

晚熟苹果新品种辽苹的选育

王冬梅, 刘志*, 吕天星, 闫忠业, 杨 锋, 黄金凤

(辽宁省果树科学研究所, 辽宁熊岳 115009)

摘 要: 辽苹是由寒富×岳帅杂交选育出的晚熟苹果新品种。果实扁圆形, 果顶略有棱起, 极易着色, 不套袋全面着深红色。平均单果质量 235 g, 果肉黄白色, 肉质松脆, 硬度 $10.8 \text{ kg} \cdot \text{cm}^{-2}$, 风味甜酸浓郁, 可溶性固形含量(w , 后同) 13.9%, 总酸含量 0.51%。果实生育期 165 d, 在熊岳地区 10 月中旬成熟, 极耐贮藏, 冷库可至翌年 5 月, 贮后风味更佳。树势强, 萌芽率高, 平均 67.8%, 成枝力中等, 平均 5.3 个。自花结实率低, S 基因型为 S_1S_9 。丰产, 利用带分枝乔化大苗建园 (666.7 m^2 定植 83 株), 栽后第 2 年见果, 第 3 年平均产量 $6\ 847.5 \text{ kg} \cdot \text{hm}^{-2}$, 7 年生树平均产量 $60\ 258 \text{ kg} \cdot \text{hm}^{-2}$ 。抗病性中等, 果实易感水心病, 对苹果枝干轮纹病表现为中抗。抗寒性较强, 适宜在辽宁省锦州市黑山以南及相似生态区栽培。

关键词: 苹果; 新品种; 辽苹; 杂交; 晚熟

中图分类号: S661.1

文献标志码: A

文章编号: 1009-9980(2022)04-0685-04

Breeding report of new late-ripening apple cultivar Liaoping

WANG Dongmei, LIU Zhi*, LÜ Tianxing, YAN Zhongye, YANG Feng, HUANG Jinfeng

(Liaoning Institute of Pomology, Xiongyue 115009, Liaoning, China)

Abstract: Liaoping is a new late-ripening apple cultivar with excellent appearance. The seedling was derived from a cross between Hanfu and Yueshuai in 1996 in the experimental field. It was initially selected in 2003 for its prominent colors and strong sweet and acid flavor. Through artificial hybridization pollination, 768 hybrid seedlings were planted in 1997. Liaoping was considered as a primary selection strain in 2008. The original code of Liaoping was 62-45. After regional adaptability testing at two sites (including Heishan country, Jinzhou city, and Dengta area, Liaoyang city,) over six years from 2015 to 2020, it was finally selected in 2019. This variety is tall, attaining a height of 3.5 m. The tree is vigorous with semicircular crown and upright gesture. 1-year-old branch is yellow-brown. The average length of branch is 35.3 cm. The average width of branch is 5.4 mm. Leaves are ovate to elliptic, and acuminate. The ratio of leaf length to width is 1.6. The average length of leafstalk is 3.7 cm. There are five flowers within each cluster. Petals are pink. The diameter of flower is 4.1 cm. Most bearings came from both axillary flower bud and spurs on young trees. The fruit is oblate and the top of fruit is slightly prism. The fruit is full range of dark red without bagging and it's easy to set color. The ground color is yellowish-green. The average single fruit weight is 235 g. The fruit shape index is 0.85. The flesh is yellow and white. The flesh texture is light and crisp. The flavor is strong sweet acid and juicy. The soluble solid content is 13.9%, and total acidity is 0.51%. Fruit hardness is $10.8 \text{ kg} \cdot \text{cm}^{-2}$. Quality is excellent. The fruit development period is 165 d, and it matures in mid-October in Xiongyue area with $122^\circ 09'$ east longitude and $40^\circ 10'$ north latitude. The branching ability is moderate medium with an average of 5.3. The self-pollination rate is low, only 2.65%. It's high yield. Usually, an orchard should be established with vigorous large branching seedlings and 83 plants are planted per 666.7 m^2 . It has moderate disease

收稿日期: 2021-10-14 接受日期: 2021-11-18

基金项目: 辽宁省重点研发项目(2020JH2/10200019); 辽宁省农业科学院学科建设项目(2020DD165004)

