# ABSTRACT

A soil moisture distribution model to simulate soil moisture distribution pattern in black clay soil from point source application was developed and tested in the field. Simulated results when compared with observed field data using relative error percentage (REP) and students t-test, showed excellent agreement.

Experiments were conducted to study water requirement, fertilizer use and irrigation frequency in drip irrigation to optimize tomato production. Three irrigation frequencies viz. daily, every second day and every third day were tried with five irrigation levels (61%, 65%, 75%, 85%, and 89% of ET) and fertilizer levels (71%, 75%, 85%, 95%, and 99% of recommended dose). Experimental design used was response surface methodology. The highest yield of tomato crop was obtained by applying drip irrigation every second day at 75% of ET and 99% of recommended dose of fertilizer nitrogen (75 kg N per hectare). The optimum levels of irrigation and fertilizer nitrogen remain unchanged with the variation in frequency of irrigation. Prediction models developed were validated in the following year, which showed good agreement.

The depth wise root development of tomato with time was observed in the field, under daily, every second day and every third day irrigation frequency. The maximum root depth of 52 cm was observed in every third day irrigation frequency followed by 46 cm in every second day and 35 cm in daily irrigation. A sigmoidal model was fitted to the observed data and constants were estimated using iterative procedure. The predicted values showed close agreement with experimental data. Hence the proposed empirical model can be used to predict rooting depth at different time intervals in tomato crop. Application of both, soil moisture distribution and root growth model is shown for designing optimal spacing and discharge rate of dripper.



**Keywords:** ***Drip irrigation, Soil moisture model, Fertigation, Irrigation frequency.***