

## 板栗早熟新品种白露香的选育

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**摘要:**白露香是河北省农林科学院昌黎果树研究所从兴隆县板栗实生大树中选育出的早熟板栗新品种。坚果椭圆形,果皮紫褐色,果面油亮,茸毛少,筋线不明显,底座大小中等,整齐度高;果肉淡黄色,质地细糯,风味香甜;平均单粒质量10.5 g,每苞平均含坚果2.4粒,出实率38.1%;水分含量(w,后同)49.5%,可溶性糖含量23.3%,淀粉含量51.9%,蛋白质含量4.23%,维生素C含量27.3 mg·100 g<sup>-1</sup>。该品种在河北省燕山地区9月上旬成熟。生长势强,结果枝健壮,平均长度47.84 cm,每果枝平均着生刺苞2.16个。适应性强,耐瘠薄,抗旱性、抗寒性和耐贮性强,高抗栗疫病,抗栗红蜘蛛和桃蛀螟。适宜在河北省板栗栽培区及相似区域的山地、丘陵、河滩沙地栽培。

**关键词:**板栗;新品种;白露香;早熟

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### A new early-maturing chestnut cultivar Bailuxiang

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**Abstract:** Bailuxiang, a new early-maturing chestnut cultivar, was selected from the wild mature seedling chestnut trees in Yanshan Mountain of Xinglong county, Hebei province by Changli Institute of Pomology, Hebei Academy of Agricultural and Forestry Sciences. The mother tree is 70 years old, growing on the hillside. In 2001, the chestnut research group found the mother tree during the field investigation on the superior chestnut in Sandaohetun township. The old chestnut seedling tree has the characteristics of early maturity, high yield, high quality and better tolerance of barren soil. After regional adaptability testing at three sites of Hebei province (including Xinglong, Qianxi and Kuancheng) over sixteen years from 2004 to 2020, it was finally selected in 2021. This cultivar is tall, the tree posture is half-spreading, and the tree has strong growth vigor. The biennial bearing branches are grayish brown in color. The size and density of lenticel are intermediate. Leaf color is yellow green. Leaves are ellipse with serrate, spreading, and gradually acute apex. The average length of catkin is 17.3 cm and the numbers of catkin on each biennial bearing branch is 7.8. The shape of bur is ellipse and bur is cruciform-cracked. The spine bundle on the bur is hard, the density is intermediate, and the average length of spine bundle is 1.4 cm. The nut color is purple-brown and bright, and the side nut shape is ellipse. The stripes on nut is not obvious, size of hilum is intermediate, and the regularity of nuts is high. The flesh of nut is faint yellow in color, fine-textured and smooth. The nuts are perfect for stir-fry purpose. Cooked nut taste is fragrant and glutinous. And the nut average weight is 10.5 g, each bur contains an average of 2.4

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nuts, with a seed yield of 38.1%. The water content is 49.5%, the total soluble sugar, starch and protein contents are 23.3%, 51.9% and 4.23%, respectively, and vitamin C content is 27.3 mg · 100 g<sup>-1</sup>. Nut quality is excellent. It ripens in early September in Hebei area. Annual branches are strong, with an average length of 47.84 cm and a thickness of 0.76 cm. The average bearing shoot numbers on each biennial bearing branch is 3.65, and each biennial bearing branch has an average of 2.16 burs. The cultivar has good adaptability, and is resistant to barren soil, cold climate, drought, red mite and peach borer, and highly resistant to chestnut blight. The nut has very long storage-life. The new cultivar is appropriate to be planted in mountains, hills and beach sand of the chestnut cultivation area of Hebei province and similar areas. It is early fruiting and produces high yield. This cultivar can bear fruits next year after grafting. Trees grafted after four years has a high yield potential of 3 915.0 kg · hm<sup>-2</sup>. Orchards should be chosen on gneiss mountain or beach sandy lands. The spacing in the rows and spacing between rows are 4 m × 4 m. The appropriate pollinizers are Yanxing and Yanming. The cultivar is suitable for training the natural open center system or two-layer small canopy sparse system. The new branches of young trees grow vigorously, and the effect of branch pulling and bud carving is excellent, which can achieve early bearing and high yield. The mature trees can adopt rotational and renewal pruning technology.

