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Feasibility of Drip in Cotton Under Clayay Soil of Narmada Command

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Cotton is grown in 24 per cent of total cultivated area of region I of Narmada Command. Earlier study showed that the cotton responds to irrigation and economically higher yield was obtained with 5 irrigation of 80 mm depth after lessation of monsoon (Annual Report, 1993-94). With this view, an experiment was planned to work out economic feasibility of drip in cotton variety Hybrid 8.

An investigation was carried out during monsoon season (*kharif*) of 1992-93 to 1994-95 at Narmada Irrigation Research Project, Khandha, Gujarat to test the economic feasibility of drip irrigation method in cotton, variety Hybrid 8. The soil of experimental plot is typic chromusterts (order-vertisol and haldar series) having 0.033% total N, 18.7 kg/ha OLsen's P_2O_5 and 1219 kg/ha available K_2O. The treatments comprising four levels of irrigation viz., 0.3, 0.5, 0.7 and 0.9 fraction of pan evaporation through drip and surface method (flood) irrigation of 80 mm depth of water. The experiment was laid out in RBD with four replications.

Irrigation was applied at the interval of 20 to 25 days with 80 mm depth in surface method as per farmer's practice. In drip irrigation method, the irrigation was applied alternate day on the basis of Fraction of Pan evaporation (FPE). If Fraction of Pan evaporation is 1 mm then 0.3, 0.5, 0.7 and 0.9 fraction of pan evaporation (1.0 mm) were applied in respective treatments i.e. irrigation was applied @ 30 (0.3 FPE), 50 (0.5 FPE), 70 (0.7 FPE) and 90 (0.9 FPE) per cent of cumulative two days pan evaporation. Crop was fertilized with 240 kg N/ha in four splits. No phosphorus and potash were applied. Sowing was done in middle of June during 1992-93 and 1994-95 while in first week of August during 1993-94 using 4 kg/ha seed and keeping inter and intra row spacing of 120 cm and 45 cm respectively. The lateral pipe lines were laid out in plot at 120 cm distance. The drippers were fitted on lateral line at the distance of 90 cm. The on line type of emitters were used with 4 liter per hour discharge of dripper.

Irrigation scheduled at different fractions of Pan evaporation (FPE) i.e. 0.3, 0.5, 0.7 and 0.9 gave significantly higher yield than surface irrigation of 80 mm depth (table 1). Amongst different fractions of pan evaporation 0.7 FPE gave significantly higher yield over 0.3 and 0.9 FPE but at par with 0.5 FPE. The higher yield obtained under 0.5 and 0.7 FPE might be due to better soil water regime. The results coroborated the statement of Goldberg *et al.* (1976).

TABLE 1

Effect of treatments on seed cotton yield, water saving, water use efficiency (WUE) and net realization.

Treatments	*Seed cotton yield, kg/ha*				*Percentage increase in yield over control*	*Total qnty. of water used, mm*	*Water saving %*	*WUE kg/ha mm*	*Net realization Rs/ha*
	1992-93	*1993-94*	*1994-95*	*Average*					
Drip method of irrigation at									
0.3 FPE	3437	2518	2149	2701	14	155	67.8	17.4	82800
0.5 FPE	3621	2939	2426	2995	27	227	52.7	13.2	68770
0.7 FPE	3719	3192	2546	3152	33	299	37.7	10.5	56520
0.9 FPE	3541	2697	2338	2858	21	371	22.7	7.7	39520
Surface (flood) irrigation	2958	2131	2004	2364	—	480	—	4.9	33280
S. Em. =	125	154	120	75	—	—	—	—	—
C. D. 0.05	384	474	NS	215	—	—	—	—	—
C. V. %	7.2	11.4	10.5	9.5	—	—	—	—	—

The results furrther revealed that there was saving of water from 23 to 68 per cent under different fractions and highest was with the lowest fraction of 0.3 (Table 1). The water use efficiency (kg/ha-mm) was higher (i.e. 17.4) with 0.3 FPE and decreased with increase in the fraction of pan evaporation. This might be due to better utilization of irrigation water at lower fraction, whereas in higher fraction, the rate of water loss as evapotranspiration might be high and relative increase in yield was not proportional to the increase in water applied. These results are in close agreement with the findings of Malik *et al.* (1994) in pea and Patel *et al.* (1997) in castor crop.

The net realization was higher with drip method of irrigation applied at 0.3 fraction of pan evaporation followed by 0.5 FPE.

The above study revealed that the irrigation scheduling under drip method of irrigation may be followed at 0.5 FPE to get about 27 per cent increase in cotton yield and cotton crop can be grown successfully with 30 cm of water through drip after cessation of monsoon on typic chromusterts (order-vertisol, series-Haldar). Under extreme constraints of irrigation water, the crop can be irrigated at 0.3 FPE through drip.

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