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Wetting Pattern in Sub Surface Irrigation

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Abstract

The sub surface method, porous pipe, irrigation was used for brinjal in view of studying the wetting pattern at different depths, i.e. at a distance of 15, 30, 45 and 60 cm, laterally and vertically from the centre of porous pipe. The observations were recorded on 30th, 60th, 90th and 120th day from transplanting. On the 30th day soil moisture was in the range of 25 to 39 % at a horizontal distance of 45 cm from porous pipe. However, it was in the range of 27.5 to 39% in the vicinity of 60 cm distance (downward) form the porous pipe. This similar type of trend, i.e. more spread of soil moisture vertically downward than horizontal, was recorded on 60th, 90th and 120th day. The soil moisture spread, laterally and vertically, was found increased from 30th to 90th day from transplanting might be due to fully developed roots of brinjal and subsequently the higher water uptake. The reduced moisture spread was recorded on 120th day. The developing roots towards the later growth stages of the crop might have restricted the soil moisture spread laterally and vertically.

Keywords: Sub surface irrigation; Soil moisture; Wetting zone.

Introduction

Porous pipe irrigation system is a sub surface irrigation system in which pipes, having micro holes, are buried near the crop at about 10 to 20 cm depth below the soil surface. The pipes are connected by suitable arrangement to the water tank provided at the height of 2 to 5 m from the ground surface. Another end of porous pipes is plugged and the water flows from tank into the porous pipe due to gravity. Due to hydraulic gradient the water is released from the pipe in the vicinity of root zone due to gravity and capillary. The porous pipe acts as continuous emitting system being naturally controlled by soil moisture status and the water uptake by the plants. Wetting pattern under this irrigation system was studied in view of obtaining water distribution and spacing of the pipes.

Materials and Methods

The physical and chemical properties of the soil are depicted in Table 1 and Table 2. The textural class of the soil of experimental site was clay loam. The field capacity and permanent wilting point were observed 37.5 percent and 20.3 percent, respectively and the bulk density of the experimental field was 1.29.

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Table 1: Physical properties of soil

Sr. No	Particulars	Results
1	Particle size distribution	
	I. Sand, %	40
	II. Silt, %	24.6
	III. Clay, %	35.4
2.	Textural class	Clay loam
3	Field capacity, %	37.5
4	Permanent wilting point,%	20.3
5	Bulk density, g/cc	1.29
6	Infiltration rate, cm/hr	0.48

Table 2: Chemical properties of soil

Sr. No.	Particulars	Result
1	pH	8.08
2	EC, ds/m	0.56
3	Available N (kg/ha)	218
4	Available P (kg/ha)	30.9
5	Available K (kg/ha)	597

Moisture distribution pattern

The soil samples were collected from the field, with brinjal crop, after three hours from irrigation, at a distance of 15, 30, 45 and 60 cm horizontally and vertically from the center of porous pipe. The data on moisture content was then utilized to draw the contours so as to get the moisture distribution pattern under drip irrigation.

Results and Discussion

The wetting pattern, i.e. distribution of soil moisture under the sub surface irrigation was observed on 30th, 60th, 90th and 120th days from transplanting of brinjal (Fig.1, Fig.2, Fig. 3 and Fig.4)

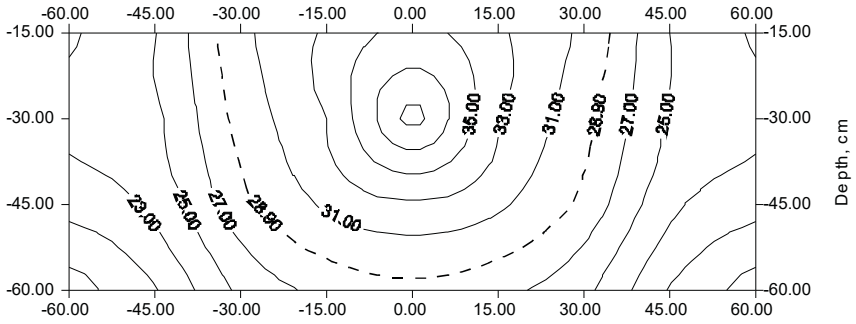

Fig. 1: Moisture distribution pattern in porous pipe after 30 days of transplanting