**Key words:** Chestnut; New cultivar; Bailuxiang; Early-maturing

板栗是我国的主要经济林树种,也是河北省特色和优势干果,在山区脱贫致富、乡村振兴、农民增收等方面有着不可替代的作用<sup>[1-3]</sup>。板栗的早熟品种<sup>[4-6]</sup>有抢先上市的巨大优势,因此,早熟板栗品种在市场上逐渐受到欢迎<sup>[7]</sup>。生产上现有品种存在成熟期相对集中(80%为中熟品种<sup>[8-13]</sup>)、优质早熟品种较少、高产品种抗逆性差和不耐瘠薄等问题,造成板栗品质的良莠不齐,影响了果农的经济效益<sup>[14-15]</sup>。针对这些问题,河北省农林科学院昌黎果树研究所开展了板栗良种选育工作,选育出耐瘠薄、优质、丰产、早熟的板栗新品种白露香(图1)。

## 1 选育经过

白露香板栗是从板栗实生种质资源中选出的板栗新品种,母树为河北省兴隆县三道河乡偏岭子村的1株约70年生的实生板栗树。2001年,河北省农林科学院昌黎果树研究所板栗课题组在河北省兴隆县三道河乡进行板栗资源调查时发现该品种母株,具有早熟、丰产、优质、耐瘠薄等特性。在原地进行了主要经济性状的调查鉴别后,定为初选优株,临时命名为三道河1号,之后又连续实地调查评价2 a(年)。2004年,采其接穗引种到本单位良种选育圃进行主要农艺性状的系统研究,并以北方板栗主栽

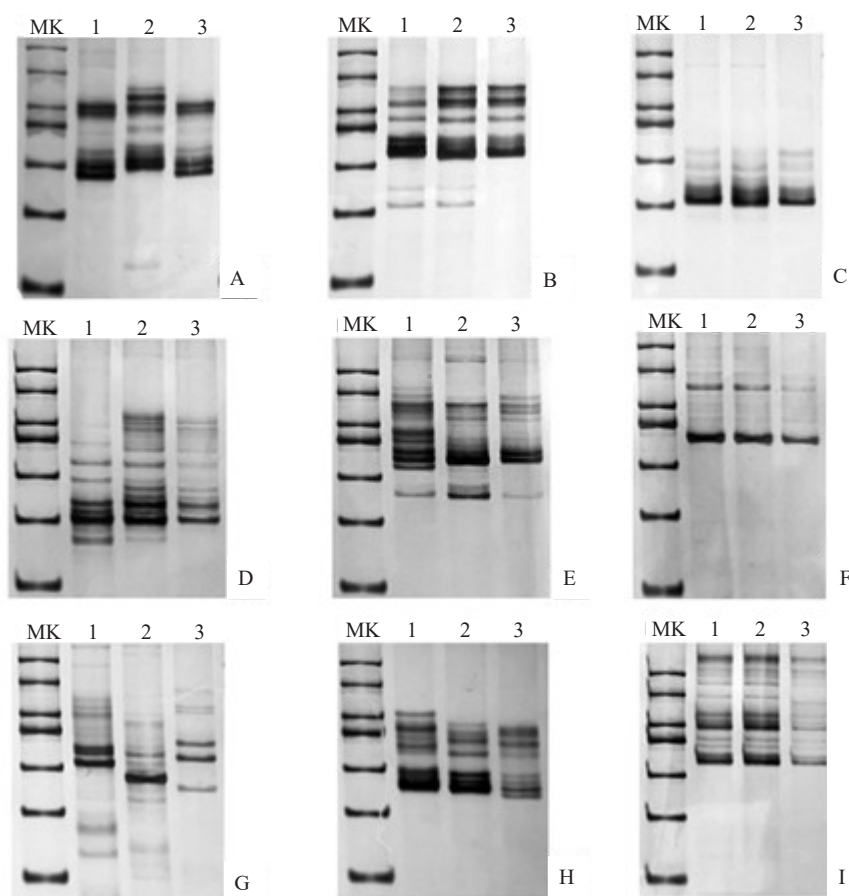


图1 板栗新品种白露香

Fig. 1 A new chestnut cultivar Bailuxiang

品种(燕山早丰、大板红)为对照,进行复选工作。2010年后,在燕山板栗主栽地区(兴隆县、迁西县、宽城县等)进行了多点区试试验。经SSR分子标记分析,确定它与目前主栽品种燕山早丰和大板红在

分子水平上存在差异(图2)。通过对植物学特征、生长结果习性、坚果性状、丰产性、适应性等方面的研究与评价,证明三道河1号丰产稳产,优质,抗逆性强,优良农艺性状表现稳定,可作为后备良种进行



1. 三道河1号;2. 燕山早丰;3. 大板红;A-I. SSR标记引物(ICMA009a、ICMA010、ICMA015、ICMA005、ICMA006、ICMA001t、ICMA017、CsCAT14、ICMA011);MK. DNA Marker。

1. Sandaoh No.1; 2. Yanshanzaofeng; 3. Dabanhong; A-I. Primers of SSR marker (ICMA009a, ICMA010, ICMA015, ICMA005, ICMA006, ICMA001t, ICMA017, CsCAT14, ICMA011; MK. DNA Marker); MK. DNA Marker.

