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Where to monitor the soil-water potential for scheduling drip irrigation in Populus tomentosa plantations located on the North China Plain?

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Determining the optimal tensiometer placement is crucial for scheduling irrigation based on soil water potential (SWP) in poplar plantations. However, such work has never been done. The stand-age effect on the tensiometer placement is still unknown, hindering the development of a dynamic irrigation regime. In a surface drip irrigated *Populus tomentosa*, short-rotation plantation on sandy loam soil, the variation of SWP at different positions [hereafter expressed in spatial coordinates (distance from dripper in cm, depth in cm)] within the soil wetting volume (WV), and the daily tree growth rates were continuously monitored in one growing season. Whereas, the transpiration and fine root distribution were measured in two growing seasons. The HYDRUS model was calibrated using soil water and transpiration data from one growing season and validated using data in another growing season. Then the model was applied to simulate sixty scenarios, which were combinations of different SWP measurement positions (ten scenarios), root distribution patterns (three scenarios; mainly using rooting depth as a proxy for trees at different ages), and irrigation thresholds (two scenarios). Based on the simulation results, we estimated the ratio of actual to potential transpiration (T_a/T_p) and irrigation efficiency (IE; calculated as (T_a/T_p)/irrigation amount) for each scenario. The absolute value of the mean relative difference of SWP was smaller at (15, 10) than at any other positions within the WV. The proportion of variation in growth (R^2=0.294) and transpiration rates (R^2=0.247) explained by root water-uptake was also highest at (15, 10). Fine roots concentrated on both sides of dripper as the trees grew bigger, with the maximal root density finally occurring at about (15, 10) and (-15, 10). Under the (-15, 10), (0, 10), (15, 10) and (0, 30) position scenarios, the T_a/T_p was at a high level relative to other scenarios, while the IE were at a middle level. As rooting depth increased, the ranks of different tensiometer positions in T_a/T_p and IE changed only a little, and T_a/T_p decreased slightly, implying the optimal placement should not vary with stand age. Therefore, tensiometer was recommended to place at 10 cm depth and about 15 cm distance from the dripper to schedule drip irrigation in different-aged *P. tomentosa* plantations on sandy loam soil. This will bring benefits to minimizing the use of irrigation water and maximizing production. Besides, the comprehensive approach used in this study can be adopted, when determining the optimal soil water measurement positions for scheduling irrigation for other plant species growing on other soil types.