作者简介: 王冬梅, 女, 研究员, 从事苹果新品种选育工作。Tel: 0417-7033412, E-mail: lgwdm@163.com

*通信作者 Author for correspondence. Tel: 13470420115, E-mail: lnliuzhi@163.com

resistance. The fruit is susceptible to water core disorder. The plant is moderate resistance to ring rot of apple. The fruit has very long storage-life, cold storage life is 7 months and shelf life are over 90 days. The fruit has better flavor after storage. This variety is suitable for cultivation in Heishan area, south of Jinzhou and similar climate areas in Liaoning province. Fruiting started at the second year after planting. In the third year, the average yield was $6847.5 \text{ kg} \cdot \text{hm}^{-2}$. In 7th year, the yield was $60\,258 \text{ kg} \cdot \text{hm}^{-2}$. On flat terrain, fertile soil with good irrigation conditions, dwarf trees and trellis cultivation can be applied. On mountain or relatively barren soil, relatively adaptable trees should be chosen. Spacing in the rows and between rows are $2 \text{ m} \times 4 \text{ m}$ on vigorous rootstock and $1.5 \text{ m} \times 4 \text{ m}$ on dwarf rootstock. The suitable interstocks are *Malus micromalus*, *M. hupehensis*, GM256, Liaozhen 2, etc. The S genotypes was S₇S₉. Suitable pollination varieties can be chosen from Golden Delicious, Gala, Yueyan, Yueyanghong, Yuehua, Yueguan, etc. Trees should be shaped as high spindle or thin spindle system, and the height is controlled at 3 to 3.5 meters. The number of branches is 30 to 35, angle of branch is from 100° to 120° , and the ratio of branch thickness to trunk thickness is from 1:3 to 1:5. Liaoping fruit is fully colored, which can be considered as non-bagging cultivation. In order to prevent from fruit water core disorder, $300 \text{ kg} \cdot \text{hm}^{-2}$ of calcium nitrate can be applied into the soil in spring. Before fruit bagging and picking, amino acid calcium should be sprayed 2-3 times.

Key words: Apple; New cultivar; Liaoping; Hybrid; Late ripening

我国作为苹果生产大国,生产上富士、新红星、金冠、乔纳金和嘎拉等品种约占栽培总量的85%^[1]。大多数主栽品种需要套袋栽培解决果实着色问题,在增加劳动力成本的同时,果实的风味、香气、贮性等也受到影响^[2]。近年来农村劳动力缺乏、年龄老化,生产成本增加很快,而消费者对水果品质和特色的要求日益迫切。培育和筛选出品质优良、特色鲜明、栽培性能好的省力化品种,成为苹果育种工作者努力的方向^[3]。

1 选育经过

辽宁省果树科学研究所苹果育种室在1996年利用抗寒大苹果寒富^[4]与金冠×红星的优良后代岳帅^[5]进行杂交,获得的杂交种子于1997年春季播种。1999年对田间假植的杂种苗进行预选,剔除病弱株和野生性状明显的单株,然后将768株杂种苗定植在杂种圃中继续观察。2003年起这个组合的杂种苗陆续开始结果,其中代号62-45的单株果实着色突出,内膛果实也全红,果量较大,且连年结果。果实晚熟,果个中等,刚采收时偏硬,但极耐贮藏,贮后风味甜酸浓郁。连续观察3 a后,果实主要性状遗传稳定,2005年选为初选系,代号410-16。2008年将其嫁接到乔化大树上进行复选鉴定,同时繁苗进行一致性观察和省际区域试验。经过多年观察,其繁殖材料代际间稳定,树体及果实经济性状等

各项指标表现一致,适应性也较强。认为该品种着色好,风味浓、耐贮藏,易管理,综合性状优良。2019年申请了植物新品种权,2021年6月通过授权,编号CNA20191000599,命名为辽苹(图1)。



图1 晚熟苹果新品种辽苹

Fig. 1 A New late ripening apple cultivar Liaoping

2 主要特征特性

2.1 植物学特征

树势强,树姿开张。1年生枝黄褐色,平均长35.3 cm、粗5.4 mm,节间平均长度3.3 cm,叶背茸毛稀疏,皮孔较密;叶姿水平,叶片深绿色,叶面抱合,叶缘锐锯齿,叶片长宽比1.6,叶柄长3.6 cm;每花序平均5枚花朵,花冠直径4.1 cm,花蕾粉红色,花瓣邻接、卵圆形。果梗长3.7 cm,粗2.1 mm,梗洼深、中广,无锈,萼片宿存、半开张,萼洼中深、广、无锈。心室中等大小、半开,种子褐色。

