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水氮耦合对膜下滴灌马铃薯产量、品质及水分利用的影响

Coupling effects of water and nitrogen on yield, quality and water use of potato with drip irrigation under plastic film mulch

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中文关键词：水质,氮,灌溉,膜下滴灌,水氮耦合,马铃薯,块茎品质,产量,水分利用效率

英文关键词:water quality nitrogen irrigation drip irrigation under mulch water and nitrogen coupling potato tuber quality yield water use efficiency

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作者	单位
宋 娜	中国农业大学水利与土木工程学院，北京 100083
王凤新	中国农业大学水利与土木工程学院，北京 100083
杨晨飞	中国农业大学水利与土木工程学院，北京 100083
杨开静	中国农业大学水利与土木工程学院，北京 100083

中文摘要:

该文通过田间试验，研究在西北旱区对膜下滴灌条件下水氮耦合效应及其对马铃薯产量、品质和水分利用效率的影响，从而确定马铃薯适宜的水氮用量，以求达到节水、节肥和高产优质的目的。试验设置2个土壤湿润比水平：40%（P1）和70%（P2），5个施氮水平：90（N1）、135（N2）、180（N3）、225（N4）、270 kg/hm2（N5），共10个处理。试验结果表明：相同水分条件下，马铃薯块茎质量、块茎淀粉含量、块茎维生素C含量、耗水量、产量和水分利用效率都随施氮量的增加而呈抛物线趋势变化，块茎蛋白质含量随施氮量的增加呈增加趋势。相同氮肥条件下，湿润比P2处理的马铃薯块茎质量、块茎淀粉含量、块茎维生素C含量、块茎蛋白质含量均高于湿润比P1，湿润比P2处理的耗水量比湿润比处理P1高11%，湿润比P2处理的产量比湿润比处理P1高5%，但是湿润比P1处理的水分利用效率比湿润比P2处理高5.4%。其中，P2N3处理的马铃薯单株块茎质量、块茎维生素C含量表现最好，P1N5处理的马铃薯块茎蛋白质含量最高，P2N2处理的马铃薯块茎淀粉含量和产量表现最优，产量最高为54 187 kg/hm2，P1N2处理的水分利用效率最高为12.86 kg/m3。P2N3处理的马铃薯高产优质，且水分利用效率较高，是西北旱区膜下滴灌条件下马铃薯生产中适宜的水氮组合。

英文摘要:

Abstract: In order to find out the best combination of water and nitrogen in the production of potato and to achieve the goal of saving water and fertilizer and maintaining high yield and good quality, we carried out a field experiment. The experiment was conducted to study the coupling effects of water and nitrogen on potato yield, quality and water use efficiency under drip irrigation with plastic film mulch in an arid area of Northwest China. There were ten treatments, including two soil wetting proportion levels (P1-40%, P2-70%) and five nitrogen levels (N1-90 kg/hm2, N2-135 kg/hm2, N3-180 kg/hm2, N4-225 kg/hm2, N5-270 kg/hm2). The results indicated that the weight of potato tuber, starch content of tuber and vitamin C content of tuber showed the parabolic changing tendency with the rise of nitrogen application rate for the same water level. Protein content of potato tuber ascended with the rise of nitrogen application rate. All of above showed the significant difference in different treatments. Potato tuber quality of P2 soil wetting proportion treatments was higher than that of P1 soil wetting proportion treatments with the same nitrogen amount. Yield, evapotranspiration and water use efficiency of potato showed the parabolic changing tendency with the rise of nitrogen application rate for the same water. Tuber yield of P2 soil wetting proportion treatments were 5% higher than those of P1 soil wetting proportion treatments. The yield showed the significant difference in different treatments. Evapotranspiration of the P2 soil wetting proportion treatments were 11% higher than those of P1 soil wetting proportion treatments. Water use efficiency of P1 soil wetting proportion treatments were 5.4% higher than those of P2 soil wetting proportion treatments. The tuber weight per plant and vitamin C content of potato tuber of P2N3 treatment and the starch content of tuber of P2N2 treatment had the best performance. The protein content of potato tuber of P1N5 treatment was the highest. Considering the quality indicators of the potato tuber, the quality of potato tuber of P2N3 treatment had the best performance. Treatment P2N2 had the highest yield in all treatments, amounting to 54 187 kg/hm2. Treatment P1N2 had the highest water use efficiency of 12.86 kg/m3. In consideration of the comprehensive performance of the yield, tuber quality and water use efficiency, treatment P2N3 are recommended as the best combination of water and nitrogen in the production of potato under drip irrigation with plastic film mulch in such an arid area of Northwest China.

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