕉科(Musaceae)、芭蕉属(*Musa*)的经济作物,在北美洲、中南美洲如巴西、哥斯达黎加、澳洲及亚洲如泰国、柬埔寨及中国等地区广泛种植。据FAO统计,2018年世界香蕉的种植面积为5.73×10<sup>6</sup> hm<sup>2</sup>,总产量1.16×10<sup>8</sup> t,贸易额达264亿美元,我国香蕉种植面积3.83×10<sup>5</sup> hm<sup>2</sup>,总产量1.16×10<sup>7</sup> t,约占中国热带水果总产量的60%<sup>[1]</sup>。

近年来,香蕉主产区如广东、云南、广西和海南等发展受到较大制约,种植面积和产量有所下降,如受尖孢镰刀菌枯萎病危害甚为严重<sup>[2]</sup>;香蕉市场品种单一,常规品种‘巴西蕉’植株高大,华南地区台风易侵袭,且生育期较长(12~13个月),增加了香蕉生产成本。因此,香蕉矮化育种及栽培技术的研究日益受到重视,既能丰富品种结构,改善抗风能力,同时又能相应缩短生长周期,有利推动香蕉产业的品种结构调整和健康发展。另外,矮生香蕉因矮小及姿态优美,根据市场需求可作为观赏树种用于休闲观光以及生态农业建设,市场发展前景良好<sup>[3]</sup>。

## 1 选育经过

‘中蕉12号’是以国内主栽香蕉品种‘巴西蕉’的胚性细胞悬浮系经辐射诱变、再生筛选而获得的优良矮化后代。‘巴西蕉’的胚性细胞悬浮系为材料,经 $\gamma$ 射线(<sup>60</sup>Co)辐射处理。诱变处理后的材料在继代培养基中继代培养,4个继代周期后进行再生。再生生根的植株幼苗种植于田间,筛选植株较矮化、较早熟的综合性状优良优株。优株经组培扩繁后于

2013年初和2014年初进行品种比较试验,经过2个生长周期的比较,发现其与亲本‘巴西蕉’相比,植株矮化、较早熟的遗传性状特点十分明显,而其他性状较类似。2013年初至2015年初,该优株(系)经过不同时期的分化后的生根苗种植,以亲本‘巴西蕉’为对照,在广东的广州、东莞、龙门等地进行品种多点试验和综合评价,该优系与亲本‘巴西蕉’相比,植株矮化、叶距密、叶鞘蜡粉多、生长周期短,且遗传性状稳定,遂命名为‘中蕉12号’香蕉。2013—2015年,在广东、广西、山东等产区进行适应性和综合表现观察,对该品种的农艺性状与经济性状进行综合评价,确定其生产利用价值。2016—2018年,在广东、海南和山东等地开展试种和推广,并总结出该品种在不同区域和不同季节的配套栽培技术,为品种推广与区域布局提供参考。经相关部门审核,‘中蕉12号’目前已获得了中国农业部植物新品种保护办公室的植物新品种权证书(CNA20151598.5)。

## 2 主要性状

### 2.1 植物学特征

与亲本‘巴西蕉’相比,‘中蕉12号’品种植株显著矮化,田间假茎高度仅约0.82~0.95 m,茎基部粗度为0.5~0.6 m,茎基假茎颜色为浅绿色,花青苷显色程度为中等,内层假茎呈紫红色。叶片颜色呈绿色,叶鞘基部蜡粉很多,叶柄基部有大斑点,叶间距很短,约7.5 cm;叶片较短小,长度约95~120 cm;叶柄较短,长度约10~15 cm,叶姿较开张,排列密集

(图1)。“中蕉12号”生育期较短,为280~310 d,较亲本短60~70 d。

## 2.2 主要经济学特性

“中蕉12号”果穗形状呈短圆柱状,果穗长度约



图1 矮生香蕉新品种‘中蕉12号’

Fig. 1 A new dwarf banana cultivar of ‘Zhongjiao No.12’

为38.2 cm,果梳结构紧凑,梳形较整齐。果梳的果指略朝上或垂直于果轴,果指较直且短,果棱略明显,果指长约14.5 cm,粗度(周长)约为10.3 cm,果穗7梳的总果指数约为105.8个(表1)。“中蕉12号”单果质量约85.5 g,显著小于对照品种;丰产性良好,单株产量为8.4 kg,每666.7 m<sup>2</sup>产量约为1 680 kg。

果梳较为整齐,果指大小均匀,生果皮呈绿色,熟果皮黄色,不易开裂,果实横切面微具棱角,果肉呈黄白色,商品性状较好。品质测试结果如表2所示,“中蕉12号”果实可食率68.63%,熟果果肉口味香甜,其中还原糖为13.4%,维生素C含量12.10 mg·100 g<sup>-1</sup>,两者显著高于对照品种,其余品质参数如可溶性固形物含量、

表1 ‘中蕉12号’香蕉与对照品种果实产量经济性状比较

Table 1 Comparison of yield characteristics between ‘Zhongjiao No.12’ and the control cultivar