图2 白露香与燕山早丰、大板红的分子标记图谱

Fig. 2 The SSR molecular markers map of Bailuxiang, Yanshanzaofeng and Dabanhong

生产应用。2022年3月30日通过河北省林木品种审定委员会审定,命名为白露香,良种编号:冀S-SV-CM-005-2021。

## 2 主要性状

### 2.1 植物学特征

植株树体高大,树姿半开张,生长势强;树干皮色深褐色;结果母枝健壮,分枝角度中等,枝条皮色灰褐色,皮孔中等大小,分布不规则,密度中等;叶片黄绿色,长椭圆形,平展,背面密被灰白色星状毛,锯齿中等,内向,先端渐尖;叶柄黄绿色,平均长度为1.9 cm;每果枝平均着生雄花序7.8条,斜生,平均长

度17.3 cm;刺苞椭圆形,成熟时黄绿色,十字形开裂,苞皮厚度中等,平均苞质量46.5 g;刺束密度中等,硬度大,成熟时黄绿色,刺平均长度1.4 cm。

### 2.2 生长结果习性

白露香结果母枝平均抽生果枝数3.65条,每果枝平均着生刺苞2.16个,每苞平均含坚果2.4粒;幼树生长势强,盛果期后生长势中庸;树冠紧凑度一般;结果母枝萌芽率78.8%,结果枝比例45.0%,雄花枝占比12.3%,发育枝占比23.7%;1年生枝条健壮,平均长度47.84 cm,粗0.76 cm,节间长1.62 cm,次年平均抽生结果新梢3.65条。白露香生长势强,从表1可知,该品种树高、树冠面积高于对照品种,1

表1 板栗白露香与对照品种(5 a)生长特性比较

Table 1 Comparisons on growing habits between Chinese chestnut Bailuxiang and check cultivars (5 a)

品种 Cultivar	干周 Trunk perimeter/cm	树高 Tree height/m	树冠面积 Crown size/ m <sup>2</sup>	1年枝 1 a branch/cm		结果枝占比 Bearing branch rate/%	每枝结苞数 Bur numbers of branch
				长度 Length	粗度 Width		
白露香 Bailuxiang	42.5	4.32	7.21	47.84	0.76	45.00	2.20
燕山早丰 Yanshanzaofeng	43.8	3.76	6.2	37.90	0.63	58.00	2.80
大板红 Dabanhong	38.2	3.85	6.48	29.50	0.64	39.00	2.16

年生枝长度、粗度大于对照品种。

### 2.3 果实经济性状

白露香刺苞椭圆形,平均每苞含坚果2.4粒,出实率38.1%;坚果椭圆形,紫褐色,油亮,茸毛少,筋线不明显,底座大小中等,接线月牙状或直线形,整

齐度高,平均单粒质量10.5 g;果肉淡黄色,质地细糯,风味香甜,含水量49.5%,可溶性糖含量23.3%,淀粉含量51.9%,蛋白质含量4.23%,维生素C含量27.3 mg·100 g<sup>-1</sup>(表2)。适宜炒食,耐贮性强,腐烂率低,商品性优。

表2 板栗白露香与对照品种果实品质测定

Table 2 Fruit quality measurement of Bailuxiang and check cultivars

品种 Cultivar	w(水分) Water content/%	w(可溶性糖) Total sugar content/%	w(淀粉) Starch content/%	w(蛋白质) Protein content/%	w(维生素C) Vitamin C content/(mg·100 g <sup>-1</sup> )
白露香 Bailuxiang	49.5	23.3	51.9	4.23	27.3
燕山早丰 Yanshanzaofeng	52.0	20.2	46.1	5.02	29.5
大板红 Dabanhong	50.2	21.2	54.1	4.03	26.3

### 2.4 丰产稳产性

白露香幼树生长势强,雌花易形成,结果早,产量高,嫁接后第4年即进入丰产期。稳产性强,无大小年结果现象。早实性好,采用拉枝刻芽技术处理

幼树,嫁接第2年结果株率在95%以上,产量为1500~2250 kg·hm<sup>-2</sup>。盛果期产量可达3915.3 kg·hm<sup>-2</sup>。从表3可以看出,白露香和对照品种单株产量和盛果期平均产量没有明显差异,均属于丰产型品种。

