J. Indian bot. Soc. 63 : 91—96, 1984.

EFFECT OF LEAF-APPLIED N AND P AT TWO BASAL FERTILISER LEVELS ON THE YIELD OF LENTIL[1]

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ABSTRACT

The effect of foliar application of 10 kg N and 2 kg P_2O_5/ha, separately and in combination, at full basal (45 kg N+70 kg P_2O_5+70 kg K_2O/ha) and half basal (22.5 kg N+35 kg P_2O_5+35 kg K_2O/ha) level, on yield characteristics of lentil (*Lens culinaris* Medic. var. T-36) was studied at Aligarh. The plants were sprayed either at 80 or 110 days after sowing. Pod number/plant, pod length, seed number/pod, 1,000 seed weight and seed yield were studied at harvest. The plants receiving full basal dose, when sprayed either with water or with 10 kg N/ha, gave maximum response. However, it was equalled by the performance of plants sprayed with 10 kg N+2 kg P_2O_5/ha and raised only with half the basal dose of fertilisers. The effect was more pronounced when the spray was applied at 110 days after sowing. Thus, considerable fertiliser economy may be effected by using the technique of foliar spray.

INTRODUCTION

There are several reasons for low production of pulses. These include constraints on inputs, mainly fertilisers, as many of our farmers are not able to apply the full recommended dose of fertilisers either due to high cost or short supply. Moreover, fertilisers applied to the soil at the time of sowing do not remain fully available to the plants as the crop approaches maturity due to many reasons (Russell, 1950). To overcome these problems, several investigators have studied the feasibility of foliar application at different places (Wittwer & Teubner, 1959; De, 1971 and Afridi, 1983). At Aligarh, considerable work has been done on foliar application of macronutrients on different crops, including cereals, oilseeds and vegetables (Afridi & Samiullah, 1973; Khalique, 1975; Samiullah & Afridi, 1975; Naqvi *et al.*, 1977; Afridi *et al.*, 1978, a, b, c, and Afridi & Parvaiz, 1981), but these do not inclube pulses. In this paper, we describe the effect of spray nitrogen and phosphorus applied at two stages on lentil, grown at full and half recommended basal fertiliser levels to establish the optimal combination of spray and basal nutrients for maximum productivity.

MATERIAL AND METHODS

The experiment was conducted during 'rabi' (winter) season of 1982-83 at the Farm-cum-Botanical Garden of the Aligarh Muslim University, Aligarh. The soil was sandy loam (pH:

[1] The paper was awarded a Certificate of Merit and Cash Prize at the VI All India Botanical Conference held at Bhubaneswar in December, 1983.

[2] M. A. and S. A. A. are grateful to the Council of Scientific and Industrial Research, New Delhi for the award of Research Fellowships.

8.5; organic carbon: 0.71% ; available nitrogen: 266.5 kg N/ha ; available phosphorus: 100 kg P_2O_5/ha and available potassium: 1619 kg K_2O/ha). Lentil (*Lens culinaris* Medic. var. T-36) was sown at the seed rate of 50 kg/ha. The seeds were treated with *Rhizobium* culture. Two doses of fertilisers, viz. full (45 kg N+70 kgP_2O_5 +70 kg K_2O /ha) and half (22.5 kg N + 35 kg P_2O_5 +35 kg K_2O/ha) recommended basal dose, were applied to the soil at the time of sowing. Aqueous solutions containing 10 kg N and 2 kg P_2O_5/ha were applied as a foliar spray separately and in combination at both basal levels. The controls at each level were sprayed with water.

The trial was based on the split plot design and consisted of two main plots, each comprising eight 5 sq m sub-plots. One main plot was sprayed at 80 days (pre-flowering stage) and the other at 110 days (pod initiation stage) after sowing. Thus, in all there were sixteen sub-plots, each with three replications (Table I). Basal nitrogen, phosphorus and potassium were applied as urea, single superphosphate and muriate of potash respectively. Spray of nitrogen and phosphorus was done in the form of aqueous solutions of urea and sodium dihydrogen orthophosphate respectively. Five yield attributes, namely pod number/plant, pod length, seed number/pod, 1,000 seed weight and seed yield, were studied at harvest (140 days after sowing).

