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Soil Moisture Distribution Pattern as Influenced by Water Application Rates Through Drip in Deep Black Soils

Soil moisture distribution pattern has greater significance in drip irrigation system as water application is on a restricted area. Further, the discharge rate, duration of irrigation and soil type play important role in distribution of moisture in the system. The knowledge of moisture distribution pattern helps in the effectiveness of drip irrigation. With this in view, attempts were made to study the moisture distribution pattern from a drip irrigation experiment conducted to know the water requirement of ber in deep black soils at Water Management Research Centre, Belvatagi. The experiment was conducted for two years i.e., 1994-95 and 1995-96 in ber plantation established in October, 1992 with 6 m X 6 m spacing. There were eight drip irrigation treatments of water application rates based on combinations of per cent wetted area (20,40, 60 and 80) and per cent pan evaporation (25, 50 and 75). Treatments were replicated five times in a radomized block design. Based on the percentage of wetted area and percentage of previous 24 hours USWB Class-A pan evaporation reading, the quantity of water was worked out and applied in liter per day per ber tree. The water application rates increased progressively from Tl to T8. The average uniformity co-efficients of drip system were 86.8 and 88.3 per cent during 1994-95 and 1995-96 respectively. The soil of the experimental area was black clay in nature and belonged to suborder chromustert of the order vertisol with field capacity of 39.25 per cent. The soil moisture determinations were done at 0-15 cm, 15-30 cm, 30-60 cm and 60-90 cm soil depth (vertical) and 0, 25, 50, 75 and 100 cm away from emitter point (horizontal/radial). The soil moisture sampling was done before irrigation with screw augur. The soil moisture content was worked out gravimetrically and expressed in per cent. The sampling was done four times in each year and average values were worked out.

In general, the highest soil moisture percentage was recorded near the emitter point and it progressively decreased as the radial distance increased (Table 1 & Fig. 1). The over all mean data indicated that, near the emitter the soil moisture was 33.21 per cent and it decreased to 30.99, 27.48,23.71 and 21.12 per cent at 25, 50, 75 and 100 cm away from emitter point respectively.

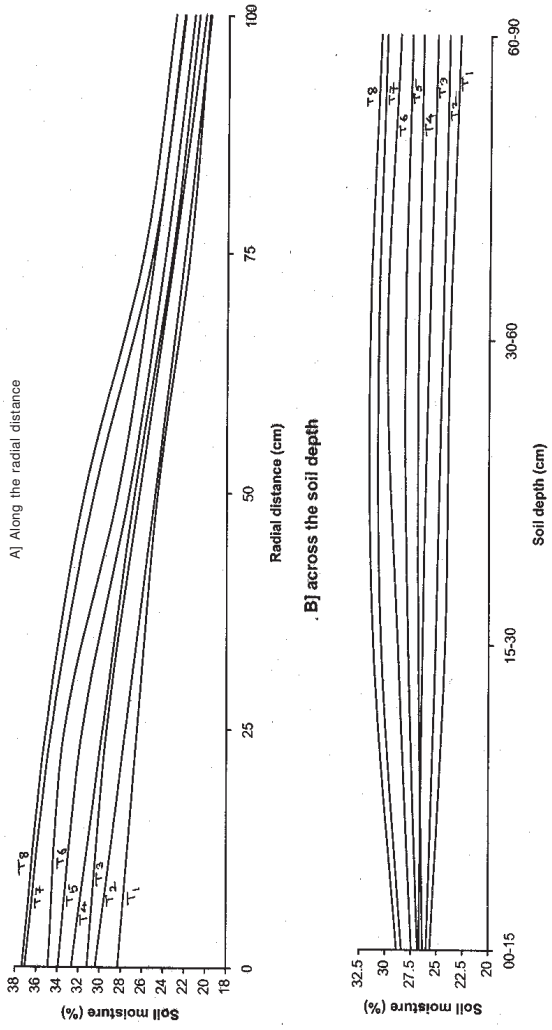

Fig.1: Influence of water application rates through drip on soil moisture distribution

Table 1. Soil moisture distribution (%) as influenced by various water application rates through drip to ber in deep black soils

