

香榧新品种磐月榧的选育

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摘要: 磐月榧是从磐安县香榧古树中选育出的新品种。磐月榧种实、种核、种仁形状均为长倒卵形, 部分为弯长形。磐月榧平均单种质量 8.0 g, 种子纵径 3.78 cm, 横径 1.85 cm, 种形指数 2.05, 假种皮厚 0.37 cm, 鲜出核率 32.87%, 干出核率 63.56%。种核、种仁长倒卵状椭圆形, 部分为弯长形, 平均单核鲜质量 2.7 g, 纵径 3.55 cm, 横径 1.14 cm, 核形指数 3.11, 骨质中种皮厚 0.07 cm, 干出仁率 70.12%。平均单仁干质量 1.2 g, 含油率 55.4%, 可溶性糖含量(w, 后同) 6.16%, 蛋白质含量 8.92%, 炒制后脱衣方便, 质地松脆。磐月榧在种子外观上与当前主栽种细榧明显不同, 与磐安长榧很相似, 但通过 SSR 分子标记进行遗传鉴定表明, 磐月榧与磐安长榧在 DNA 水平上存在明显的差别, 是两个不同的品种。磐月榧在浙江省会稽山脉海拔 200~800 m 的山地中栽培生长良好, 其栽培技术要求与细榧相同。

关键词: 榧树; 新品种; 磐月榧

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Breeding report of a new *Torreya grandis* cultivar Panyuefei

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Abstract: Panyuefei was selected from seedlings of wild *Torreya grandis* and the maternal plant of 600 years old was discovered in 2004 in Anwen Town, Pan'an County of Zhejiang province. The numbers of asexual progenies through grafting have expanded to 160 since 2005. The new variety of *Torreya grandis* was registered in 2020 and was named Panyuefei after several years' selection. The outstanding feature of Panyuefei was that some seeds, nuts, and kernels were long extra and curved in shape, which was obviously different from the major variety Xifei. Therefore, morphological measurements showed that the average shape index of seed was 2.05 according to the average diameter in verticality of 3.78 cm and that in horizon of 1.85 cm. The average shape index of nut was 3.11 derived from the ratio of the vertical diameter of 3.55 cm and the horizontal diameter of 1.14 cm. The average mass of single fresh nut and dry kernel was 2.7 g and 1.2 g, respectively. The thickness of the peel and the shell was 0.37 cm and 0.07 cm, respectively. The weight of fresh nut was 32.87% of that of the seed; the mass of dry nut was elevated to 63.56% of that of the seed; the mass percentage of dry kernel is up to 70.12% of dry nut. Assay of nutrition content showed that the content of fat, total sugar and soluble protein was 55.4%, 6.16% and 8.92% of dry kernel, respectively. An outstanding feature of processing in Panyuefei was that the endopleura was easy to remove from the nut after baking and the nut tasted crisp mainly resulted from the high content of fat. Analyses of hereditary difference by PCR amplification us-

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ing SSR molecular markers showed that Panyuefei had unique DNA brands and was absolutely distinguished from Pananchangfei in genome. Survey of phenological period showed that the floral buds of Panyuefei sprout in late March, and the effective pollination were performed in the mid-April. The fruits matured at mid-September of next year in Pan'an County of Zhejiang province. Seedlings in nursery and young trees needed surroundings of high humidity and shading during May to September for avoiding of exposure to hot and strong sunlight. At present, Panyuefei grew well at 200-800 meters above sea level in the mountain areas of Pan'an County and required cultivation managements similar with *Torreya grandis* 'Xifei'. Young trees derived from three-years-old seedlings grafted on the stocks could be used in forestation in large-scale with planting density of no more than 670 plants per hm^2 or with row spacing of $4\text{m}\times 4\text{m}$, and male plants could be planted less than 5% of female plants per hm^2 . Production measurements of adult trees of Panyuefei would be focused on promotion of comprehensive resistance to pests and diseases by proper fertilizing, weeding and soil loosening, as well as on early bearing and yield improvement by proper pruning and training.

Key words: *Torreya grandis*; New cultivar; Panyuefei

香榧是榧树(*Torreya grandis*)中优良品种的统称,在我国已有1000余年的嫁接栽培历史。香榧种仁含油率50%左右,其中不饱和脂肪酸含量占90.84%,还具有多种人体必需的氨基酸、维生素和矿物质^[1]等营养成分,是集食用、油用和药用于一体的中国特产珍稀干果。宋代文学家苏轼在《送郑户曹赋席上果得榧子》一诗中写到“彼美玉山果,粲为金盘实”“驱攘三彭仇,已我心腹疾”“斫为君倚几,滑净不容削”,描述了当时浙江省磐安县玉山一带香榧的食用、药用和材用价值。浙江磐安现存3700多株生物学性状和种实品质各异的实生古榧树,是挖掘香榧新品种和进行良种选育的种质资源宝库。磐月榧(*Torreya grandis* 'Panyuefei')是从磐安县丰富的实生古榧树资源中选育出的一个新品种,与磐安长榧(*Torreya grandis* 'Pan' anchangfei')^[2]相比,该品种种子成熟期稍晚,种仁含油率更高,部分种实、种核、种仁为弯长形,质地松脆,风味香甜,商品性能优良。