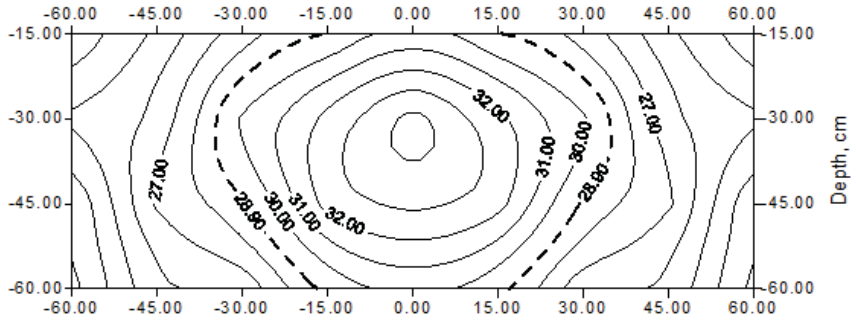

Fig. 2: Moisture distribution pattern in porous pipe after 60 days of transplanting

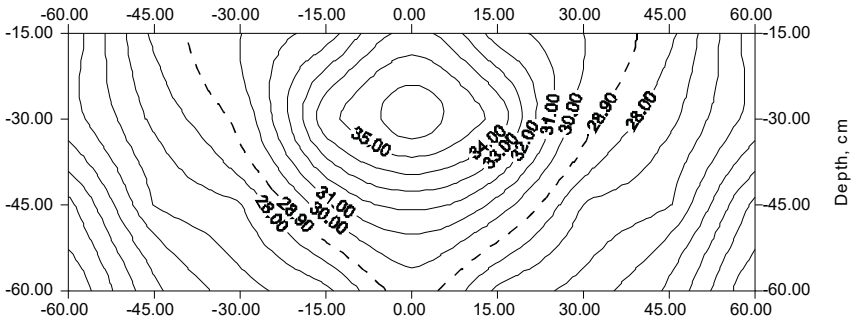

Fig. 3: Moisture distribution pattern in porous pipe after 90 days of transplanting

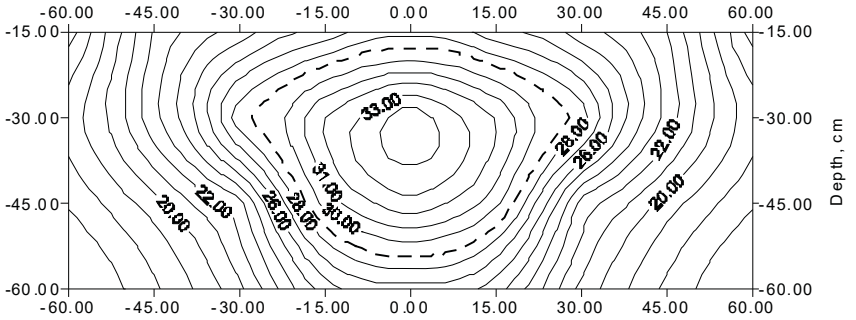

Fig. 4: Moisture distribution pattern in porous pipe after 120 days of transplanting

It is revealed from Fig.1 that on the 30th day soil moisture was in the range of 25 to 39 % at a horizontal distance of 45 cm from porous pipe. However, it was in the range of 27.5 to 39% in the vicinity of 60 cm distance (downward) form the porous pipe. The moisture content was higher near the centre of porous pipe and reduced with the distance from the centre of porous pipe as also recorded by Kharat and Wakchoure (2003). This similar type of trend, i.e. more spread of soil moisture vertically downward than horizontal, was recorded on 60th, 90th and 120th day (Fig. 2, 3 and 4). The soil moisture distribution was increased laterally as well as vertically from 30th day of transplanting up to 90th day of transplanting. This might be due to the increase in water uptake from 30th day up to 90th day after transplanting (Jadhav, 1993 and Kolhe and Ghadge 1998). The vertical spread of moisture was more than the horizontal spread in all observations. This similar type of trend, i.e. more spread of soil moisture vertically downward than horizontal, was recorded on 60th, 90th and 120th day. The soil moisture spread found reduced on 120th day, the developing roots towards the later growth stages of the crop might have restricted the soil moisture spread laterally and vertically. The results obtained by Khatri et al. (1984) Schwartzman and Zur (1986) strengthen the findings.

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