

新疆核桃重要种质坚果表型多样性及其相关关系分析

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摘要:【目的】以新疆核桃重要品种、农家类型和优良单株为对象,研究其表型丰富度和变异特点,为挖掘优异种质、提高核桃种质资源利用效率提供理论依据。【方法】以24份新疆核桃重要种质的坚果为材料,测定其16个描述性状和8个数量性状,计算这些重要经济性状的变异系数、Simpson多样性指数、Shannon-weaver多样性指数和欧氏距离,采用类平均法(UPGMA)进行聚类分析,并进行差异显著性检验与相关性分析。同时,采用主成分分析的方法进行鉴定和综合评价。【结果】(1)供试新疆核桃种质资源的24个坚果表型具有丰富的遗传多样性,16个描述性性状的Simpson多样性指数为0.9595~0.9822、Shannon指数为4.4316~4.5789,处于较高水平,8个坚果数量性状的变异系数为7.71%~22.64%,其中,变异程度最大的是平均单果重,变异程度最小的是横径。(2)纵径与横径、三径均值、果形指数、平均单果重极显著正相关,与侧径和壳厚显著正相关,但与出仁率显著负相关。果形指数和平均单果重与出仁率显著负相关,而平均单果重与壳厚呈极显著正相关,壳厚与出仁率呈极显著负相关。(3)坚果表型数量性状频率分布存在一定差异,其中,纵径集中在37.68 mm~41.84 mm,横径集中在32.25 mm~34.55 mm,侧径集中在32.01 mm~37.00 mm,三径均值大多为33.53 mm~39.38 mm,果形指数在1.12~1.21和1.30~1.40两个区间较多,平均单果重多为13.43 g~16.64 g,核壳厚度以1.16 mm~1.61 mm居多,出仁率则集中在49.50%以下。(4)主成分分析确定了7类影响因子,前7个主成分反映了24个性状的全部信息,累计贡献率达86.23%,反映了育种选择方向及潜力。基于各种质间坚果形态性状的差异,将24份核桃种质划分为5大类群,各类种质群间差异明显。(5)‘新光’‘扎露仁’‘扎210’“和田22-5”“和田23-1”和‘新温179’等的坚果均匀度和一致度表现较好。【结论】新疆核桃种质资源坚果表型变异较为丰富,研究为品种遗传改良和新品种选育提供了有益参考和基础数据。基于坚果重要性状变异系数和频度分析的种质类群划分方法,可应用于核桃定向育种中的亲本材料筛选,使亲本间优良性状的搭配更优化。

关键词: 核桃; 种质资源; 品种; 表型多样性

基金项目: 国家科技基础资源调查专项子课题(2019FY100801_02); 核桃产业国家创新联盟(NAWI)

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Morphological Diversity and Correlativity Analysis of Nut Traits of Important Walnut Germplasm Resources from Xinjiang Province

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Abstract: **【Objective】** The aim of this study was to investigate to study the phenotypic richness and variation characteristics of important Xinjiang walnut varieties, landraces and superior individuals, so as to provide a theoretical basis for excavating excellent germplasm and improving the utilization efficiency of walnut germplasm resources. **【Method】** The nuts of 24 Xinjiang walnut germplasm resources were used to determine 16 descriptive traits and 8 quantitative traits. The coefficients of variation, Simpson diversity index, Shannon-weaver diversity index and Euclidean distance of these economically important traits were calculated. Cluster analysis was carried out using the class average method (UPGMA). Principal component analysis (PCA) was used for identification and comprehensive evaluation. **【Result】** (1) The 24 nut phenotypes of Xinjiang walnut germplasm resources tested indicated a relatively high level of genetic diversity, with Simpson's diversity indexes of 0.9595-0.9822 and Shannon's indexes of 4.4316-4.5789 for 16 descriptive traits, while coefficients of variation ranged 7.71%-22.64% for 8 quantitative traits. Among them, the greatest degree of variation was in the average single fruit weight, and the smallest degree of variation was in the transverse diameter. (2) Longitudinal diameter was significantly positively correlated with transverse diameter, mean of the three diameters, fruit shape index and mean fruit weight, and significantly positively correlated with lateral diameter and shell thickness, but significantly negatively correlated with kernel yield. Fruit shape index and average fruit weight were significantly negatively correlated with kernel yield, while average fruit weight was highly significantly positively correlated with shell thickness and shell thickness was highly significantly negatively correlated with kernel yield. (3) There were some differences in the frequency distribution of the quantitative traits of the nut phenotype, in which the longitudinal diameter was concentrated in the range of 37.68 mm to 41.84 mm, the transverse diameter in the range of 32.25 mm to 34.55 mm, and the lateral diameter in the range of 32.01 mm to 37.00 mm, with the mean values of the three diameters mostly ranging from 33.53 mm to 39.38 mm. ~The average fruit weight was mostly 13.43 g to 16.64 g, the shell thickness was mostly 1.16 mm~1.61 mm, and the kernel yield was concentrated below 49.50%. (4) The principal component analysis (PCA) identified 7 categories of influencing factors, and the 1st 7 principal components represented a cumulative contribution of 86.23%. Based on the differences in nut morphological traits among the germplasm, the 24 walnut germplasm were divided into 5 major groups, with obvious differences among the various germplasm groups. (5) The nut uniformity and consistency of 'Xinguang', 'Zhaluren', 'Zha 210', "Hotan 22-5", "Hotan 23-1" and 'Xinwen 179' performed better. **【Conclusion】** The nut phenotypic variation of Xinjiang walnut germplasm resources was relatively rich, and the study provided useful references and basic data for variety genetic improvement and new variety selection. The germplasm classification method based on the coefficient of variation and frequency analysis of important nut traits can be applied to the selection of parental materials in walnut directional breeding.

Key words: walnut; germplasm resources; cultivar; morphological diversity.