Treatments	Soil depth (cm)	Radial distance (cm)					
		00	25	50	75	100	Mean
T_1	00-15	31.52	28.31	26.39	23.11	18.82	25.63
20% WA x 25% PE	15-30	29.39	28.12	24.34	20.83	18.38	24.21
	30-60	27.36	26.18	24.18	20.87	20.46	23.81
	60-90	24.86	23.36	26.34	21.54	21.63	22.94
	Mean	28.27	26.49	24.56	21.58	19.82	
T_2	00-15	33.18	29.39	26.00	22.36	19.03	25.99
40% WA x 25% PE	15-30	31.27	29.24	24.61	21.26	19.16	25.12
or	30-60	29.94	25.99	24.33	22.11	20.18	24.51
20% WA x 50% PE	60-90	27.12	25.78	24.24	22.52	20.37	24.00
	Mean	30.40	27.60	24.79	22.06	1968	
T_3	00-15	33.77	3044	26.84	22.84	19.56	26.69
60% WA x 25% PE	15-30	32.95	32.19	25.16	22.48	19.19	26.39
or	30-60	29.87	27.36	26.96	23.31	21.63	25.82
20% WA x 75% PE	60-90	28.13	27.54	26.18	23.62	20.32	25.15
	Mean	31.18	29.38	26.28	23.06	20.17	
T_4	00-15	35.84	30.84	25.34	20.58	19.18	26.35
40% WA x 50% PE	15-30	33.62	30.24	27.18	22.69	20.30	26.80
or	30-60	31.08	28.92	26.78	25.36	22.15	26.85
80% WA x 25% PE	60-90	30.12	29.06	27.66	24.28	21.53	26.53
	Mean	32.66	29.76	26.74	23.22	20.79	
T_5	00-15	36.05	31.26	26.70	21.34	18.87	26.84
40% WA x 75% PE	15-30	34.86	33.69	27.55	22.81	20.13	27.80
or	30-60	33.93	31.16	26.88	26.01	22.67	28.13
60% WA x 50% PE	60-90	30.89	30.59	27.87	25.39	23.25	27.59
	Mean	33.93	31.67	27.25	23.88	21.23	
T_6	00-15	36.65	32.18	26.89	21.54	19.85	27.42
80% WA x 50% PE	15-30	35.18	35.04	28.48	24.18	21.16	28.80
	30-60	35.52	34.16	28.75	27.15	23.86	29.88
	60-90	32.18	32.02	29.14	26.74	23.56	28.72
	Mean	34.88	33.35	28.31	24.90	22.10	
T_7	00-15	37.53	35.18	28.08	21.80	19.38	28.39
60% WA x 75% PE	15-30	38.79	36.74	32.25	23.71	20.64	30.42
	30-60	35.74	35.12	30.63	27.55	24.57	30.72
	60-90	36.19	31.35	31.22	27.30	24.13	30.03
	Mean	37.06	34.59	30.54	25.09	22.18	
T_8	00-15	37.88	35.82	28.63	22.31	19.75	28.87
80% WA x 75% PE	15-30	38.50	37.41	33.70	25.01	21.32	31.18
	30-60	36.74	34.86	32.01	28.56	25.62	31.55
	60-90	36.18	32.27	31.36	27.84	25.40	30.61
	Mean	37.32	35.09	31.47	25.93	23.02	

Irrespective of soil depth, the soil moisture percentage at emitter point in the lowest water application rate treatment (T_1) was 28.27 per cent and correspondingly it was 37.32 per cent in the highest water application rate treatments (T_8). At the subsequent radial distances of 25, 50, 75 and 100 can the difference in soil moisture between the lowest (T_1) and highest (T_8) water application rates were 8.60, 6.86, 4.35 and 3.2 per cent respectively. The remaining water application treatments (T_2 to T_7) recorded similar trends.

In general, the soil moisture decreased from surface soil layer (0-15 cm) to deeper soil depth (60-90 cm) in lower water application rate treatments (T_1 to T_3). In contrast, the soil moisture increased uniformly from surface layer towards deeper soil depths in higher water application rates (T_4 to T_8). At emitter point, the distribution of soil moisture in higher application rates was uniform throughout soil depth (0-90 cm) and it progressively decreased in lower water application rates treatments.

Water moves through the soil profile under gravitational and capillary forces. Therefore, the radial spread of moisture was more in lower water application rates whereas; the vertical spread was more in higher water application rates due to gravitational force. Similar findings of moisture distribution were reported by Phadtare *et al.* (1992), Mostaghimi *et al.* (1982) and Mishra and Pyasi (1993).

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