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## 滴灌模式对棉花根系分布和水分利用效率的影响

### Effects of drip irrigation strategy on cotton root distribution and water use efficiency

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中文摘要:

理解膜下滴灌参数对土壤盐分运移和作物生长的影响是制定科学滴灌制度、合理利用水资源的重要环节。毛管布置方式和滴灌水质是膜下滴灌的重要参数,为研究其对土壤盐分变化、棉花根系分布及水分利用效率的影响,设计了2种毛管布置方式(一管四行(Ms)和一管两行(Md))和3个滴灌水质水平(淡水0.24 dS/m、微咸水4.68 dS/m、咸水7.42 dS/m)。结果表明,滴管布置方式对土壤盐分变化和根系分布有显著影响。在相同滴灌水质条件下,Ms处理有利于降低棉花根区土壤含盐量。所有处理根系主要分布于0~40 cm土层内,矿质水滴灌时Md中根系受抑制程度明显高于Ms,但其主要影响根系密度 $\delta R > 0.5 \text{ kg/m}^3$ 区域的分布范围,对 $\delta R > 0.2 \text{ kg/m}^3$ 区域范围分布无明显影响。生育期内棉花总耗水量随滴灌水矿化度的上升而降低,与滴管布置无关。相对淡水滴灌而言,矿质水滴灌时Ms处理产量有所降低,但其水分利用效率随灌水矿化度上升而升高;而Md处理产量和水分利用效率均随灌水矿化度上升而下降。

英文摘要:

The effects of different drip irrigation parameters on crop growth and transportation of soil water and salinity are important for designing scientific irrigation strategies and rational utilization of water resources in arid area. Drip tape arrangement and irrigation water quality are two important factors of mulched drip irrigation. In order to investigate their influences on distribution of soil salinity and roots, and water use efficiency, field experiment was conducted in the north of Xinjiang in 2010. Two drip tape arrangements (a tap for four lines, Ms; a tap for two lines, Md) and three levels of irrigation water quality (0.24 dS/m, 4.68 dS/m, 7.42 dS/m) were designed. The results showed that drip tape arrangement played an important role in change of soil salinity and cotton roots distribution. Under the same condition of water quality, Ms reduced the salinity accumulation in root zone, and lower salinity concentration was observed in 0~40 cm soil layer of Ms treatment than that in Md treatment. Cotton roots mainly distributed in 0~40 cm layer in all the treatments. Stronger stress on cotton root growth was observed in Md treatment than in Ms treatment under irrigated with the same saline water. However, the saline water only affected the distribution area where the cotton root density was higher than 0.5 kg/m<sup>3</sup>. The cotton water consumption appeared no significant relationship with the drip tape arrangement under the same irrigation amount, and decreased with the increase of irrigation salinity. Moreover, the saline water reduced the cotton yield but improved the water use efficiency (WUE); saline water irrigation reduced both the WUE and cotton yield in Md.

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