

石羊河流域武威绿洲春玉米水氮耦合效应

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Coupling effect of water and nitrogen on spring maize in Wuwei Oasis of Shiyang River Basin, Northwest China.

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摘要

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摘要

为探讨西北旱区春玉米最佳的水氮耦合模式,在甘肃石羊河流域武威绿洲边缘进行田间正交试验,研究不同生育阶段水量分配及施氮量对春玉米群体产量和水氮利用的影响.结果表明:石羊河流域武威绿洲春玉米籽粒产量随施氮量的增加而增加;施氮量为300 kg·hm⁻²、拔节期灌水136 mm时的籽粒产量最大.籽粒灌溉水利用效率随灌水量的增加而降低;全生育期灌水340 mm时增施氮肥可使籽粒产量和籽粒灌溉水利用效率同时提高;施氮量为300 kg·hm⁻²、苗期和灌浆期分别灌水34 mm时籽粒灌溉水利用效率最大.各因素对玉米植株全氮累积总量的影响由大到小依次为:施氮量、拔节期灌水、苗期灌水、灌浆期灌水和抽穗期灌水.石羊河流域武威绿洲春玉米水氮耦合最佳模式为:施氮量300 kg·hm⁻²,苗期、拔节期、抽穗期和灌浆期分别灌水34、136、68和102 mm.

关键词: 春玉米 水氮耦合效应 节水灌溉 石羊河流域武威绿洲

Abstract:

To explore the optimal supply model of water and nitrogen for spring maize under limited irrigation in arid Northwest China, a field experiment with orthogonal design was conducted in the Wuwei Oasis region margin of Shiyang River Basin to study the effects of irrigation amount at different growth stages and the nitrogen application rate on the group yield and the water and nitrogen utilization of spring maize. With the increase of nitrogen application rate, the grain yield of spring maize increased, and the highest grain yield was obtained when the nitrogen application rate was 300 kg·hm⁻² and the irrigation amount at jointing stage was 136 mm. The grain irrigation water use efficiency (GIWUE) decreased with increasing irrigation amount. When the irrigation amount in whole growth period was 340 mm, the grain yield and GIWUE were improved simultaneously with increasing nitrogen application rate. The GIWUE reached the maximum when the nitrogen application rate was 300 kg·hm⁻² and the irrigation amount at seedling and grain filling stages was 34 mm, respectively. The effects of nitrogen application and irrigation on the nitrogen accumulation in the whole plant decreased in the order of nitrogen application rate, irrigation at jointing stage, irrigation at seedling stage, irrigation at grain filling stage, and irrigation at heading stage. The optimal supply model of water and nitrogen for spring maize in Wuwei Oasis was 300 kg·hm⁻² of nitrogen application plus 34, 136, 68 and 102 mm of irrigation at seedling, jointing, heading and grain-filling stages, respectively.

Key words: spring maize coupling effect of water and nitrogen saving water irrigation Wuwei Oasis of Shiyang River Basin.

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