RESULTS AND DUSCUSSION

The effect of sub-plot and main plot treatments, as well as of their interaction, was found significant for all the yield characteristics studied, except 1,000 seed weight (Tables II-III). Among sub-plot treatments, nutrient spray on plants receiving full basal dose proved superfluous. However,

TABLE I

SCHEME OF TREATMENTS

Sub-plots	Main plots		Remarks
	80 days	110 days	
A+W (T_1)	,,	,,	Half basal dose+Spray of deionised water
A+N (T_2)	,,	,,	Half basal dose+Spray of 10 kg N/ha
A+P_2O_5 (T_3)	,,	,,	Half basal dose+Spray of 2 kg P_2O_5/ha
A+N+P_2O_5 (T_4)	,,	,,	Half basal dose+Spray of 10 kg N and 2 kg P_2O_5/ha
B+W (T_5)	,,	,,	Full basal dose+Spray of deionised water
B+N (T_6)	,,	,,	Full basal dose+Spray of 10 kg N/ha
B+P_2O_5 (T_7)	,,	,,	Full basal dose+Spray of 2 kg P_2O_5/ha
B+N+P_2O_5 (T_8)	,,	,,	Full basal dose+Spray of 10 kg N and 2 kg P_2O_5/ha

A=22.5 kg N, 35 kg P_2O_5 and 35 kg K_2O/ha
B=45 kg N, 70 kg P_2O_5 and 70 kg K_2O/ha

TABLE II

EFFECT OF LEAF-APPLIED NUTRIENTS ON YIELD CHARACTERISTICS IN LENTIL

Sub-plots	Pod number/plant			Pod length (cm)			Seed number/pod		
	Main plots			Main plots			Main plots		
	80 days	110 days	Mean	80 days	110 days	Mean	80 days	110 days	Mean
T_1	238	268	253.0	0.681	0.783	0.732	1.648	1.758	1.703
T_2	263	273	268.0	0.683	0.783	0.733	1.649	1.757	1.703
T_3	290	312	301.0	0.694	0.984	0.839	1.688	1.898	1.793
T_4	298	369	333.0	0.788	0.989	0.888	1.948	1.984	1.966
T_5	302	372	337.0	0.784	0.984	0.884	1.950	1.968	1.959
T_6	293	368	330.5	0.784	0.933	0.858	1.934	1.943	1.938
T_7	290	353	321.5	0.768	0.902	0.835	1.865	1.882	1.873
T_8	273	302	287.5	0.769	0.883	0.826	1.863	1.913	1.888
Mean	280.87	327.00		0.745	0.905		1.818	1.887	

	C. D. at 5%	C. D. at 5%	C. D. at 5%
Sub-plot marginal means	10.187*	0.0283*	0.0187*
Main plot marginal means	15.487*	0.0241*	0.0183*
Sub-plot means at the same level of main plot	18.143*	0.0380*	0.0289*
Main plot means at the same level of sub-plot	17.437*	0.0389*	0.0237*

*Significant at 5% level

their performance was equalled by that of plants raised only with half the basal dose of fertilisers if sprayed with 10 kg N+2 kg P_2O_5/ha. This spray treatment increased pod number/plant by 31.6%, pod length by 21.3%, seed number/pod by 15.4% and seed yield by 50.6% as compared with its water-sprayed control (Tables II-III). Thus, on the basis of yield, considerable saving of fertilisers can be effected as in the case of cereals (Afridi *et al.* 1978, c and Afridi, 1983).

On comparing the values for main plot means, it was noted that plants sprayed at 110 days after sowing showed good response for all yield characteristics. It increased pod number/plant by 16.4%, pod length by 21.5%, seed number/pod by 1.8% and seed yield by 21.1%.

When the differences of main plot means at the same level of sub-plot were considered, all yield attributes were found to be enhanced with subplot treatments × plants sprayed at 110 days

TABLE III

EFFECT OF LEAF-APPLIED NUTRIENTS ON YIELD CHARACTERISTICS IN LENTIL

Sub-plots	1,000 seed weight (g)			Seed yield (q/ha)		
	Main plots			Main plots		
	80 days	110 days	Mean	80 days	110 days	Mean
T_1	12.181	13.284	12.732	9.18	11.26	10.220
T_2	12.289	13.682	12.985	9.87	13.48	11.675
T_3	12.487	13.984	13.235	11.48	13.58	12.530
T_4	13.984	13.986	13.985	13.93	16.86	15.395
T_5	13.884	13.084	13.484	13.98	16.98	15.480
T_6	13.864	13.034	13.449	13.69	15.82	14.750
T_7	13.098	13.028	13.063	12.84	15.80	14.320
T_8	13.017	13.186	13.101	12.82	14.68	13.750
Mean	13.100	13.408		12.12	14.87	

	C. D. at 5%	C. D. at 5%
Sub-plot marginal means	N. S.	1.847*
Main plot marginal means	N. S.	1.948*
Sub-plot means at the same level of main plot	N. S.	2.018*
Main plot means at the same level of sub-plots	N. S.	2.187*

*Significant at 5% level
N. S.—Non-significant

with respect to their counterparts i.e. sub-plot treatments × plants sprayed at 80 days. Among different combinations, 10 kg N+2 kg P_2O_5/ha, when sprayed at 110 days at half basal fertiliser level, proved best for pod number/plant, pod length, seed number /pod and seed yield.

