

## Effect of liquid fertilizer through drip irrigation on growth and yield of okra (*Hibiscus esculentus*)

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### ABSTRACT

A field experiment was conducted during summer season of 1996 and 1997 to study the effect of fertigation of liquid fertilizer on growth and yield of summer okra (*Hibiscus esculentus* L.) in sandy-clay loam soil. The treatment consisted of 5 fertigation levels (125, 100, 75, 50 and 25% of recommended dose) compared with recommended dose of solid fertilizer (band placement) with surface-irrigation method. The drip-irrigation treatment proved superior to surface irrigation. An application of 75% recommended dose by liquid fertilizer through drip irrigation performed better, resulting in 25% saving of fertilizer compared with conventional method of fertilizer application. Similarly, 50% of recommended dose of liquid fertilizer through drip irrigation was equally effective to produce yield that of conventional method of irrigation and fertilizer application. The fertigation increased the water-use efficiency.

**Key words :** Okra, Liquid fertilizer, Drip irrigation, Yield

In Maharashtra, okra is taken in both rainy (*kharif*) and summer seasons. Besides water, the most crucial factor which seriously affects the growth and yield of crops is plant nutrients, and fertilizer application is must because our soils are poor in N and medium in  $P_2O_5$ . Fertilizers being costly input, every effort needs to be made to enhance fertilizer-use efficiency. Since a very meagre work has been carried out on fertigation in okra vegetable, the present experiment was conducted.

### MATERIALS AND METHODS

A field experiment was conducted in sandy-clay loam soil at MPKV, Rahuri, dur-

ing summer 1996 and 1997. The soil was low in available N (161-165 kg/ha), medium in available phosphorus (13.9-21.6 kg/ha) and rich in available potassium (442-482 kg/ha). It was medium deep (45 cm depth) and slightly alkaline in reaction (pH 8.0). The trial consisted of 2 treatments of solid fertilizer, viz.  $T_1$ , 100% recommended dose of straight fertilizer by band placement with surface irrigation;  $T_2$ , 100% recommended dose of straight fertilizers by band placement with drip irrigation; and 4 treatments ( $T_3$ ,  $T_4$ ,  $T_5$  and  $T_6$ ) of liquid fertilizers, viz. 100, 75, 50 and 25% of recommended dose (grade 8 : 8 : 8 NPK) with drip irrigation during 1996. Dur-

ing 1997, however, the T<sub>3</sub>, T<sub>4</sub>, T<sub>5</sub> and T<sub>6</sub> treatments were 125, 100, 75 and 50% of recommended dose of liquid fertilizer applied through drip. The gross and net plot size was 5.40 m x 4.60 m and 4.50 m x 2.40 m respectively. The dibbling of okra cv. 'Arka Anamika' seed was carried out at 30 cm x 22.5 cm spacing. In treatments T<sub>1</sub> and T<sub>2</sub> 100% recommended dose of straight fertilizers were applied through urea (46% N), single superphosphate (16% P<sub>2</sub>O<sub>5</sub>) and muriate of potash (60% K<sub>2</sub>O). Half dose of N and full dose of P and K were applied 15 days after sowing and remaining half was applied 45 days after sowing. In liquid fertilizer treatments 50% N, 100% P and K were applied in 7 equal splits at 15, 19, 23, 27, 31, 35 and 39 days. Remaining 50% N was applied through urea at 43, 47, 51, 55, 59, 63 and 67 days. The surface irrigation was applied at 75 mm CPE with 6 cm depth of water. In drip irrigation water use applied every alternate day as per climatological approach using pan evaporation, crop factor and wetting front (0.6). Growth observations such as plant height, total fruits/plant, fruit weight/plant and yield at every harvest were recorded.

