Modeling Wet Bulb and Soil Moisture Under Drip Irrigation in of the Bolivian Highlands, Through Dimensional Analysis and Multiple Correlation

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Abstract

Agricultural areas of the Bolivian highlands are located between 3200-4000 meters above sea level, where soils are shallow and show great variability, which hinders the proper application of drip irrigation, as these systems are designed to achieve high efficiencies, however, technology by itself does not guarantee that. Therefore it is necessary consider in the design the wet bulb geometry and soil moisture. In this sense, the objective was to conduct mathematical modeling of wet bulb and humidity under surface drip irrigation, to soil from the highlands of Bolivia. Physical and hydrological characteristics of soil and water dynamics under drip irrigation were determined. For this we used a point source. Mathematical modeling was carried out for saturated and unsaturated zone. In the first case modeling was done using dimensional analysis, obtaining a quadratic equation for the maximum diameter of wet, reaching 28 cm for a flow rate of 1 l/h and 8 hours of irrigation, while the observed value field was 29 cm. In the unsaturated zone modeling was done by the method of multiple correlation, determining a maximum depth of 21 cm for a flow rate of 5 l/h and 4 hours of irrigation, in field a value of 20 cm was observed. Regarding the volumetric soil moiture, modeling was performed using matrix equations, observed that for high flow rates and high time irrigation, the simulated moisture was 0.52 and the observed was 0.54. In general the simulated and observed data of the three parameters had a proper fit.

Keywords: surface drip irrigation, wet bulb, saturated and unsaturated zone, m odeling