Indian J. Agron. **40** (1) : 143–145 (March 1995)

Economic feasibility of drip irrigation in garlic (*Allium sativum*)

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Received: October 1993

An investigation was carried out during the winter season (*rabi*) of 1991–92 at Agronomy Farm, Junagadh, to test the economic feasibility of drip-irrigation method in garlic (*Allium sativum* L.) crop. The soil of experimental plot was medium in available nitrogen and potassium and low in available phosphorus, with slightly alkaline in reaction. The treatment comprising 5 levels of irrigation method in main plot and 3 levels of nitrogen in subplot (Table 1). The experiment was laid out in split-plot design with 4 replications. Irrigation was applied at an interval of 8–10 days with 50 mm depth in surface method. In drip-irrigation method, irrigation was applied alternate day on the basis of cumulative pan evaporation (CPE). If cumulative pan evaporation is 1 mm, then 0.4, 0.6 and 0.8 fraction of CPE (1 mm) and equal amount of water (1.0) to that of CPE were applied in respective treatments, i.e. irrigation was applied @ 40 (0.4 fraction of CPE), 60 (0.6 fraction of CPE), 80 (0.8 fraction of CPE) and 100 (1.0 CPE) % of cumulative pan evaporation in respective treatments. Crop was fertilized with nitrogen as per treatments. Half the quantity of N and entire quantity of P_2O_5 (50 kg/ha) and K_2O (50 kg/ha) were applied at the time of sowing. Remaining quantity of N was top-dressed 1 month after sowing. Sowing was done on 30 October 1991 using recommended seed rate of 450 kg/ha and keeping inter- and intera-row spacing of 15 and 10 cm respectively. The lateral pipe lines were laid out in plot at 60 cm distance. The droppers were fitted on lateral line at the distance of 45 cm.

The maximum dry weight of weeds was noticed under surface method of irrigation and it was significantly higher over all the levels of drip-irrigation method (Table 1). The less dry weight of weeds recorded under the drip-irrigation method may be due to partial wetting of the soil. Significantly higher N uptake was recorded under drip irrigation method at 1.0 CPE (equal amount of CPE) than surface method and all the other levels of drip-irrigation method. The increase in solubility of nutrients with increase in water content is responsible for higher content of N in plant and ultimately increase in the N uptake. The different methods of irrigation did not differ statistically for available N content in soil and bulk density of the soil after harvesting of the crop. Different levels of drip-irrigation method saved the water 27.20–62.80% compared with surface method. This may be due to the fact that in drip-irrigation method water was applied into the root zone of the crop in right quantity minimizes conventional loss as deep percolation, run-off and soil-water evaporation. Drip irrigation at 1.0 CPE (equal amount of CPE) was found significantly superior to surface method and

Table 1. Effect of method of irrigation and level of nitrogen on yield, nutrient uptake, water saving and net return in garlic

Treatment	Bulb yield (q/ha)	Weed-dry weight (kg/ha)	Total N uptake (kg/ha)	Available N in soil (kg/ha) after harvest	Bulk density (g/cm^3)	Water saved over surface method (%)	Water-expense efficiency (kg/ha-mm)	Net realization (Rs/ha)
Method of irrigation (I)								
Surface method	70.02	502.33	88.76	228.0	1.63		9.34	22,698
Drip 0.4 CPE	48.27	135.04	57.29	227.6	1.64	62.80	17.33	6,981
Drip 0.6 CPE	52.90	194.96	64.09	228.3	1.60	50.93	14.3	9,113
Drip 0.8 CPE	67.00	264.01	84.42	228.0	1.59	39.07	14.66	15,980
Drip 1.0 CPE	75.87	276.94	98.16	227.0	1.58	27.20	13.89	20,265
CD (P = 0.05)	4.35	31.55	5.18	NS	NS		0.95	
Nitrogen (kg/ha) (N)								
25	60.45	241.10	74.17	226.9	1.61		13.34	14,019
50	65.91	283.59	82.58	228.0	1.61		14.73	16,556
75	62.08	299.27	78.88	228.5	1.60		13.69	14,448
CD (P = 0.05)	2.27	24.67	2.98	NS	NS		0.53	
Interaction (I x N)								
CD (P = 0.05)	NS	NS	NS	NS	NS		NS	

NS, Not significant

other levels of drip-irrigation method for bulb yield (75.87 kg/ha). The water tension in soil is directly related to available moisture to roots of crops. As the water tension increases, the available moisture decreases and the roots have to exert more to get the water from soil particles. In drip-irrigation method, water tension remains low as compared to surface method of irrigation. This is one of the main reasons for getting higher production under drip-irrigation method at 1.0 CPE. The lowest dry weight of weeds and higher N uptake recorded under the drip-irrigation method may also be the reason of getting higher yield under drip-irrigation at 1.0 CPE. These findings are in agreement with those of Bogle *et al.* (1989) in tomato and of Jadav *et al.* (1990) in eggplant. All the levels of drip-irrigation method recorded higher water-expense efficiency and were found significantly superior to surface method of irrigation. It may be due to higher yield obtained with less amount of water used in drip-irrigation method. The maximum net realization of Rs 22,698/ha was accrued from surface method, closely followed by drip irrigation at 1.0 CPE (Rs 20,256/ha).

The dry weight of weeds (Table 1) was increased with each increase in N levels. Higher level of N increased the growth of weeds which resulted in more dry weight of weeds. The maximum uptake of N recorded

with 50 kg/ha was found significantly superior to 75 and 25 kg/ha. This may be due to the cumulative effect of increased yield as well as increased content of N in plant. The available N content in soil and bulk density of soil after harvest the crop remained unaffected due to different levels of N. Water-expense efficiency was found the maximum under 50 kg N/ha. Crop fertilized with 50 kg N/ha recorded maximum bulb yield of 65.91 q/ha and net realization of Rs 16,556/ha.

It was concluded that profitable production in garlic on medium black soil of Junagadh can be achieved by irrigating the crop with surface method of irrigation at an interval of 8–10 days with 50 mm depth along with 50 kg N/ha.

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Indian J. Agron. **40** (1) : 145–146 (March 1995)

Production potential of chilli (*Capsicum annuum*) under levels of irrigation and nitrogen

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Received: January 1994

An experiment was conducted during the winter season (*rabi*) of 1992–93 at Chiplima, to study production potential of chilli (*Capsicum annuum* L.) under different levels of irrigation and nitrogen. The soil was sandy-clay loam having 0.041% total nitrogen, 0.48% organic carbon, average field capacity 17.5% and wilting point 7.5%. The experiment consisting of 4 irrigation [0.4, 0.6, 0.8 and 1.0 irrigation water : cumulative pan evaporation (IW : CPE) ratios] and 4 nitrogen levels (40, 60, 80 and 100 kg/ha) was conducted in randomized block design replicated 4 times. Variety 'NP 46 A' was used as test crop and planted on 1 December 1992 with 35-day-old seedlings spaced at 50 cm x 20 cm apart. Whole of recommended P and K (75 kg P/ha and 70 kg K/ha) were applied as a basal dose. Half amount of N, as per treatment, was applied after establishment and remaining N at 3 weeks after the establishment. An irrigation