DEFINING OPTIMAL IRRIGATION STRATEGIES FOR COTTON USING SUB-SURFACE DRIP AND OVERHEAD IRRIGATION SYSTEMS IN GEORGIA

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Abstract

Population growth and episodic droughts have substantially increased the demand of groundwater resources in the state of Georgia. Additionally, improved efficiency is needed in order to maintain or increase current usage of irrigation. A series of experiments were conducted during 2011 at Stripling Irrigation Research Park near Camilla, GA to investigate the response of two common cotton varieties {Deltapine 1050 B2RF® (late maturing, less sensitive to water stress) and FiberMax 1740 B2F® (early maturing, more sensitive to water stress)} to various SSDI and OVHD irrigation management strategies. These trials were conducted using a split- block design containing six replications. Treatments included two varieties, OVHD irrigation triggered at Watermark® moisture potential sensors (MPS) at -40cb and -70cb, shallow (2in depth) SSDI triggered at -40cb and -70cb via MPS and checkbook irrigations of 65% and 100% of UGA recommendations, deep (12in depth) SSDI triggered at -40cb and -70cb via MPS and checkbook irrigations of 65% and 100% of UGA recommendations, and a dryland treatment. The results of this experiment show that SSDI had a 19% water savings from overhead with each treatment receiving between 2.4in and 7.3in of irrigation, in addition to 15.3in of rainfall that the area received. Most SSDI and OVHD irrigation treatments resulted in a similar yield response when pooled over varieties. All irrigation treatments resulted in higher yields when compared to the dryland; however there was a reduction in yield associated with the 70cb trigger point in both SSDI and OVHD systems. FiberMax 1740 B2F® resulted in higher yields compared to DP 1050 B2RF® when pooled over all irrigation treatments. When comparing the lint yield responses of shallow and deep SSDI, and OVHD irrigation systems, all systems resulted in higher yields than the dryland treatment. When removing the dryland treatment from the analysis, yields were reduced by the deep SSDI compared to both the OVHD and shallow SSDI systems. Additionally, when the interaction between variety and irrigation system was examined, again with the dryland treatment excluded from the analysis, Deltapine 1050 B2RF® shows no yield response to irrigation system whereas FiberMax 1740 B2F® resulted in higher yields associated with the OVHD and shallow SSDI treatments when compared to that of the deep SSDI treatments. When the interaction between variety and irrigation system is examined with the dryland treatment included in the analysis, there was no response of FiberMax 1740 B2F® to the irrigations systems. However, Deltapine 1050 B2RF® yielded higher when the shallow SSDI was used compared to the OVHD. When the interaction between variety and irrigation system at the -70cb trigger was examined (this interaction at -40cb was non-significant), Deltapine 1050 B2RF® resulted in no yield response to irrigation system however FiberMax 1740 B2F® had higher yields associated with the OVHD system compared to that of the deep SSDI. All irrigation systems and treatments improved yields when compared to dryland, and yields were generally similar between OVHD and SSDI systems. In general, the -70cb trigger allowed for significant stress resulting in yield loss. In some situations, some varieties may respond better to shallow versus deep SSDI. This research shows that SSDI is a viable irrigation system for Georgia however future research should investigate responses of additional varieties and soil types as well as conduct a similar experiment in environments that encounter more stress since 15in of rain fell during the duration of this experiment.