Root Water Uptake and Soil Water Profile as Affected by Rooting Depth and Root Clustering. (6073)

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Abstract:

Pattern of belowground plant rooting plays a key role in global water cycle and has great potentials in improving the agricultural and ecosystem managements. Water uptake by density-varying roots at different depths is the primary mechanism controlling the water balance in the field profiles. Based on the field experiments with maize (Zea Mays L.), in this study we investigated effects of plant rooting depth on root water uptake and the resulted changes of soil water profiles. The observations indicate that bulk water uptake rate of the whole plant root system responded to the variation of rooting depth much more pronouncedly when soil was relatively dry than when soil water was sufficient. Root distribution, to a great extent, determined the water balance in the soil profiles. As observed, soil water potentials changed dramatically in daytime for the horizons where root length density was high. Clustering of the plant rooting enhanced the difference of soil water potentials between the horizons. In contrast, this difference turned out to be small when the roots distributed freely in the soil profiles. The study implies that belowground root architecture is very critical to the regulation of soil water use and endurance of plants to the seasonal drought for sustainable biomass productivity.

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