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STUDY ON THE EFFECT OF NUTRIENT MANAGEMENT ON SEED CROP OF OKRA VAR. PARBHANI KRANTI

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ABSTRACT : The sixteen treatments were compared in randomized block design (RBD) with three replications. The seed was sown at spacing of 45 cm x 15 cm on ridges. The seed-pods were picked before shattering through successive pickings as and when required. The studies were concentrated on crop-stand, plant-growth and development traits, crop productivity, seed quality and net profit (₹) per hectare. It is inferred from the findings that the seed crop of okra cv. Parbhani Kranti during the spring-summer (Zaid) season should be cultivated in western Uttar Pradesh by applying nitrogen @ 100 kg ha^{-1}, phosphorus @ 40 kg ha^{-1} and *Azotobacter* @ 2 kg ha^{-1}.

Keywords : *Okra, nutrient management, Parbhani Kranti.*

Okra is one of the most important and widely grown vegetable throughout the country for green fruits. Parbhani Kranti is a very important, high yielding and widely accepted variety of okra. It is equally grown in rainy as well as in spring-summer seasons. Therefore, there is a great demand of its seed during both the seasons. In Indian plains, it is generally observed that the seed produced from spring-summer crop of okra is mostly preferred by the farmers because of being free from yellow vein mosaic and other diseases, as well as insect pests as compared to the seed produced in rainy season. The application of chemical fertilizers has increased the yield of vegetables tremendously. However, with the increased cost of chemical fertilizers and deteriorating eco-system, it is evidently essential to adopt a strategy of integrated nutrient management in vegetable production by using judicious combinations of chemical fertilizers, organic manures and bio-fertilizers. The bio-fertilizers are natural fertilizers containing carrier based micro-organisms which enhance productivity by biological nitrogen fixation or solubilization of insoluble phosphate or producing hormones, vitamins and other growth factors required for plant growth. Keeping these views in mind, the experiment was carried out to formulate an effective *i.e.* productive and profitable, package of integrated nutrient management for *zaid* seed crop of okra, cv Parbhani Kranti, for western zone of Uttar Pradesh.

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MATERIALS AND METHODS

The experiment was conducted at RBS College Experimental Farm, Bichpuri, Agra (U.P.) during the spring-summer seasons (March to June) and next year (Feb. to June). In the cropping years, the experiment was laid out at two different sites, viz. plot A_6 in the first year (2003) and plot A_7 (2004) in the second year. Nutritional treatments were applied as per combinations given in Table 1. Observations on productive and profitability parameters were taken during experimentation period.

Table 1: Treatment combinations for okra crop.

Treatments	Notation
150 kg N + 60 kg P_2O_5 ha^{-1}	T_1
100 kg N + 60 kg P_2O_5 ha^{-1}	T_2
150 kg N + 40 kg P_2O_5 ha^{-1}	T_3
100 kg N + 40 kg P_2O_5 ha^{-1}	T_4
100 kg N + 60 kg P_2O_5 + 10 t FYM ha^{-1}	T_5
150 kg N + 40 kg P_2O_5 + 10 t FYM ha^{-1}	T_6
100 kg N + 40 kg P_2O_5 + 10 t FYM ha^{-1}	T_7
100 kg N + 60 kg P_2O_5 + *Azotobacter* @ 2 kg ha^{-1}	T_8
150 kg N + 40 kg P_2O_5 + *Azotobacter* @ 2 kg ha^{-1}	T_9
100 kg N + 40 kg P_2O_5 + *Azotobacter* @ 2 kg ha^{-1}	T_{10}
150 kg N + 60 kg P_2O_5 + 20 kg $ZnSO_4$ ha^{-1}	T_{11}
100 kg N + 60 kg P_2O_5 + 20 kg $ZnSO_4$ ha^{-1}	T_{12}

150 kg N + 40 kg P_2O_5 + 20 kg $ZnSO_4$ ha^{-1}	T_{13}
100 kg N + 40 kg P_2O_5 + 20 kg $ZnSO_4$ ha^{-1}	T_{14}
20 tonnes FYM ha^{-1}	T_{15}
Control : No, N, P, *Azotobacter*, FYM and $ZnSO_4$	T_{16}

The data recorded for growth, yield and chemical analysis were subjected to statistical analysis as per method of anlaysis of variance (Fisher, 3 and Snedcor and Cochran, 7). The significance of treatment effects was worked out with the help of 'F' values (Variance ratio) and the significance of differences between means of any two treatments was judged by calculating the critical difference.