2.2 果实经济性状

果实扁圆形,果形指数0.85,平均单果质量235 g。果实全面着深红色,片红,底色黄绿色,无蜡质、有少量果粉,果顶有弱棱起。果肉黄白色、肉质中粗、硬

脆、液汁多,风味甜酸。采收时硬度 $10.8 \text{ kg} \cdot \text{cm}^{-2}$,可溶性固形物含量13.9%,总酸含量0.51%(表1)。熊岳地区果实10月中旬成熟,采前不落果,极耐贮藏,冷库($\pm 1 \text{ }^\circ\text{C}$)可贮至翌年5月,贮后风味更佳。

表1 辽苹与对照品种果实经济性状比较

Table 1 Comparison of fruit economic characteristics of Liaoping and control varieties

品种 Cultivar	成熟期 Fructescence	果形 Fruit shape	着色 Coloring	单果质量 Fruit weight/g	果实硬度 Firmness/($\text{kg} \cdot \text{cm}^{-2}$)	w(可溶性固形物) Soluble solid content/%	w(总酸) Total acid content/%
辽苹 Liaoping	10月中旬 Mid-October	扁圆 Oblate	深红色 Strong red	235	10.8	13.9	0.51
寒富 Hanfu	10月上旬 Early October	圆锥 Conical shape	鲜红色 Full red	245	8.5	13.2	0.32
岳帅 Yueshuai	10月中旬 Mid-October	近圆 Suborbicular	橙红晕 Orange red	224	8.2	14.5	0.27

2.3 生长结果习性

辽苹丰产性强。幼树生长较快,利用带分枝乔化大苗建园,第2年即可见果,第3年平均树高2.7 m,干径8.6 cm,东西冠径2.4 m,南北冠径2.5 m,主干上着生12~16个主枝,以短果枝和腋花芽结果为主,平均株产5.5 kg。进入稳产阶段树势变缓,7年生树树高控制在3.2~3.5 m,东西冠径 $3.1 \text{ m} \times 3.4 \text{ m}$,以中、长枝结为主,单株结果个数220~250个,平均产量 $60\ 258 \text{ kg} \cdot \text{hm}^{-2}$,连续结果能力强,无大小年结果现象。

辽苹自花结实能力弱,自花授粉花朵坐果率2.65%,需配置授粉树。利用苹果自交不亲和S等位基因特异性PCR技术,鉴定辽苹的S基因型为 S_7S_9 ,与岳艳、嘎拉、金冠、岳阳红、岳华、岳冠等可相互授粉。

2.4 物候期

辽苹在辽宁熊岳地区4月中旬花芽萌动,4月末至5月初初花,花期持续5~7 d,10月中旬果实成熟,果实发育期165 d左右,为晚熟品种,11月中下旬落叶,营养生长时间220 d左右。

2.5 适应性及抗病性

辽苹适应性较强,在辽宁熊岳地区(1月平均气温 $-9.2 \text{ }^\circ\text{C}$),多年生实生母树能正常生长。在较寒冷的锦州市黑山地区、辽阳市灯塔地区,新植幼树经过涂白或绑草把等简单防护可安全越冬。4~6年生树也无花芽、枝条及主干受冻情况。

辽苹抗病性中等,2016—2018年田间自然发病观察及人工接种抗性鉴定表明,其对苹果枝干轮纹病表现为中抗^[6];通过多年观察,其果实接近成熟时

容易发生水心病(糖心)。从已有试栽结果看,适宜在辽宁省锦州市黑山以南及相似气候条件区栽植。

3 栽培技术要点

3.1 栽植密度及授粉品种

地势平坦、土质肥沃、有灌溉条件的地块可定植矮化树,株行距 $1.5 \text{ m} \times 4 \text{ m}$,架式栽培;山地或土壤相对瘠薄的地块要选择适应性强的乔化树,株行距 $2 \text{ m} \times 4 \text{ m}$ 。适宜的砧木有山定子、平邑甜茶、GM256、辽砧2号等。选择带6~9个分枝的大苗建园,成本高,但见效快,可提早2~3 a结果。授粉品种可选择花期相近、S基因型不同的嘎拉、金冠、岳艳、岳阳红、岳华、岳冠等。

