

Potential and predictive model of inferring biodiesel from leaf phenotypic traits in yellowhorn

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ABSTRACT: In the realm of crop improvement, it is commonly employed the strategy of indirect selection, which relies on the identification of germplasm exhibiting favorable agronomic traits through their correlation with other intuitive traits. The plant yellowhorn (*Xanthoceras sorbifolia* bunge) is an ideal oil woody species for the production of biodiesel due to the high composition of oleic acid (C18:1) and linoleic acid (C18:2). Nevertheless, the knowledge about the correlation between the biodiesel characteristics and agronomic traits in yellowhorn remains to be elucidated. In this study, the leaf morphological structure, biodiesel characteristics and fatty acid composition of 206 yellowhorn germplasm resources were measured and calculated. The coefficients of variation for 25 leaf quality traits, 8 biodiesel characterization indexes, and 13 fatty acids composition of yellowhorn exhibited a ranged of -2.91 % ~1591.61 %, -0.11 % ~ 0.10 % and 2.89 % ~ 19.54 %, respectively. The correlation analysis showed that SPAD, FN, LRWC, LSI, $\delta^{15}\text{N}$ and W/L showed stronger correlations with the biodiesel characterization indexes of yellowhorn, making them valuable indicators for assessing the relationship between leaf traits and biodiesel. Meanwhile, SPAD, LRWC, SLW, $\delta^{13}\text{C}$ and FN (leaf photosynthetic index) also exhibited advantage significant associations with the majority of fatty acids. Finally, the key attributes of biodiesel (CN, IV, OS, and CFPP) were utilized as a foundation for constructing a prediction diagram for biodiesel characteristics, with the five primary leaf indicators (SPAD, FN, LRWC, LSI and W/L) serving as the vertices. This study provided valuable insights into the prediction of intricate biodiesel traits using easily measurable leaf traits.

基于叶片表型特征的文冠果生物柴油品质预测模型

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摘要: 在作物改良方面, 通常采用间接选择策略, 即通过与其他性状的相关性来鉴定优势农艺性状的种质。文冠果 (*Xanthoceras sorbifolia* bunge) 种子富含油酸 (C18:1) 和亚油酸 (C18:2), 是生产生物柴油的理想油料资源。然而, 文冠果生物柴油特性与农艺性状之间的关系尚不清楚。本研究对 206 份文冠果

种质资源的叶片性状指标、生物柴油特性和脂肪酸组成进行了测定和计算。文冠果 25 个叶片质量性状、8 个生物柴油表征指标和 13 个脂肪酸组成的变异系数分别为- 2.91% ~ 1591.61%、- 0.11% ~ 0.10%和 2.89% ~ 19.54%。相关性分析表明, SPAD、FN、LRWC、LSI、 $\delta^{15}\text{N}$ 和 W/L 与文冠果生物柴油特性指标的相关性较强, 可作为评价文冠果叶片性状与生物柴油特性相关性的重要指标。同时, SPAD、LRWC、SLW、 $\delta^{13}\text{C}$ 和 FN (叶片光合指数) 也与大多数脂肪酸表现出极显著的相关性。最后, 以生物柴油的关键特性 C N、IV、OS 和 CFPP 为基础, 以 5 种主要叶片性状指标 SPAD、FN、LRWC、LSI 和 W/L 为支点, 构建生物柴油特性预测图。该研究提供了通过较易检测的叶片性状预测复杂的生物柴油性状的图谱。