

Comprehensive evaluation of foxtail millet varieties based on grey correlation degree, DTOPSIS and situational decision-making method

Yan Guo¹, Xing Shi¹, Shaohua Chai¹, Shuqing Guo¹, Hui Song², Qinghua Yang¹, Jinfeng Gao¹, Xiaoli Gao¹, Baili Feng¹, and Pu Yang^{1,*}

¹ College of Agriculture, Northwest A&F University/State Key Laboratory of Crop Stress Biology in Arid Areas, Yangling 712100, China;

² Institute of Millet Crops, Anyang Academy of Agricultural Sciences, Anyang 455000, China)

Abstract: 【Objective】 Foxtail millet (*Setaria italica* (L.) Beauv.), as a cultivar of the genus Dogwood (*Setaria* Beauv) of the family Gramineae (Gramineae), have significant drought and water conservation and barrenness tolerance and balanced nutritional health effects, and are a strategic reserve crop for drought resistance and a pioneer crop for rural revitalization in China at present. Most of the summer foxtail millet areas in North China belong to the resowing foxtail millet area, which is limited by the biannual cultivation system, the foxtail millet fertility time is short, and many varieties in production still cannot reach the normal maturity requirements. Therefore, screening simple and effective evaluation methods to accurately evaluate the comprehensive traits of existing varieties and recommending a number of new foxtail millet varieties with excellent comprehensive traits is one of the urgent problems to be solved in the production of North China summer foxtail millet area. **【Method】** This study uses the grey correlation degree, DIOPSIS and DIOPSIS respectively. Using the situational decision-making method, the 8 main characters of the 25 new foxtail millet varieties promoted nationwide were evaluated by weighted correlation degree, Ci value and Ki value. **【Result】** The results showed that the top five cultivars according to the grey correlation value were Yugu 18, Changnong 47, Changnong 35, Yugu 35 and Jiugu 23; according to the Ci values of the 25 cultivars, the top five foxtail millet cultivars were Yugu 18, Yugu 18, and Jiugu 23. Jigu 39, Yugu 35, Chaogu 58, Jiugu 23; the top five varieties ranked according to the weighted comprehensive effect ki value of each participating variety are Yugu 18, Jigu 39, Yugu 35, Chaogu 58, Kutani 23. Combining the three decision-making methods, the ranking of 4 varieties including Yugu 18, Yugu 35, Jigu 39 and Jiugu 23 is basically the same, and the comprehensive evaluation order of other varieties is different. All three evaluation methods can objectively evaluate the comprehensive and excellent characteristics of foxtail millet varieties, but the grey situation decision method is simple, accurate and easy to operate. **【Conclusion】** According to the agronomic characters and yield characters of each cultivar, the suitable high-yielding cultivars in the summer valley area of North China were preliminarily screened as Yugu 18, Yugu 35, Jigu 39 and Jiugu 23. The gray situation decision method has a simple calculation process and better results among the three methods.