表3 板栗白露香与对照品种稳产性比较

Table 3 Comparisons on yield stability between Chinese chestnut Bailuxiang and check cultivars

品种 Cultivar	株产量 Yield per plant/kg			平均产量 Average yield/(kg·hm <sup>-2</sup> )
	嫁接后第2年 2nd year after grafting	嫁接后第3年 3rd year after grafting	嫁接后第4年 4th year after grafting	
白露香 Bailuxiang	0.69	1.47	2.77	3 915.3
燕山早丰 Yanshanzaofeng	1.12	1.40	2.45	4 114.8
大板红 Dabanhong	0.78	1.45	2.82	4 000.4

该品种连续结果能力较强,16年生嫁接树连续3 a结果的母枝占80%,连续2 a结果的母枝占15%。树冠投影面积产量0.5 kg·m<sup>-2</sup>以上,大小年产量差异度较小。

### 2.5 物候期

白露香在河北北部萌芽期4月17日,展叶期4月25日,雄花初花期6月8日,盛花期6月11日,末花期6月18日,果实成熟期9月6日左右,落叶期11月10日。由表4可知,白露香成熟期比燕山早丰晚5 d,较大板红早9 d,在9月上旬成熟。

### 2.6 适应性及抗逆性

白露香适应性强,在平原沙地、河滩地及丘陵片麻岩、页岩和花岗岩山地均能正常生长结果。参照板栗种质资源数据质量控制规范<sup>[6]</sup>,采用田间调查法比较板栗白露香与对照品种的抗逆性,由表5可知,白露香栗对红蜘蛛抗性优于对照品种,抗旱性强于燕山早丰。抗桃蛀螟、高抗栗疫病,抗寒性和耐贮性强。经在区试试验点多年的连续观察与调查,在现有品种常出现势弱早衰的干旱片麻岩陡坡山地种植,白露香不出现早衰现象,且稳产性强,大小年结



表 4 板栗白露香与对照品种物候期比较

Table 4 Comparisons on phenological period among Chinese chestnut Bailuxiang and check cultivars

品种 Cultivar	萌芽期 Germinating date	展叶期 Leaf-spreading date	盛花期 Blooming date	新梢停长期 New tip stop-growing date	果实成熟期 Ripening date	落叶期 Deciduous date
白露香 Bailuxiang	04-17	04-25	06-11	06-10	09-06	11-10
燕山早丰 Yanshanzaofeng	04-18	04-25	06-10	06-07	09-01	11-09
大板红 Dabanhong	04-18	04-24	06-14	06-10	09-15	11-07

表 5 板栗白露香与对照品种抗逆性状的综合比较

Table 5 Comprehensive comparison on stress resistance among Chinese chestnut Bailuxiang and check cultivars

品种 Cultivar	适应性 Adaptability	栗红蜘蛛抗性 Resistance to red mite	桃蛀螟抗性 Resistance to peach borer	栗疫病抗性 Resistance to chestnut blight	抗旱性 Drought resistance	抗寒性 Cold resistance	耐贮性 Storage capacity
白露香 Bailuxiang	强 Strong	抗 Resistant	抗 Resistant	高抗 High resistant	强 Strong	强 Strong	强 Strong
燕山早丰 Yanshanzaofeng	强 Strong	中抗 Moderate resistant	抗 Resistant	高抗 High resistant	中 Intermediate	强 Strong	强 Strong
大板红 Dabanhong	强 Strong	中抗 Moderate resistant	抗 Resistant	高抗 High resistant	强 Strong	强 Strong	强 Strong

果现象不明显。

### 3 栽培技术要点

该品种适宜片麻岩山地及河滩沙地栽植,栽植株行距以 4 m×4 m 为宜;授粉品种选用燕兴<sup>[17]</sup>和燕明<sup>[10]</sup>等;树形宜选用自然开心形和二层小冠疏层形;幼树新梢生长势强,拉枝、刻芽促成花效果较好,能达到早果丰产的目的;成龄大树采用“板栗轮替更新整形修剪技术”,保持结果枝量为树冠投影 7~9 条·m<sup>2</sup>;秋后果园施基肥,春季萌芽前施入氮磷钾复合肥,施肥后及时浇水;采用生物、物理和化学等方法综合防治板栗红蜘蛛和桃蛀螟等病虫害。

### 4 综合评价

白露香板栗适应性强,具有结果早、产量高、品质好的优良特性,并且无明显病虫害,本身生物学性状稳定,无大小年结果现象,抗旱、耐瘠薄性强。适宜在河北省板栗产区以及与此生态类型相似区域种植。

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