RESULTS AND DISCUSSION

Plant height

The data for plant height in the final study (Table 1) showed that the treatments under investigation increased the plant stand over control invariably but the superiority exhibited by the T_8 to T_{14} treatments during both the years. Similar observations were also reported by Arora *et al.* (1) and Bajpai *et al.* (2).

Number of seed pods per plant

The maximum number of seed pods per plant during I^{st} and II^{nd} year (5.24 and 5.75, respectively) were recorded with T_{12} (100 kg N + 60 kg P_2O_5 + 20 kg $ZnSO_4$) (Table 1). However, the treatments T_1 to T_{15} were credited with more number of seed pods per plant in comparison to control during both the years. The treatments from T_8 to T_{14} produced more seed pods than those by T_1 to T_7 and T_{15}. The excellence of these treatments over control was from 38.43% to 44.08% confirming to the reports of Shanke *et al.* (4) and Singh and Balyan (6).

Number of seeds per pod and seed yield/ha

A persual of Table 2 showed that the pods of 2^{nd} year crop contained more seeds than of first year. The pods of T_1 to T_{15} contained more seeds than of control during both years.

The seed yield varied significantly in the light of role of nutrient treatments applied through NPK (inorganics), FYM, *Azotobacter* and $ZnSO_4$. The lowest seed yield was observed in control (8.37 and 7.35q ha^{-1} during I^{st} and II^{nd} year, respectively) which increased significantly with all other treatments during both the years. It was commonly observed that the seed yield with all the treatments was apparently more in the first year than in the second year. T_8, T_9 and T_{12} produced 14.65, 14.54 and 14.57 q seeds per hectare in the first year as against 13.61, 13.49 and 13.51 q in the second year. The variations among these values

Table 1: Effect of nutritional treatments on plant height and number of seed-pods/plant.

Treatment (ha^{-1})	Notation	Plant height (cm)				No. of seed pods/plant			
		2003	2004	Av.	% increase over control	2003	2004	Av.	% increase over control
150 N + 60 P (kg)	T_1	46.55	45.00	**45.78**	14.14	6.47	7.03	**6.75**	22.95
100 N + 60 P (kg)	T_2	45.44	44.22	**44.83**	11.76	6.25	6.79	**6.52**	18.76
150 N + 40 P (kg)	T_3	46.56	45.11	**45.84**	14.28	6.46	6.95	**6.71**	22.22
100 N + 40 P (kg)	T_4	45.39	44.11	**44.75**	11.57	6.20	6.72	**6.46**	17.67
100 N + 60 P (kg) + 10 t FYM	T_5	47.78	45.89	**46.84**	16.78	6.69	7.27	**6.98**	27.14
150 N + 40 P (kg) + 10 t FYM	T_6	48.33	46.34	**47.34**	18.02	6.80	7.39	**7.10**	29.33
100 N + 40 P (kg) + 10 t FYM	T_7	47.67	45.78	**46.73**	16.50	6.67	7.24	**6.96**	26.77
100 N + 60 P + 2 Azoto. (kg)	T_8	52.17	49.33	**50.75**	26.53	7.58	8.24	**7.91**	44.08
150 N + 40 P + 2 Azoto. (kg)	T_9	52.11	49.33	**50.72**	26.45	7.46	8.16	**7.81**	42.26
100 N + 40 P + 2 Azoto. (kg)	T_{10}	52.17	49.34	**50.76**	26.55	7.38	8.10	**7.74**	40.98
150 N + 60 P + 20 $ZnSO_4$ (kg)	T_{11}	52.05	49.22	**50.64**	26.25	7.29	8.07	**7.68**	39.89
100 N + 60 P + 20 $ZnSO_4$ (kg)	T_{12}	52.17	49.33	**50.75**	26.53	7.50	8.17	**7.84**	42.81
150 N + 40 P + 20 $ZnSO_4$ (kg)	T_{13}	52.00	49.11	**50.56**	26.05	7.28	8.03	**7.66**	39.53
100 N + 40 P + 20 $ZnSO_4$ (kg)	T_{14}	51.94	49.22	**50.58**	26.10	7.21	7.98	**7.60**	38.43
20 t FYM	T_{15}	44.33	43.33	**43.83**	9.27	6.03	6.54	**6.29**	14.57
Control	T_{16}	40.62	39.61	**40.11**	-	5.24	5.75	**5.49**	-
CD (P=0.05)		3.718	3.718			**0.789**	0.789		

Number of seeds per pod and seed yield per ha

Table 2: Effect of nutritional treatments on number of seeds/pod and seed yield/ha .