## RESULTS AND DISCUSSION

### Growth and yield

All the growth and yield attributes were

significantly higher under drip-irrigated treatments with liquid fertilizer (Table 1). The plant height, total fruits/plant and fruit weight/plant were found maximum with 100 and 125% of recommended doses of liquid fertilizer (RDLF) and were at par with 75% RDLF and was significantly higher than 50% RDLF. Significantly lower values than conventional control (surface irrigation) and drip irrigation treatments were observed in 50% RDLF in respect of these parameters. These results confirm those of Dukre (1991) and Pawar *et al.* (1992). The highest yield found in 125% treatment was, however, on a par with 100% RDLF and significantly better than 75% RDLF. All these 3 levels proved superior to 50% RDLF and surface irrigation and drip-irrigation treatments, the drip irrigation treatment being significantly superior to surface-irrigation treatment. Although the 50% recommended dose of NPK liquid fertilizer was significantly better than conventional control, indicating 50% saving in recommended dose of fertilizer, the application of higher levels through liquid fertilizer showed significant increase in the yield.

### Water-use efficiency

The maximum quantity of irrigation water was applied in surface irrigation, whereas minimum in drip irrigation throughout the

Table 1. Growth and yield-contributing characters of okra as influenced by different treatments

Treatment	Plant height (cm)		Fruit/plant (No.)		Fruit weight (g/plant)		Yield (q/ha)	
	1996	1997	1996	1997	1996	1997	1996	1997
T <sub>1</sub>	55.8	77.3	16	21	109.8	129.2	152.65	147.22
T <sub>2</sub>	58.7	88.8	20	22	126.4	132.2	175.85	171.29
T <sub>3</sub>		106.3		24		136.2		186.12
T <sub>4</sub>	61.5	96.8	24	23	135.3	134.8	188.14	194.90
T <sub>5</sub>	60.9	92.7	23	22	132.7	132.5	185.82	181.94
T <sub>6</sub>	55.4	82.8	18	17	113.4	115.5	155.05	150.66
T <sub>7</sub>	51.6		14		101.7		143.84	
CD (P = 0.05)	0.43	17.24	1.84	2.76	2.58	4.19	2.41	3.61

Details of treatments are given under Materials and Methods

**Table 2.** Total water applied, seasonal-water requirement, saving of water and water-use efficiency as influenced by different treatments

Treatment	Total water applied (cm)		Effective rainfall (cm)		Seasonal water requirement		Yield (kg/ha)		Water use efficiency (kg/ha-cm)	
	1996	1997	1996	1997	1996	1997	1996	1997	1996	1997
T <sub>1</sub>	54.00	54.0	4.50	3.4	58.5	57.4	1,526	1,713	28.17	29.84
T <sub>2</sub>	40.35	42.5	2.34	1.2	42.69	43.7	1,759	1,472	41.19	33.68
T <sub>3</sub>		42.5	2.34	1.2		43.7		1,861		42.59
T <sub>4</sub>	40.35	42.5	2.34	1.2	42.69	43.7	1,881	1,842	44.07	42.13
T <sub>5</sub>	40.34	42.5	2.34	1.2	42.69	43.7	1,858	1,819	43.53	41.63
T <sub>6</sub>	40.35	42.5	2.34	1.2	42.69	43.7	1,551	1,507	36.32	34.47
T <sub>7</sub>	40.35		2.34		42.69		1,438		33.69	

growth period during both the years (Table 2). There was saving in irrigation water up to 27 and 24% during 1996 and 1997, respectively, in drip irrigation compared with surface irrigation method. Sivanapan *et al.* (1974) also reported 30% saving in water. This might be due to quantity of water applied was almost as per the need of the crop and hence the net quantity of water applied was nearly equal to the soil moisture depleted by the crop under drip irrigation.

Considerably higher water-use efficiency (WUE) was observed in all the drip-irrigation and fertigation treatments than the con-

ventional surface irrigation. The WUE under 100% and 75% RDLF during 1996 and 125%, 100% and 75% RDLF during 1997 were almost comparable.

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