

5.5 年生红锥半同胞家系生长变异及优良家系选择

孔乐^{1,2}, 谭长强², 滕维超¹

(1. 广西大学林科院 南宁 530002; 2. 广西壮族自治区林业科学研究院 南宁 530002)

摘要:为探索红锥半同胞子代家系生长变异规律, 筛选优良家系, 为珍贵乡土速生树种红锥 (*Castanopsis hystrix*) 的遗传改良、良种选育和林业生产实践提供参考。以 3 个试验点 (玉林、柳州、南宁) 的 33 个红锥半同胞子代家系为研究对象, 通过对红锥生长性状 (胸径、树高、东西冠幅、南北冠幅、单株材积) 变异分析和遗传参数估算, 分析试验点间基因型 and 环境的互作模式、量化环境因子对红锥生长性状的影响; 并通过估算各试验点各家系生长性状的最佳线性无偏预测 (BLUP) 值, 并结合主成分分析的因子分析筛选出各试验点的优良家系。(1) 红锥半同胞家系生长性状分化明显, 南宁试验点的红锥半同胞家系具有胸径、树高和单株材积性状优势, 柳州试验点具有东西冠幅、南北冠幅性状优势。(2) 在单个和多试验点方差分析中的地点、区组、家系及其之间的交互作用存在极显著差异; 遗传参数估算总体为家系遗传力大于单株遗传力、家系间变异系数大于家系内变异系数平均值, 表明各生长性状均受较高程度遗传控制、生长性状变异主要为家系间变异, 适宜进行家系选优; 且家系不同性状之间具有显著的相关性。(3) 生长性状存在基因型与环境互作效应, 互作模式包含 B 和 D 模式, 交互作用复杂; 环境因子显著影响红锥的生长, 其中, 树高、单株材积性状和环境因子极显著相关, 胸径、树高、单株材积性状方面环境因子中年均温的相对重要性最大, 东西冠幅、南北冠幅性状纬度相对重要性最大。(4) 各试验点入选优良家系的单株材积性状平均现实增益为 13.91%~25.45%、遗传增益为 7.92%~16.35%, 增益效果明显; 玉林与柳州试验点共有优良家系为 23 和 28 号家系, 玉林和南宁试验点共有优良家系为 32 号家系, 柳州和南宁试验点共有优良家系为 5 号家系。红锥半同胞家系生长性状在家系间变异丰富, 基因型和环境互作效应极显著影响红锥的生长, 综合筛选出的优良家系可为遗传改良、良种选育和生产实践提供极佳的种质资料。红锥优良家系筛选和示范推广过程中, 可充分考虑环境、基因型与环境互作效应, 因地制宜的选择与当地环境条件良好耦合的家系。

5.5 year old *Castanopsis hystrix* half-sib family and selection of good family

Kong Le^{1,2} Tan Zhangqiang² Teng Weichao¹

(1. Academy of Forestry, Guangxi University Nanning 530002; 2. Guangxi Academy of Forestry Sciences Nanning 530002)

Abstract: In order to explore the growth and variation rules of half-sib progeny of *Castanopsis hystrix* screen the excellent families, and provide reference for genetic improvement, breeding and forestry production practice of the precious fast growing native tree *Castanopsis hystrix*. 33 half-sib lineages from 3 experimental sites (Yulin, Liuzhou and Nanning) were selected as the research objects. The variation and genetic parameters of growth traits (DBH, tree height, east-west crown width, north-south crown width, tree volume per plant) were analyzed, and the

interaction pattern between genotype and environment was analyzed and the influence of environmental factors on growth traits of *Castanopsis hystrix* was quantified. By estimating the best linear unbiased prediction (BLUP) value of the growth traits of each line at each test site, and combining with the factor analysis of principal component analysis, the excellent families were selected. (1) The growth traits of *Castanopsis hystrix* half-sib families were significantly differentiated. The Nanning half-sib families had advantages in DBH, tree height and individual tree volume, while the Liuzhou test site had advantages in east-west crown width and north-south crown width. (2) There were significant differences in location, block group, family and their interactions in single and multi-point ANOVA; The estimated genetic parameters showed that family heritability was greater than single plant heritability, and the coefficient of variation between families was greater than the average coefficient of variation within families, indicating that all growth traits were subject to high degree of genetic control, and the variation of growth traits was mainly inter-family variation, which was suitable for family selection. There was significant correlation between different traits in the family. (3) There were interaction effects between genotype and environment in growth traits, and the interaction patterns included B and D patterns, and the interaction was complex; Environmental factors significantly affected the growth of *Castanopsis hystrix*, among which tree height, tree height and tree volume per plant were significantly correlated with environmental factors. The relative importance of the environmental factors in diameter at breast height, tree height and tree volume per plant was the greatest, and the relative importance of latitude in east-west crown width and north-south crown width was the greatest. (4) The average practical gain and genetic gain of individual tree volume traits were 13.91%-25.45% and 7.92%-16.35% respectively, and the gain effect was obvious. The excellent family number 23 and 28 in Yulin and Liuzhou test sites, the excellent family number 32 in Yulin and Nanning test sites, and the excellent family number 5 in Liuzhou and Nanning test sites. There is abundant variation in growth traits of *Castanopsis hystrix* half-sib families among families, and the interaction between genotype and environment has a very significant effect on the growth of *Castanopsis hystrix*. The comprehensive selection of excellent families can provide excellent germplasm for genetic improvement, breeding and production practice. In the process of screening and demonstration, the interaction effect of environment, genotype and environment can be fully considered, and the families with good coupling with local environmental conditions can be selected according to local conditions.