1 选育过程

2004年,在榧树资源调查过程中发现1株优株,位于磐安县安文街道。该优株为实生起源的榧树古树,树龄高达600余年。树冠呈尖塔形,树高15 m,胸径92 cm。与主栽品种细榧相比,该品种最明显的特征为种核和种仁细长,部分为弯长形。2005年开始采取磐月榧接穗,利用2年生实生苗嫁接和实生大苗高接,扩繁培育了子代160多株。目前子代已开始结实,性状与母树一致,表现稳定。2016—

2019年对种实性状和种仁品质指标进行测定分析,与近似品种磐安长榧比较,其部分种核、种仁为弯长形,种仁含油率高,炒制后脱除内种皮方便、质地松脆,商品性能优,是一个有推广价值的新品种。2019年完成DUS测试,2020年12月获国家林业和草原局新品种授权,品种权号:20200383。

2 品种特性

2.1 植物学特征

磐月榧成年结果树的树冠为尖塔形,树体高大,长势旺盛。具有线状披针形的叶片,其正面呈深绿色,背面为淡绿色,长2.2 cm,宽0.37 cm,厚0.07 cm,叶尖刺较长。磐月榧雌花芽一般由结果母枝的顶侧芽分化形成,少部分由长势旺盛的1年生枝条上的潜伏芽分化形成,为混合芽。胚珠于结果枝中部的叶腋成对着生,种子为核果状,有肉质假种皮将其完全包被,假种皮在成熟时由绿色变为淡黄绿色,种柄短,先端有小突尖头。在枝叶性状上,磐月榧与磐安长榧相近。

2.2 生物学特性

磐月榧的种子成熟期为9月中旬,较磐安长榧迟4~5 d。其他物候期与磐安长榧相近,花芽(混合芽)萌芽期在3月下旬,叶芽萌芽期在4月上旬。4月上、中旬为胚珠传粉滴吐露期,未授粉胚珠脱落期在5月,第2年5—6月为落实期。种子发育期主要分为4个阶段:头年5月初至当年4月底为缓生期,当年5—6月为速生期,6月底至9月上、中旬为充实期,9月中旬为成熟期。

2.3 种实性状

磐月榧种实长倒卵形,部分为弯长形,种实顶部较平,基部显著变细,部分种实假种皮表面旋纹(维管束扭曲)。种核大多为长倒卵状椭圆形,部分为弯长形;种仁大多也是长倒卵状椭圆形,部分为弯长形(图1)。平均鲜种质量 8.0 g,种子纵径 3.78 cm,横径 1.85 cm,种形指数 2.05,假种皮厚 0.37 cm,鲜出核率 32.87%,干出核率 63.56%。平均鲜单核质量 2.7 g,种核纵径 3.55 cm,横径 1.14 cm,核形指数 3.11,骨质中种皮厚 0.07 cm,干出仁率 70.12%。平均干单仁质量 1.2 g,含油率 55.4%(表1)。干仁可溶性糖含量 6.16%,蛋白质含量 8.92%,脂肪酸组成:油酸 33.9%、亚油酸 43.6%、棕

榈酸 7.3%、金松酸 7.8%、硬脂酸 2.9%、11,14-二十碳烯酸 2.5%。炒制后脱衣方便,质松脆,商品性能优。

磐月榧与细榧的主要区别是种实、种核、种仁形状均为长倒卵形,部分为弯长形,明显比细榧长,单个种实平均质量较细榧轻,假种皮、骨质中种皮比细榧薄,出仁率、含油率比细榧高;种仁质松脆、香味浓,品质更优。磐月榧与同为长籽形的磐安长榧在种实性状方面存在的主要差别是部分种实、种核、种仁为弯长形;部分种实假种皮表面旋纹(维管束扭曲);种实顶部较平,基部显著变细(图1);种实出核率比磐安长榧低,种仁含油率比磐安长榧高;种实成熟期较磐安长榧迟 4~5 d(表1)。



A. 磐月榧鲜种实;B. 磐安长榧鲜种实;C. 磐月榧种仁;D. 磐安长榧种仁。

A. Panyuefei fresh seed;B. Pan' anchangfei fresh seed;C. Panyuefei dry kernel;D. Pan' anchangfei dry kernel.

图 1 磐月榧与磐安长榧的鲜种实和种仁

Fig. 1 Comparison of fresh seed and dry kernel between Panyuefei and Pan' anchangfei

表 1 磐月榧与磐安长榧种实主要性状比较

Table 1 Comparison of seed characters between Panyuefei and Pan' anchangfei

品种 Cultivar	种实(种核、 种仁)形状 Shape of seed (nut, kernel)	种形 指数 Index of seed	核形 指数 Index of nut	鲜单实质量 Single mass of fresh seed/g	鲜单核质量 Single mass of fresh nut/g	假种皮厚 Peel thickness/ cm	鲜出核率 Ratio of freshnut to seed/%	干核出仁率 Ratio of dry kernel to nut/%	含油率 Oil content of dry kernel/%
磐月榧 Panyuefei	直或弯 Straight or curved	2.05 a*	3.11 a	8.04 b	2.66 b	0.37 a	32.87 b	70.12 a	55.4 a
细榧 Xifei	直 Straight	1.59 c	2.33 c	10.7 a	3.40 a	0.37 a	31.78 b	65.09 b	50.1 b
磐安长榧 Pan' anchangfei	直 Straight	1.97 b	2.86 b	8.14 b	2.85 b	0.33 a	35.04 a	69.30 a	50.4 b

