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# Management of surface drip irrigation according to different soil water potential thresholds in a Populus × euramericana "Guariento" plantation

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Fast-growing and high-yielding poplar plantations have been identified as major commercial forests in China. Intensive management of irrigation can greatly increase productivity of plantations. Quantitative investigations on the cumulative effect of drip irrigation over years are quite infrequent. In this study, we quantitatively evaluated the effects of drip irrigation at different soil water potential thresholds on tree growth and productivity in a Populus × euramericana "Guariento" plantation. Treatments include three surface drip irrigation, which were conducted when soil water potential at 20 cm soil depth under the drip emitter reached -75, -50, and -25 kPa (denoted as WP-75, WP-50, and WP-25, respectively), and single furrow irrigation in spring as control. Soil water potential (SWP) and soil water content (SWC) were measured throughout the three-year experiment. Based on tree surveys, tree growth, volume, and biomass production were evaluated each year. SWC within 20 cm soil depth was highly influenced by drip irrigation management. During the periods of April–June and September–November, SWC dynamics varied among the treatments. With increasing level of irrigation, SWC varied with a higher frequency but with smaller amplitude. Due to ample rainfall from July to September every year, the average SWC was much higher than that in other periods under all treatments. In the three growing seasons, the average SWC under all irrigation treatments were much higher than that in the control, with the average SWC under the three levels of drip irrigation being 61–69%, 50–56%, and 27–55% higher than control, respectively. This indicates that higher level of drip irrigation resulted in greater surface soil water availability. Surface drip irrigation resulted in significant higher growth, stem volume, and biomass productions compared with the control. Biomass increments in drip irrigation treated plots were 5–50%, 5–27%, and 4–52% higher than control in the three experimental years, respectively, with WP-25 and WP-50 recording the highest increments. The promoting effects were mainly attributable to increased water availability in the surface soil through the irrigation management.