

Sowing Date Regulates the Growth and Yield of Broomcorn Millet (*Panicum miliaceum* L.): From Two Different Ecological Sites on the Loess Plateau of China

Yan Luo^{1,2} Baili Feng^{1,*}

¹ College of Agronomy, State Key Laboratory of Crop Stress Biology in Arid Areas, Northwest A & F University, Yangling, Shaanxi 712100, PR China

² College of Life Science, Yulin University, Yulin, Shaanxi 719000, PR China

Abstract: 【 Objective 】 In order to investigate the relationship between sowing date and millets photosynthesis, fluorescence, yield and seed size with meteorological factors in different ecological sites.

【 Method 】 Four millet varieties of Shaanmei No. 1 (V1), Yumei No. 2 (V2), Black mei (V3) and Jinshu No. 5 (V4) were used to design 4 (Yulin, single cropping in spring sowing area)/3 (Baoji, summer sowing area replanting) sowing dates, record the light, temperature and water conditions during each growth period, and measure the photosynthesis and fluorescence effects of flag leaves, and analyze the agronomic traits, yield and grain size, and compare the effects of sowing dates on broomcorn millet growth and development in different ecological sites and the key meteorological factors that affect them. **【 Result 】** Sowing dates had significant effects on the leaf net photosynthesis (Pn) and chlorophyll fluorescence and multivariate analysis showed that the effects of variety, sowing date, measuring stage and their interactions were significant in both sites. The days from seeding to maturity were strongly decreased (6–35 d) and the ratios of reproductive growth to vegetative growth were increased in V2 and V4 and decreased in V1 and V3 in Baoji and increased in all varieties in Yulin. The highest yield was Jinshu 5 in Baoji and Shaanmei 1 in Yulin, and the total average yield of Yulin (2408.3 kg ha⁻¹) was higher than that of Baoji (1385.2 kg ha⁻¹) and the average yield was reduced by 12.4% and 27.2% compared to BJ1 in Baoji and 15.5%, 3.6% and 12.7% compared to YL1 in Yulin. Correlation analysis showed that the key meteorological factors which limit the growth and yield of broomcorn millet were different for the two sites. The optimal yield combinations were V1 (May 10), V2 (June 10), V3 (June 25) and V4 (June 25) in Yulin, and were V1 (June 4), V2 (June 14), V3 (June 4) and V4 (June 14) in Baoji, respectively. Moreover, linear fitting analysis indicated that the accumulated temperature and the number of growth days in the reproductive growth stage ($R^2 = 0.5306$ and 0.5139) and accumulated temperature during the whole growth period ($R^2 = 0.4323$) were the top three factors affecting the yield in Baoji and precipitation ($R^2 = 0.386$) affected the yield in Yulin. Overall, the results of this study determined that the varieties of broomcorn millet with a short growth period should have delayed sowing, while those with a longer growth period are suitable for early sowing in the

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Yan Luo, E-mail: 1994lyyl@nwfafu.edu.cn;

Baili Feng, E-mail: fengbaili@nwfafu.edu.cn

semi-arid area.