

北美鹅掌楸优树半同胞家系生长与形质指标变异

穆艳娟¹ 张馨蕊^{1,2} 季新月¹ 朱娜娜^{1,3} 孙涛¹ 栗宁宁¹ 韩庆军¹ 厉锋³ 姚金刚³ 刘瑞杰² 徐琰³ 鲁仪增^{1*}

(1. 山东省林草种质资源中心 暖温带林草种质资源保存与利用国家林业和草原局重点实验室 山东济南 250102; 2. 山东农业工程学院, 山东 济南 250100; 3. 沂水县国有沂山林场 山东沂水 276414)

摘 要: 北美鹅掌楸 (*Liriodendron tulipifera*) 为木兰科 (Magnoliaceae) 鹅掌楸属 (*Liriodendron*) 落叶大乔木, 是一种很好的园林观赏、用材及蜜源植物兼备的树种。其木材广泛用于细木工制品、室内装修、建筑用材、胶合板等方面。经过 20 多年的引种驯化, 北美鹅掌楸在山东已正常开花结实, 已培育出‘郁北 1 号’北美鹅掌楸、‘郁北 2 号’北美鹅掌楸和‘郁北 3 号’北美鹅掌楸等品种多个。【目的】为揭示北美鹅掌楸半同胞家系苗木生长和形质指标变异规律。【方法】2024 年 3 月以 12 个 3 年生北美鹅掌楸优树的半同胞家系为试验材料, 对其树高、胸径、枝下高、分枝数量、第一分枝粗度和第一分枝长度等 6 个生长和形质指标进行方差分析、多重比较和家系苗期遗传参数比较, 初步筛选出苗期速生优质半同胞家系。【结果】结果表明, 12 个家系的 6 个生长和形质指标变异丰富, 指标间差异均达到极显著水平 ($P < 0.01$); 12 个家系的各性状均存在一定变异, 部分家系间的指标差异达到显著水平 ($P < 0.05$), 按照平均变异系数由大到小依次为: 胸径 (变异幅度 26.43%-51.31%, 平均变异系数值 40.29%) > 枝下高 (变异幅度 23.68%-53.84%, 平均变异系数值 38.72%) > 分枝数量 (变异幅度 27.99%-44.74%, 平均变异系数值 37.07%) > 第一分枝粗度 (变异幅度 23.96%-63.80%, 平均变异系数值 36.75%) > 第一分枝长度 (变异幅度 30.02%-45.43%, 平均变异系数值 36.10%) > 树高 (变异幅度 14.06%-26.95%, 平均变异系数值 20.31%); 不同家系间各性状间的广义遗传力差异达到极显著水平, 其中, 树高的广义遗传力最大 (97.98%), 枝下高、第一分枝长度、分枝数量、胸径、树高的广义遗传力次之, 第一分枝粗度的广义遗传力最小 (75.60%), 第一分枝粗度受环境影响较大, 其他性状均受到遗传影响较大; 按照树高和胸径平均值加标准差的方法, 综合筛选出 2 个苗期速生的优良家系 LYZ02 和 LYZ03。【结论】北美鹅掌楸优树半同胞家系具有良好的遗传改良潜力, 树高和胸径可作为北美鹅掌楸半同胞家系苗期早期选择的重要指标。

关键词: 北美鹅掌楸; 半同胞家系; 生长量; 形质指标; 变异

Variation in growth and morphological indicators of half sibling families of the Superior tree of *Liriodendron tulipifera*

Yan-juan Mu¹ Xin-rui Zhang^{1,2} Xin-yue Ji¹ Na-na Zhu^{1,3} Tao Sun¹ Ning-ning Li¹ Qing-jun Han¹ Feng Li³ Jingang Yao³ Rui-jie Liu² Yan Xu³ Yi-zeng Lu^{1*}

((1. Shandong Provincial Center of Forest and Grass Germplasm Resources, Key Laboratory of National Forestry and Grassland Administration on Conservation and Utilization of Warm Temperate Zone Forest and Grass Germplasm Resources, Jinan

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250102, China; 2. Shandong Agriculture and Engineering University, Jinan 250110, China; 3. State-Owned Yishan Forest Farm in Yishui County, Linyi 276400, China)

Abstract: *Liriodendron tulipifera* is a deciduous large tree in the Magnoliaceae family of the *Liriodendron* genus. It is a great tree species for garden viewing, timber, and nectar sources. Its wood is widely used in fine woodworking products, interior decoration, building materials, plywood and other fields. After more than 20 years of introduction and domestication, the *L. tulipifera* has bloomed and borne fruit normally in Shandong. Multiple varieties have been cultivated, including 'Yubei 1' *L. tulipifera*, 'Yubei 2' *L. tulipifera* and 'Yubei 3' *L. tulipifera*.

【Objective】 To reveal the variation patterns of growth and morphological indicators of half sibling families of *L. tulipifera* seedlings. **【Method】** In March 2024, twelve half sibling families of 3-year-old *L. tulipifera* seedlings were selected as experimental materials. Six growth and morphological indicators, including tree height, breast height diameter, branch height, branch number, first branch thickness, and first branch length, were analyzed for variance, multiple comparisons, and genetic parameter comparisons during the seedling stage. A preliminary screening was conducted to identify fast-growing and high-quality half sibling families during the seedling stage.

【Result】 The results showed that there was abundant variation in 6 indicators among 12 families, and the differences between indicators reached a highly significant level ($P < 0.01$). There is a certain degree of variation in various traits among the 12 families, and the differences in indicators between some families have reached a significant level ($P < 0.05$). According to the average coefficient of variation, the order from highest to lowest is: diameter at breast height (range of variation 26.43% -51.31%, average coefficient of variation 40.29%) > height under branches (range of variation 23.68% -53.84%, average coefficient of variation 38.72%) > number of branches (range of variation 27.99% -44.74%, average coefficient of variation 37.07%) > thickness of the first branch (range of variation 23.96% -63.80%, average coefficient of variation 36.75%) > length of the first branch (range of variation 30.02% -45.43%, average coefficient of variation 36.10%) > tree height (range of variation 14.06% -26.95%) The average coefficient of variation is 20.31%. The differences in the generalized heritability of various traits among different families reached a highly significant level. Among them, the generalized heritability of tree height was the highest (97.98%), followed by the generalized heritability of branch height, first branch length, branch number, breast height diameter, and tree height. The generalized heritability of first branch thickness was the lowest (75.60%), and the first branch thickness was greatly influenced by the environment, while other traits were greatly influenced by genetics. According to the method of adding standard deviation to the average tree height and breast height diameter, two excellent families LYZ02 and LYZ03 with rapid seedling growth were comprehensively screened.

【Conclusion】 The half sibling families of the *L. tulipifera* has good genetic improvement potential, and tree height and diameter at breast height can be important indicators for early selection during the seedling stage of the half sibling family of the *L. tulipifera*.

Keywords: *Liriodendron tulipifera*; Half sibling family; Growth; morphological indicator; variation