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Lateral and vertical movement of water through soil under gravity fed drip irrigation system

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ABSTRACT

The study was carried out on an economic considerations as per layouts and determined lateral and vertical movement of water through soil under gravity fed drip irrigation system at Research Farm, Department of Irrigation and Drainage Engineering, Dr. Budhajirao Mulik College of Agricultural Engineering and Technology, Mandki – Palvan, Tq. Chiplun Dist: - Ratnagiri during the year of 2007–2008. The experiment was carried out with cucumber crop having field size of 10 m x 5 m and the online emitters, which were used having average discharge of 2.6 lph. The diameter of main line and sub main was 25.4 mm and that of lateral was 16 mm. The vertical and lateral movement of water was 15.8 cm and 25.5 cm for 1 hour, respectively. The relationship was formed between time and depth of irrigation and width of water spreading under gravity fed drip irrigation system. The three different distributions were tested on the water spreading area under cucumber crops with gravity fed drip irrigation systems *i.e.* Linear, Polynomial and logarithmic. Therefore, Polynomial equation having value of regression coefficient (R^2) as 0.989 found to be good for the relationship shows between depths of water movement into the soil with time interval. However, logarithmic model was found to be suitable for the relationship between width of water movement and time of irrigation (R^2 = 0.995). Also found the average radius of water spreading under this experiment because of movement of water was three dimensional in the experimental soil. The relationship between time and average radius showed significant effect of lateral and vertical movement of water with the polynomial model tested (R^2 = 0.989).

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Key words : Water movement through soil, Regression coefficients, Irrigation water depth, Water spreading width and time of irrigation water application etc.

Agriculture is backbone of Indian economy and it is based on rainfall distribution. Rainfall is a crucial climatic factor which plays an important role in food production. About 67% cultivable lands are rainfed in India, while about 80% cultivable land depends on rainfall in Maharashtra. Hence, efficient utilization of available water resources is crucial for developing agriculture. To reduce the pressure on water without compensation on production, there is necessity to increase water use efficiency. Hence, the drip irrigation is one of the methods that can help to increase irrigation potential by optimizing the use of limited available water resources. However, in the Konkan region farmers are under marginal landholders and there is no use of drip irrigation in Konkan region because of high expenditure, operational and maintenance cost, irregular supply of electricity. To overcome from all these limitations a new irrigation system is introduced for marginal farmers which is gravity fed drip irrigation systems that is use of zero electricity or any fuel energy.

The drip irrigation method is favored over others systems because of added advantages like higher irrigation efficiencies *i.e.* 90 per cent. It saves 60 per cent of water as compared to surface irrigation methods. The Indian national commission on irrigation and drainage has reported that, in India 3.97 per cent of the area irrigated by drip irrigation system as compared to worldwide. In drip irrigation system, small quantities of water are applied at frequent intervals directly to the plant root zone from single emission point, line source, small spray and bubbles or subsurface with proper applicator (Shivannapan *et al.*, 2000). The rate of applying water in drip irrigation system is an important factor, which governs moisture distribution in soil profile. A high rate may cause deep percolation loss whereas very low rate may contributor to evaporation losses.

METHODOLOGY

The experiment was carried out with the plot size of 10 m x 5 m with the cucumber crop having spacing of 1 m x 1 m and the water source was tank which was located near about at 3 m height and 10 m away from experimental site. The experiment was planned with gravity fed surface drip irrigation systems for performance evaluation on emission uniformity, manufacturers coefficients of variation, water movement through the emitter/wetted area (lateral and vertical) and different equations were