3.2 整形修剪

树形可采用高纺锤形或细长纺锤形,树高3~3.5 m,干高1.0 m以上;主枝在中心干上交错排列,数量30~35个,角度 $100^\circ \sim 120^\circ$;主枝不固定,枝干比1:3~5,在主枝上直接生结果枝组;成龄树树体顶端结果后回缩至较弱的结果枝处,控制树高。

3.3 花果管理

辽苹果实着色充分,可考虑无袋栽培。结果性良好,无大小年结果现象,采前不落果,生理落果后要及时疏果。病虫害方面重点防治果实水心病,可在春季土壤中根施硝酸钙 $300 \text{ kg} \cdot \text{hm}^{-2}$ 、果实套袋及采收前各喷2~3遍氨基酸类钙制剂进行预防。

3.4 肥水管理

成龄树一般每年施肥2次。果实采收后,秋施基肥主要是有机肥及氮、磷、钾复混肥,可按每生产50 kg果施农家肥如牛粪75 kg、尿素0.2 kg、磷酸二

铵 0.18 kg, 硫酸钾 0.1 kg。6—7月追施氮、钾肥, 促进果实膨大, 提高果实品质, 可结合灌水按每生产 50 kg 果施尿素 0.35 kg、硫酸钾 0.3 kg。

3.5 适宜区域

适合在辽宁省锦州市黑山以南及相似生态区发展。

参考文献 References:

- [1] 赵德英, 袁继存, 徐锴, 程存刚, 闫帅. 近 10 年来国内外苹果产销分析[J]. 中国果树, 2016(3): 87-93.
ZHAO Deying, YUAN Jicun, XU Kai, CHENG Cungang, YAN Shuai. The analysis of production and marketing of apple in domestic and foreign markets in 10 years[J]. China Fruit, 2016(3): 87-93.
- [2] 翟浩, 王贵平, 李晓军, 王金政. 苹果无袋栽培对果实品质和安全性的影响[J]. 中国果树, 2015(1): 29-32.
ZHAI Hao, WANG Guiping, LI Xiaojun, WANG Jinzheng. Effects of bagless cultivation on fruit quality and safety of apple[J]. China Fruit, 2015(1): 29-32.
- [3] 刘肖烽, 丛佩华, 张彩霞, 张利义, 杨玲, 李武兴, 康立群, 张士才, 韩晓蕾, 王强. 苹果晚熟新品种华妃的选育[J]. 果树学报, 2021, 38(5): 828-830.
LIU Xiaofeng, CONG Peihua, ZHANG Caixia, ZHANG Liyi, YANG Ling, LI Wuxing, KANG Liqun, ZHANG Shicai, HAN Xiaolei, WANG Qiang. Breeding report of a new later ripening apple cultivar Huafei[J]. Journal of Fruit Science, 2021, 38(5): 828-830.
- [4] 李怀玉, 孙红旭, 乔凤岐, 丛日春. 抗寒优质苹果新品种短枝寒富[J]. 中国果树, 1995(1): 1-2.
LI Huaiyu, SUN Hongxu, QIAO Fengqi, CONG Richun. A new cold resistant and high quality apple variety Hanfu[J]. China Fruit, 1995(1): 1-2.
- [5] 乔辰生, 杨彬, 张敏, 丁玉英, 高爱农, 谢重新, 李喜森, 王宏. 苹果新品种系‘岳帅’的选育[J]. 北方果树, 1995(1): 3-4.
QIAO Chensheng, YANG Bin, ZHANG Min, DING Yuying, GAO Ainong, XIE Chongxin, LI Xisen, WANG Hong. Breeding report of a new apple cultivar ‘Yueshuai’ [J]. Northern Fruits, 1995(1): 3-4.
- [6] 黄金凤, 王冬梅, 吕天星, 闫忠业, 王颖达, 杨锋, 刘志. 辽宁省苹果轮纹病病原菌鉴定及苹果品种(系)对其抗性的评价[J]. 中国果树, 2021(1): 70-73.
HUANG Jinfeng, WANG Dongmei, LÜ Tianxing, YAN Zhongye, WANG Yingda, YANG Feng, LIU Zhi. Identification of ring rot and evaluation disease resistant of apple germplasm in Liaoning Province[J]. China Fruit, 2021(1): 70-73.