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RESEARCH PAPER

Studies on waterfront advances in sub surface drip irrigation under laboratory conditions

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ABSTRACT

Proper utilization of water is very much essential to fight against the future water scarcity. India inhabits 16 per cent of the total world population with only 2 per cent of the total land and 4 per cent of the total water resources of the world. The per capita availability of water in India is 1820 cu. m per year whereas, it is 1700 cu. m per year in Orissa state. Subsurface drip irrigation is a better technology over the surface drip irrigation system. In case of SSDI system, laterals are placed at such a depth that wetting front water lies at least 10-15 cm below the soil surface, thus applying water directly into the root zone and leaving 10-12 cm of surface profile dry. In this system evaporation loss is reduced and thus improves irrigation efficiency by around 30 per cent over conventional drip system. Weed growth is little or fully checked due to dryness of upper soil layer. SSDI has advantages like quack plant response to nutrient application, trafficability in the field. Subsurface drip irrigation has also the potential to deliver low fertilizer rates over extended time periods with increased nutrient efficiency and reduces the leaching of nutrient below the root zone with lower cost per harvested unit. As a further development, a new irrigation method namely subsurface drip irrigation with perforated Linear Low Density Polyethylene (LLDP) tube in sand and gravel tubes is expected to increase the water use efficiency of subsurface applied drip irrigation on permanent tree crops. In this case, the micro tube emitter fitted into the lateral will be buried into the perforated LLDP tube in soil near to the plant root zone and there by evaporation losses can be completely avoided. Study of water front advances with micro tube emitter embedded in perforated LLDP tube placed in the soil, in perforated LLDP tube placed in sand tube, in perforated LLDP tube placed in fine gravel tube and placed on sand tube and fine gravel tube were reported in this article.

KEY WORDS : Waterfront, Subsurface drip-irrigation, Laboratory conditions

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INTRODUCTION

Irrigation is an ancient art and there has been continuous development of different irrigation practices, but a revolutionary development of drip irrigation system came, which is the result of a large number of studies conducted by scientists, engineers on its different aspects. At present, it has become most efficient technology in the field of pressurized irrigation. In drip method, plants are frequently watered as per the consumptive use of plants, thereby minimizing conventional losses such as deep percolation, runoff and soil water evaporation and thus soil moisture advance remain within desired range. Ahmed *et al.* (1995) studied the effect of on – line emitters on the energy losses in trickle irrigation laterals. Results of the investigation indicated that there are significant energy losses due to the emitter connections.

An increase in the energy loss of more than 32 per cent was observed for laterals of 13 mm diameter compared with plain pipe. Baker and Ayers (1990) developed a research tool to find the relationship of soil compaction to irrigation infiltration wetting front arrival time in the field. The ring electrode as a sensor works better in initially dry soil than in moist soil to detect the arrival of wetting front. In initially dry soil than in moist soil to detect the arrival of wetting front. In initially moist soil, the curve of decreasing soil electrical resistance can be much diffused. Subsurface drip irrigation (SDI) is another type of controlled irrigation system which is defined by Davis and Nelson (1970) as “application of water below the soil surface through emitters,