On comparing sub-plot means at the same level of main plot, it was observed that all spray treatments, irrespective of basal dose, gave higher values for most of the yield attributes than their respective controls at both stages of growth. It is note-worthy that 10 kg N+2kg P_2O_5/ha at half basal level, when sprayed at 110 days gave about 37%, 26%, 13% and 50% increase for pod number/plant, pod length, seed number/pod and seed yield respectively over the water-sprayed control (Tables II-III).

It is further inferred from Fig. 1 that pod number/plant, pod length, seed number/pod and 1,000 seed weight were positively correlated with seed yield, having correlation coefficient (r) = +0.951, +0.931, +0.915 and +0.814

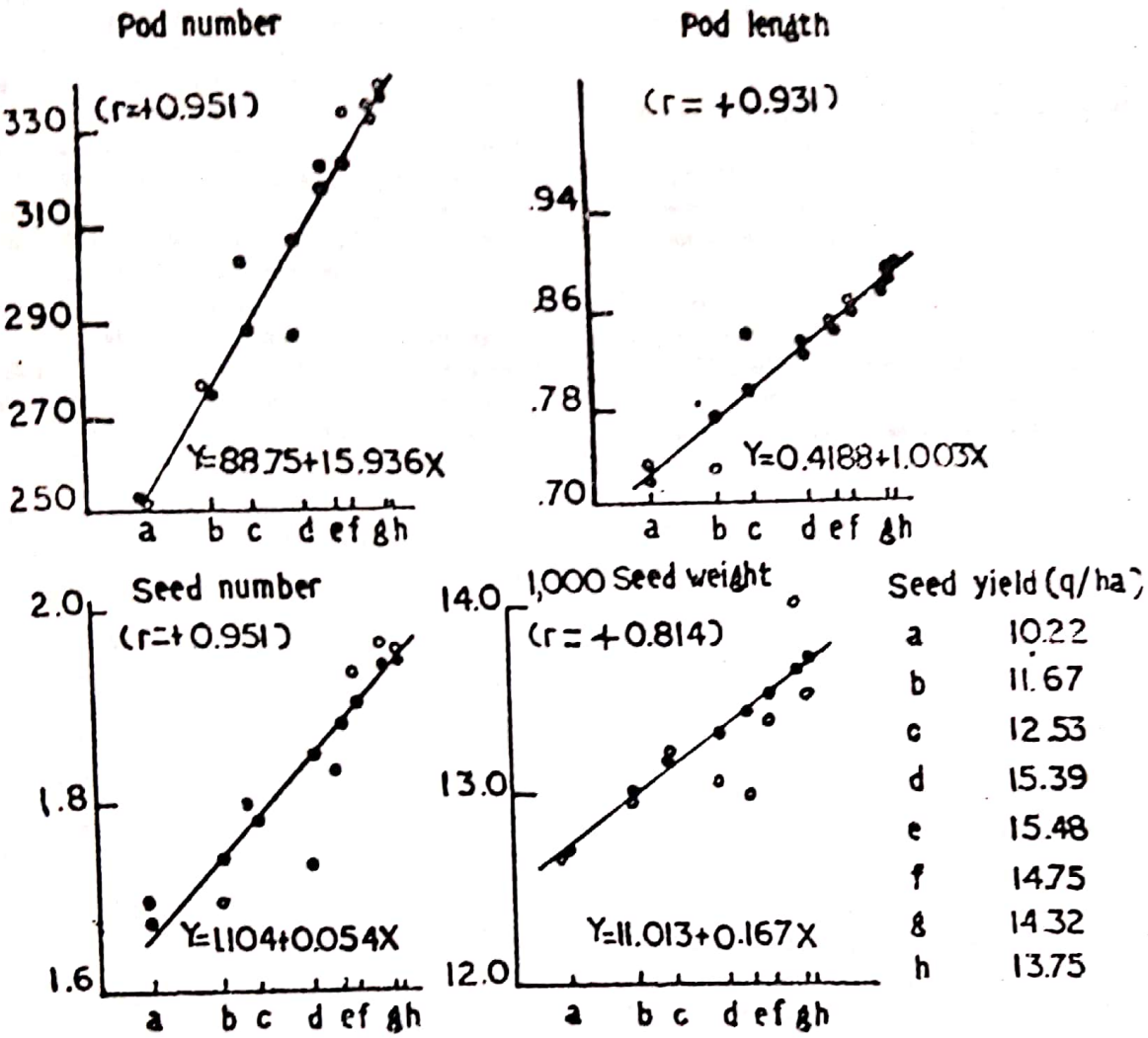

Fig. 1. Correlation coefficients and regression equations for yield characteristics

respectively, indicating the cumulative effect of these parameters on seed yield.

Considering the entire data, it is concluded that spray of 10 kg N+2kg P_2O_5/ha on plants grown with only half the recommended basal fertiliser dose 110 days after sowing, ensures maximum yield of lentil, resulting in substantial fertiliser economy.

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