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滴灌施肥对大棚西瓜生长、产量及品质的影响

Effects of drip fertigation on growth, yield and quality of watermelon in plastic greenhouse

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中文关键词: [灌溉](#) [肥料](#) [品质控制](#) [西瓜](#) [塑料大棚](#) [光合作用](#) [产量](#) [灌溉水分利用效率](#)

英文关键词: [irrigation](#) [fertilizers](#) [quality control](#) [watermelon](#) [plastic greenhouse](#) [photosynthesis](#) [yield](#) [irrigation water use efficiency](#)

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中文摘要:

该文从优质高产、高效和节水节肥的三重目标出发,通过大田试验,研究在西北旱区对大棚膜下滴灌施肥条件下不同生育时期水肥组合对西瓜生长、产量、灌溉水分利用效率和果实品质的影响,从而确定西瓜适宜滴灌施肥的水肥用量。试验设置3个灌溉量水平:450 m³/hm²(W1)、900 m³/hm²(W2)、1350 m³/hm²(W3),3个施肥水平:N 81.53 kg/hm²+P2O₅ 33.43 kg/hm²+K₂O 101.09 kg/hm²(F1),N 163.05 kg/hm²+P2O₅ 66.85 kg/hm²+K₂O 202.18 kg/hm²(F2),N 244.58 kg/hm²+P2O₅ 100.28 kg/hm²+K₂O 303.27 kg/hm²(F3),共9个处理。结果表明:在相同肥料处理条件下,提高灌水量有利于西瓜株高生长,但茎粗减小,发生徒长。F2W2处理能使西瓜叶片叶绿素含量在各个生育期保持较高水平。在西瓜苗期,增加水肥用量的F3W3处理提高了西瓜叶片净光合速率和蒸腾速率,但与F2W2处理差异不显著。坐果期后,F2W2处理的西瓜光合能力较强,获得了较高的产量和水分利用效率,较提高灌水量和施肥量的F3W3处理增产3.6%,灌溉水分利用效率(irrigation water use efficiency, iWUE)提高35.73%。在果实品质方面,F2W2处理的西瓜中、边可溶性固形物、可溶性蛋白质和番茄红素等质量分数表现最好,F2W1处理的西瓜可溶性总糖质量分数最高,F3W2处理的西瓜总维生素C质量分数最高,但与F2W2处理差异不显著,且F2W2处理西瓜产生最佳的糖酸比,口感极佳。综合分析表明,F2W2处理的西瓜生长健壮,光合作用强,优质高产,且水分利用效率较高,是利于西北旱作膜下滴灌条件下西瓜生产中适宜的水肥组合。

英文摘要:

Abstract: This study was to set up a new model for good quality and high yield evaluation of water-saving watermelon cultivation in the arid regions of northwest China. The coupling effects of water and fertilizers on plant growth, yield and fruit quality of watermelon under plastic film mulch using drip irrigation were studied in a field experiment. Nine treatments were designed including three irrigation amount levels (W1, 450 m³/hm²; W2, 900 m³/hm²; and W3, 1350 m³/hm²) and three fertilizer levels (F1, N 81.53 kg/hm²+P2O₅ 33.43 kg/hm²+K₂O 101.09 kg/hm²; F2, N 163.05 kg/hm²+P2O₅ 66.85 kg/hm²+K₂O 202.18 kg/hm²; and F3, N 244.58 kg/hm²+P2O₅ 100.28 kg/hm²+K₂O 303.27 kg/hm²). The results indicated that at the same fertilizer level, plant height increased but stem diameter decreased with increasing irrigation quantity. Compared with the other treatments, F2W2 showed much higher chlorophyll content in each growth stage. In the seedling stage, treatments with increased supplying of water and fertilizer gave rise to increases in leaf net photosynthetic rate and transpiration rate, and the net photosynthetic rate and transpiration rate in leaf were not significantly different between F2W2 and the other treatments. After the flowering stage, F2W2 treatment revealed a relatively high photosynthesis (with no significant difference with F3W3) in leaves, leading to the highest fruit yield (which was 3.6% higher than F3W3) and the highest water use efficiency (35.73% higher than F3W3) at the end of the experiment. For the fruit quality, F2W1 treatment and F3W2 treatment showed the highest soluble sugar content and total vitamin C content (but no significant difference with F2W2), respectively. The F2W2 treatment revealed the best performance with high content of total soluble solids (TSS), soluble protein and lycopene in fruits as well as good sugar acid ratio and excellent taste. The supply of water and fertilizer in the F2W2 treatment could meet needs for the watermelon growth, making plant grow strongly (with high photosynthesis capability in leaves and good quality as well as high yield in fruits) by economical irrigation water use efficiency. So, the F2W2 treatment was recommended as the best combination of water and fertilizer for the production of watermelon under drip irrigation and plastic film mulch in the arid area of northwest China.

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