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Deficit Irrigation *Vs*. Alternate Partial Root-Zone Irrigation

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Editorial

In two split-root pot trials, it was discovered that PRI plants had a similar or slightly higher xylem pH than DI plants, which was elevated by 0.2 units. Xylem pH was regulated by nitrate and total ionic concentrations (cation, anions), as well as the proportion of cations, with xylem pH increasing as nitrate and total ionic concentrations decreased and the proportion of cations increased. In most situations, PRI and DI plants had equal xylem ABA concentrations, and a clear relationship between changes in xylem pH and increased xylem ABA concentration was only discovered when the soil water content was low. When soil water content was rather high in the wetted soil compartment, anions, cations, and the sum of ions PRI were higher than in the DI treatment. When the water content in both soil compartments of the PRI pots was very low before the next watering, however, root acquisition of nutrients was inhibited, resulting in lower ion concentrations in the PRI treatment than in the DI treatment. It is therefore critical to keep the soil water content in the wet zone relatively high while keeping the soil water content in the drying soil zone relatively low; both circumstances are necessary to keep the soil and plant water levels high while maintaining ABA signalling in the plants.

Deficit irrigation (DI) and alternative partial root-zone irrigation (PRI) are two water-saving irrigation techniques that are being explored extensively on a variety of crops and fruit trees in many parts of the world. During drought-insensitive growth phases, DI irrigates the entire root zone with an amount of water less than the potential evapotranspiration, and the small stress that develops has minimal influence on the yield. The data from the laboratory split-root experiments were used to develop PRI, which is a refinement of DI. Influencing shoot physiology in drying soil by using plant root-to-shoot chemical pathways. The idea behind PRI is to alternate exposing one section of the root system to soil dryness while irrigating the other to keep the leaves wet. PRI has been shown to save a significant amount of water. In terms of maintaining yield and increasing WUE, as well as increasing carbon (C) and nitrogen (N) contents in plant biomass, PRI outperforms DI. The synthesis of abscisic acid (ABA) in the drying roots and its delivery to the leaves in the xylem stream are thought to play a major role in chemical signalling of soil water status and stomata conductance control.

In this study, the effects of PRI on xylem sap pH, ABA concentration, and ionic concentrations compared to DI treatment at different soil and plant water status were investigated under different soil N availability, namely, achieved by mineral and organic N fertilizations, in order to further exploit the potential of PRI as a management tool in improving crop water and nutrient use efficiencies. However, more research is required to investigate the aforementioned options. Our findings show that in order to optimise the PRI strategy to improve both water and nutrient use efficiencies, the soil water content in the wet zone must be kept relatively high, while the soil water content in the drying soil zone must not be too low; both conditions are necessary to maintain high soil and plant water status while maintaining plant ABA signalling.

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