注:*采用 SPSS17.0 软件对试验数据进行方差分析(ANOVA),用 LSD 法进行多重比较分析差异的显著性($p < 0.05$)。

Note: *the data were statistically assessed using SPSS version 17.0, and statistical significance of differences was calculated using oneway ANOVA and tested with a confidence level of 95.0%($p < 0.05$).

2.4 抗性

2.4.1 抗寒性 磐月榧母株树龄615 a,在低温抗性的调查中未发现有冻害受伤的记录,具有较强的低温适应性,与当前主栽品种细榧基本一致。

2.4.2 抗高温干旱性 磐月榧幼龄嫁接苗较耐阴,需较高湿度环境,不宜高温暴晒,若定植地点选择在海拔300 m以下,则需在5月至9月间进行遮阴处理,以防灼伤及生育期延迟。进入结果期后,可适当增加光照时间和光照度。

2.4.3 抗病虫性 磐月榧嫁接后代的苗木、幼树、成年树的抗病性与其他榧树品种相似,在规范的生产管理模式下一般无病害发生。若使用未经腐熟的饼肥,会引起冷杉大嘴瘿螨危害。

2.5 SSR分子鉴定

采用33对SSR引物^[3-4]分别对磐月榧和对照品种磐安长榧进行遗传鉴定,有11对引物能区分磐月榧和磐安长榧。图2为引物ZAFU-30在磐月榧(A)和磐安长榧(B)中的扩增图谱。磐月榧的母株为实生古榧树,磐安长榧为细榧芽变品种,两者种子形状细长,在香榧产区被统称为象牙榧。但SSR分子标记表明磐月榧与磐安长榧的遗传组成差异较大,是两个不同的品种。磐月榧和磐安长榧都具有长籽香榧的特性,民间也将其混为一谈。如今,笔者利用SSR标记将磐月榧和磐安长榧这两个种子形态相近的品种区分开,解决了同名异物问题。

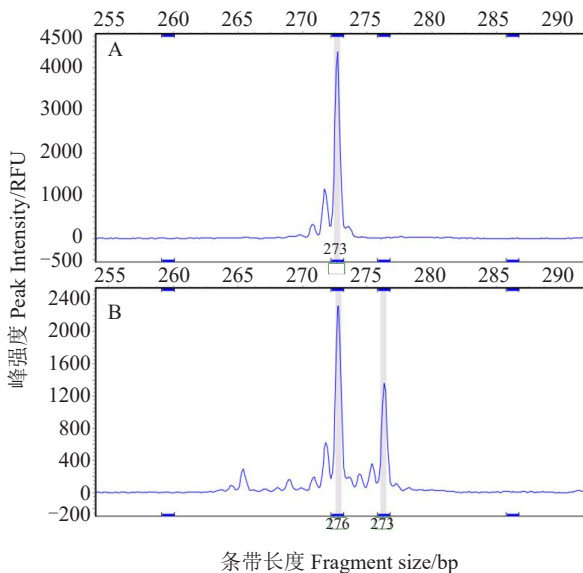


图2 引物ZAFU-30在磐月榧(A)和磐安长榧(B)中的扩增图谱

Fig. 2 Polymorphic fingerprint detected by primer ZAFU-30 for Panyuefei (A) and Pan' anchangfei (B)

3 栽培技术要点

磐月榧在海拔200~800 m的山地中栽培,可选用与主栽品种细榧基本相同的栽培技术。

选择地势平缓、海拔200 m以上的地区,要求土层较厚(60 cm以上),pH值弱酸性至中性的砂质壤土,氮、磷含量中等以上且富含钾元素的土壤。海拔500 m以上的地区。造林时间宜选择11月至土壤封冻之前。海拔500 m以上的地区,宜在春季造林,清明节前花芽萌动之前为宜。地势相对平缓的地区可进行全垦,大规模开发或陡坡区域宜采用带状整地。种植穴的规格不低于长宽深0.8 m×0.8 m×0.6 m的要求,为促进树体生长和早期丰产,定植密度控制在450~670株·hm⁻²,选择“2+3”(2年生砧木嫁接品种后培育3 a)以上的容器苗或带土球苗。

幼树生长过程中做好鼠害与冷杉大嘴瘿螨的防治工作,待进入结果期后,注意根腐、茎腐、白蚁、木蠹蛾、介壳虫的预防。

4 推广发展前景

磐月榧在浙江省磐安县已进行嫁接繁殖,并在当地有少量栽培。由于磐月榧具有可与细榧和磐安长榧相媲美的优良品质,是具有种植条件的山区进行香榧特色品种经营的良好选择。

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