品种 Cultivar	穗质量 Ear weight/kg	果穗长 Ear length/cm	果周长 Ear perimeter/cm	果指数 Finger No.	果指长 Finger length/cm	果指周长 Finger perimeter/cm	单果质量 Fruit weight/g
中蕉12号 Zhongjiao No.12	8.4±0.6 b	37.8±2.1 b	74.0±3.2 b	105.8±2.4 b	14.5±0.3 b	10.3±0.2 b	85.5±4.6 b
巴西蕉 Baxijiao	20.2±0.8 a	65.5±4.3 a	108.3±8.5 a	135.7±3.7 a	21.5±1.2 a	14.3±0.3 a	135.7±8.6 a

注:表中数据为3次重复的平均值±标准误,经Duncan方差分析,同列数据具有不同小写字母的表示差异达显著水平( $p < 0.05$ )。下同。

Note: Values were showed as average value ± standard error of 3 replicates, with different small letter indicating significant difference ( $p < 0.05$ ) by Duncan analysis method. The same below.

表2 ‘中蕉12号’香蕉与对照品种果实营养品质性状比较

Table 2 Comparison of fruit nutrient characters between ‘Zhongjiao No.12’ and the control cultivar

品种 Cultivar	w(可溶性固形物) Soluble solids content/%	w(可溶性糖) Soluble sugar content/%	w(还原糖) Reducing sugar/%	w(蔗糖) Sucrose content/%	w(可滴定酸) Titratable acid content/%	w(维生素C) Vitamin C content/ (mg·100 g <sup>-1</sup> )	可食率 Edible rate/%
中蕉12号 Zhongjiao No.12	19.9±1.3 a	16.2±2.2 a	13.4±1.0 a	8.50±0.65 ab	0.29±0.05 a	12.10±0.67 a	68.50±1.1 a
巴西蕉 Baxijiao	20.2±2.0 a	16.7±2.1 a	10.2±1.1 b	9.50±1.10 a	0.28±0.03 a	10.10±1.20 b	69.10±0.56 a

可滴定酸含量、可溶性糖含量等与对照相比差异未达显著水平。

## 2.3 生物学特性

在华南地区常规种植条件下,春植(3月上中

旬)‘中蕉12号’7叶龄组培苗,至约8月上中旬抽蕾,11月上旬开始可陆续收获,若留芽且安全过冬的情况下,次年约7月开始收获,生长叶片总数为32~35枚。‘中蕉12号’生育期较短,新植蕉生长周期

285~310 d,较亲本短60~70 d。

## 2.4 抗性和适应性

参考左存武等<sup>[4]</sup>香蕉枯萎病抗性检测方法,结果显示‘中蕉12号’香蕉较耐香蕉枯萎病4号生理小种,抽蕾期其发病率为33.2%,而对照‘巴西蕉’发病率约达75.7%。‘中蕉12号’香蕉抗风性较好,2015年9月经历强台风“彩虹”,‘中蕉12号’倒伏率约为8.3%,对照品种倒伏率达75.2%。与对照品种相似,‘中蕉12号’较不耐寒,霜冻地区应避免冬植和冬季抽蕾。因其生长周期短,在我国南方香蕉主产区可周年种植,建议选择春种,夏、秋季种植应避免冬季抽蕾,影响产量质量。在气温较低的区域春植,可采用大苗(12~14叶龄)移栽,缩短收获周期;或选择秋季种植。田间种植可以适当密植,每666.7 m<sup>2</sup>种植180~200株,常规品种则为100~120株。此外,‘中蕉12号’因植株矮小,树形优美,生长期较短,也适合于在北方温室或南方庭院开发作为盆栽或露地种植,该品种市场发展前景良好。

## 3 栽培技术要点

### 3.1 建园和定植

建议选择香蕉新植地或经检测无病原感染的蕉园种植,土层深厚、土质疏松、排灌良好的肥沃壤土为宜。种植前调整土壤pH值为弱碱性或中性,混施有机肥和复合肥为底肥。选择6~8枚叶片的健壮组培蕉苗定植,淋足量定根水促使小苗尽快恢复。管理条件较好的情况下,在母株抽蕾后可留健康吸芽1次,每2年换1次新苗为宜,保证树体强壮健康。

### 3.2 施肥方法

施肥时期和次数需结合香蕉生长发育过程,建议使用水肥一体化技术进行科学肥水管理技术。坚持“前足、中促、后补足”的原则,前期以氮磷为主,10~15 d施肥1次,约施8次,花芽分化期至抽蕾10~15 d开始重施肥,结合中微量元素补给,抽蕾、挂果

期需增施钾肥。

### 3.3 修剪、除芽

抽蕾结果期需留意清除老、旧叶片和枯、败苞片,减少病原藏身之处。清除多余吸芽时应避免伤及母株根系。

### 3.4 防治病虫害

采用综合防治技术,及时预防香蕉枯萎病、黑斑病、炭疽病、香蕉象鼻虫和根结线虫等常见病虫害。如温室种植需重点预防粉虱和红蜘蛛,利用菊酯类(如10%二氯苯醚菊酯)效果较好,红蜘蛛则用阿维菌素喷杀。

### 3.5 预防寒害

香蕉是热带作物,冬季有霜冻的地区以避免低温期抽蕾的原则,慎重选择适当种植时期。也可选择大苗(12~14叶,约60 cm高)种植,以缩短生长期。

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