

保水剂用量对小麦不同生育期根系生理特性的影响

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Effects of different application rates of water-retaining agent on root physiological characteristics of winter wheat at its different growth stages.

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- 摘要
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摘要

在河南禹州试验基地进行田间试验,研究了保水剂不同施用量(0、30、60、90 kg·hm⁻²)对两个冬小麦品种(郑麦9694和矮抗58)根系生理生化特征、生物量及产量的影响,以探明保水剂对不同生育阶段冬小麦根系的作用机理.结果表明:施用保水剂降低了冬小麦根系质膜透性和可溶性糖含量,提高了根系活力.在各生育期,郑麦9694根系质膜透性降低幅度均大于矮抗58;除90 kg·hm⁻²处理外,矮抗58的根系活力均显著大于郑麦9694.在孕穗期和灌浆期,郑麦9694的可溶性糖含量降低幅度显著大于矮抗58.在各生育期内,60 kg·hm⁻²处理的两品种质膜透性和可溶性糖含量均最小,90 kg·hm⁻²与60 kg·hm⁻²处理差异不显著.随保水剂用量的增加,郑麦9694的根系活力显著提高,而矮抗58在60 kg·hm⁻²处理下最高.施用保水剂还提高了小麦根系生物量,在拔节期和孕穗期,矮抗58的根系生物量大于郑麦9694;而在灌浆期,矮抗58在60 kg·hm⁻²和90 kg·hm⁻²处理下根系生物量显著低于郑麦9694.郑麦9694和矮抗58产量均以60 kg·hm⁻²处理增幅最高.综上,保水剂对郑麦9694的作用效果较矮抗58显著,并以60 kg·hm⁻²施用量为佳.

关键词: 保水剂 冬小麦 根系 生理特征 生物量

Abstract:

A field experiment was conducted at the Yuzhou Experimental Base of Henan Province to study the effects of different application rates (0, 30, 60, and 90 kg·hm⁻²) of water-retaining agent (WRA) on the root physiological characteristics, biomass, and grain yield of two winter wheat cultivars Zhengmai-9694 and Aikang-58, aimed to probe into the action mechanisms of WRA on the root system of winter wheat at its different growth stages. The application of WRA decreased the root membrane permeability and soluble sugar content, and increased the root vigor. After the application of WRA, the Zhengmai-9694 at its different growth stages had a greater decrement of root membrane permeability, compared with Aikang-58. In all treatments except 90 kg·hm⁻² of WRA, the root vigor of Aikang-58 was obviously higher than that of Zhengmai-9694. At booting and grain-filling stages, the root soluble sugar content of Zhengmai-9694 decreased much more than that of Aikang-58. In the whole growth period of the two cultivars, their root membrane permeability and soluble sugar content were the lowest in treatment 60 kg·hm⁻² of WRA, and no significant differences were observed between treatments 60 and 90 kg·hm⁻² of WRA. The root vigor of Zhengmai-9694 increased remarkably with the increasing rate of WRA application, while that of Aikang-58 was the highest in treatment 60 kg·hm⁻² of WRA. The application of WRA also increased root biomass, and at jointing and booting stages, the root biomass of Aikang-58 was much higher than that of Zhengmai-9694. However, at grain-filling stage, the biomass of Aikang-58 in treatments 60 and 90 kg·hm⁻² of WRA was lower than that of Zhengmai-9694. Treatment 60 kg·hm⁻² of WRA had the highest grain yield of the two cultivars. It was concluded that WRA had more significant effects on Zhengmai-9694 than on Aikang-58, and applying 60 kg·hm⁻² of WRA could obtain the best effect.

Key words: water-retaining agent winter wheat root physiological characteristics biomass

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