Treatment (ha^{-1})	Notation	No. of seeds/pod				Seed yield/ha (q)			
		2003	2004	Av.	% increase over control	2003	2004	Av.	% increase over control
150 N + 60 P (kg)	T_1	37.63	38.10	**37.87**	21.49	11.54	10.50	**11.02**	40.20
0100 N + 60 P (kg)	T_2	36.13	36.77	**36.45**	16.94	10.92	9.87	**10.40**	32.32
150 N + 40 P (kg)	T_3	37.60	38.07	**37.84**	21.39	11.52	10.41	**10.97**	39.57
100 N + 40 P (kg)	T_4	36.03	36.67	**36.35**	16.62	10.86	9.83	**10.35**	31.68
100 N + 60 P (kg) + 10 t FYM	T_5	39.10	39.43	**39.27**	25.98	12.16	11.12	**11.64**	48.09
150 N + 40 P (kg) + 10 t FYM	T_6	39.87	40.13	**40.00**	28.33	12.47	11.43	**11.95**	52.04
100 N + 40 P (kg) + 10 t FYM	T_7	39.03	39.40	**39.22**	25.83	12.14	11.10	**11.62**	47.84
100 N + 60 P + 2 Azoto. (kg)	T_8	45.13	44.87	**45.00**	44.37	14.65	13.61	**14.13**	79.77
150 N + 40 P + 2 Azoto. (kg)	T_9	45.13	44.70	**44.92**	44.11	14.54	13.49	**14.02**	78.37
100 N + 40 P + 2 Azoto. (kg)	T_{10}	45.17	44.67	**44.92**	44.11	14.46	13.46	**13.96**	77.61
150 N + 60 P + 20 $ZnSO_4$ (kg)	T_{11}	45.03	44.63	**44.83**	43.82	14.38	13.40	**13.89**	76.72
100 N + 60 P + 20 $ZnSO_4$ (kg)	T_{12}	45.20	44.80	**45.00**	44.37	14.57	13.51	**14.04**	78.63
150 N + 40 P + 20 $ZnSO_4$ (kg)	T_{13}	45.03	44.60	**44.82**	43.79	14.36	13.35	**13.86**	76.34
100 N + 40 P + 20 $ZnSO_4$ (kg)	T_{14}	44.97	44.50	**44.74**	43.54	14.30	13.29	**13.80**	75.57
20 t FYM	T_{15}	34.60	35.43	**35.02**	12.35	10.30	9.25	**9.80**	24.68
Control	T_{16}	30.23	32.11	**31.17**	-	8.37	7.35	**7.86**	-
CD (P=0.05)		4.372	3.318			1.922	1.901		

were statistically not significant during both the years. The scrutiny of yield data pertaining to these treatments showed relative superiority of T_1, T_3, T_5, T_6 and T_7 over T_2, T_4 and T_{15}. The later treatments, *viz.* T_2, T_4 and T_{15}, were at par in seed yield (q ha^{-1}) during both the years. In nutshell, T_8 to T_{14} treatments produced more than 75% but less than 80% seed in this investigation, and thus inference is being drawn on the basis of average of both years (Table 2). Similar trends for number and yield of okra seeds due to nutritional treatments were also reported by Shanke *et al.* (4) and Sharma and Shukla (5).

Economics of crop production

Table 3 revealed that T_8, T_9 and T_{10} treatments were registered with distinguished cost : benefit ratios.

On the other hand with T_{16} (control), this ratio was the lowest during both years. T_8, T_9, and T_{10} may also be treated practically at par due to marginal difference among themselves. The figures of net profit with these treatments were also very encouraging which also justify excellence of T_8, T_9 and T_{10} over control in particular and other treatments in general. The amount of net profit with these treatments is delineated here below in Table 3.

With the control (T_{16}), the net profit registered was only ₹ 9,710.00 in the first year and ₹ 8,345.00 ha^{-1} in the second year. With other treatments, however, the net profit per hectare was to the tune of ₹ 14,045.00 (T_{15}) to ₹ 28,748.71 (T_8) in the first year as against from ₹ 13,145.00 (T_{15}) to ₹ 29,191.71 (T_8) per hectare in the second year.

Table 3 : Cost : benefit ratios and net profit for excellent treatments.

Treatments	Net Profit		C: B ratios	
	I year	II year	I Year	II Year
T_8	₹ 28,748.71	₹ 29,191.71	1:1.27	1:1.29
T_9	₹ 28,368.08	₹ 28,740.08	1:1.25	1:1.27
T_{10}	₹ 28,583.71	₹ 29,121.71	1:1.29	1:1.32

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