

不同模拟雨量下耕作措施对夏玉米水分利用效率和产量的影响

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Effects of tillage mode on water use efficiency and yield of summer maize under different simulated rainfalls.

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摘要

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摘要

基于西北夏玉米生产实际和降雨特征,用自制模拟降雨器,于2010年6—9月研究了250、350和450 mm模拟雨量下翻耕、免耕、免耕覆盖对夏玉米农田水分利用效率及产量的影响。结果表明:在6—9月250 mm雨量下免耕水分利用效率比翻耕高26%,产量比翻耕高16.5%;350 mm雨量下免耕水分利用效率和产量分别比翻耕高17.6%和6.1%;在450 mm雨量下免耕的蓄水效应低于翻耕,水分利用效率比翻耕低1.1%,产量比翻耕低0.6%。免耕覆盖克服了免耕在雨量充沛时水分蓄积量低于翻耕的缺点,在3种雨量下均可有效抑制棵间蒸发,减少翻耕地表裸露造成的无效水分消耗,增加土层贮水量,增大蒸腾量占水分消耗的比例,250 mm雨量下免耕覆盖水分利用效率比翻耕高48.6%,产量比翻耕高32.9%;350 mm雨量下免耕覆盖水分利用效率比翻耕高51.6%,产量比翻耕高27.1%;450 mm雨量下免耕覆盖水分利用效率比翻耕高23.7%,产量比翻耕高13.1%。综上,免耕夏玉米在250和350 mm雨量下相对于翻耕有增产和提高水分利用效率的优势,免耕覆盖夏玉米在250、450 mm雨量下产量和水分利用效率显著高于翻耕。

关键词: 模拟雨量 保护性耕作 夏玉米 水分利用效率 产量

Abstract:

Based on the tillage practices of summer maize and the rainfall pattern in Northwest China, and by using self-made simulated rainfall device, a field experiment was conducted on the effects of plowing, no-tillage, and no-tillage plus mulching on the water use efficiency (WUE) and yield of summer maize under rainfalls 250, 350 and 450 mm from June to September, 2010. Compared with plowing, no-tillage increased the WUE and yield under rainfall 250 mm by 26% and 16.5% and under rainfall 350 mm by 17.6% and 6.1%, respectively. Under rainfall 450 mm, the water storage was smaller in treatment no-tillage than in treatment plowing, and the WUE and yield in treatment no-tillage were 1.1% and 0.6% lower than those in treatment plowing, respectively. No-tillage plus mulching overcame the disadvantage of no-tillage in lesser water-storing under sufficient rainfall than plowing. Under the three rainfalls, no-tillage plus mulching could effectively inhibit the soil evaporation between plants, decrease the invalid water consumption of bare soil, and increase the soil water storage and the rate of evapotranspiration to water consumption. Compared with plowing, no-tillage plus mulching increased the WUE and yield under rainfall 250 mm by 48.6% and 32.9%, under rainfall 350 mm by 51.6% and 27.1%, and under 450 mm rainfall by 23.7% and 13.1%, respectively. In sum, relative to plowing, no tillage showed its superiority in increasing WUE and yield under rainfalls 250 and 350 mm, whereas no-tillage plus mulching increased the WUE and yield significantly under rainfalls 250 and 450 mm.

Key words: simulated rainfall conservation tillage summer maize water use efficiency yield.

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