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IMPACT OF PITCHER MATERIAL AND SALINITY OF WATER USED ON FLOW RATE, WETTING FRONT ADVANCE, SOIL MOISTURE AND SALT DISTRIBUTION IN SOIL IN PITCHER IRRIGATION: A LABORATORY STUDY†

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ABSTRACT

Three types of pitchers made of different materials were used with saline waters of varied concentrations (5, 10, 15 and 20 dS m^{-1}) separately to study the effect on flow rate, wetting front advance, moisture and salt distribution in the wetted zone of soil around pitchers. It was found that the pitcher made of clay and sand yielded the lowest flow rate, ranging from 0.42 to 0.62%, followed by the pitcher made of clay, sand and resin, 0.51–0.69% and the pitcher made of clay, sand and sawdust, 0.91–1.02% .The wetting front advance was highest for the pitcher made of clay, sand and sawdust, followed by the pitcher made of clay, sand and resin, and the pitcher made of clay and sand. The mean soil moisture content around the pitcher made of clay and sand was found to be the minimum and varied from 8.53 to 13.3%, followed by the pitcher made of clay, sand and resin, and the pitcher made of clay, sand and sawdust with 9.56–13.7% and 14.5–20.8%, respectively. In the case of the pitcher made of clay and sand, and the pitcher made of clay, sand and resin, the maximum salt concentration in the soil profile ranged between 1.09 and 3.88 dS m^{-1} and in the pitcher made of clay, sand and sawdust, it ranged from 2.30 to 6.07 dS m^{-1}. The initial salinity of water was found to be substantially reduced around the pitcher made of clay and sand, and the pitcher made of clay, sand and resin in comparison to the pitcher made of clay, sand and sawdust. In all cases, salinity levels around the pitchers were well within the safe limit of growing crops. The study reveals that pitcher irrigation may be a promising option for growing plants using highly saline waters, sustaining hardly any salinity hazard or moisture stress.