

The values of simple correlation coefficients were worked out and it was found that the uptake of N, P and K by the crop at harvest were significantly and positively correlated with grain yield and the correlation coefficients were 0.706, 0.729 and 0.826 respectively. Correlations of N, P and K uptake with DMP at harvest showed that they were significant and positive, the correlation coefficients being 0.832, 0.361 and 0.940 respectively.

From the above results it was concluded that increasing the level of applied fertilisers from 50:25:25 kg.ha⁻¹ NPK to 80:40:40 kg.ha⁻¹ could increase the nutrient uptake significantly and consequently the grain and straw yields in the case of Mahsuri rice grown in the Onattukara tract of Kerala.

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RESPONSE OF GREENGRAM (CO 4) TO SOIL AND FOLIAR NUTRITION

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ABSTRACT

The effect of foliar spray of urea and di-ammonium phosphate (DAP) with and without basal dressing of fertilizer was studied on greengram Co4 at Tamil Nadu Agricultural University farm, Coimbatore during 1983-1984. Uptake of N and P was higher when basal application of 50 kg.ha⁻¹ was combined with foliar spraying of urea or DAP twice. The rate of nutrient uptake increased with age of the crop, and reached the peak at 40 and 60 days after sowing (DAS) for P and N respectively. No significant difference was observed in grain yield between urea and DAP foliar spray on equal N basis. The highest income and return rupee⁻¹ invested were recorded by foliar application of urea twice.

KEY WORDS : Greengram, Urea, Diammonium phosphate Foliar Application, Fertilizers.

In general, pulses respond well to N and P. But with regard to foliar nutrition of N and P, consistent results are not available at present. *Rajat De* (1971) indicated that a limited quantity of fertilizers could be used more profitably by foliar spray than soil application. Ramasamy and Ramiah (1980) obtained increased yield in blackgram by foliar spraying of three per cent DAP while Thandapani *et al.* (1982) observed a positive effect for foliar spray of urea in redgram. Therefore the present study was taken to study the effect of foliar spraying and soil application of nutrients on greengram var. Co 4.

MATERIALS AND METHODS

Two field experiments were conducted at the Tamil Nadu Agricultural University Farm, Coimbatore, during Kharif 1983 and summer 1984 under irrigated condition. During the experimental period, a total rainfall of 116.1 mm during the first season and 210.5 mm during the second season was received. The soil type of the experimental field was clay loam with low N, medium P and high K status. The pH of the soil was 7.9. The greengram variety Co 4 was taken for experimentation during both the seasons. A seed rate of 25 kg.ha⁻¹ was adopted with a spacing of 30 x 10 cm. The N and P were applied as per treatments.

The experiment was laid out in randomized block design with four replications. The treatment details are furnished in the Table 1 and 2 in which results were presented. Application of DAP was done as per treatment schedule. For foliar nutrition, the concentration of urea (46 per cent N) solution was 0.98 per cent. DAP (18:46:0) spray solution was prepared by dissolving DAP in water on previous day and kept overnight. The solution was filtered and sprayed on the foliage at flower initiation and pod filling stages. The concentration of the solution was 2.5 per cent. The ripened pods were picked in two stages with an interval 10 days. The pods were dried, threshed and grain yield recorded at 12 per cent moisture. The N and P content were estimated and uptake was worked out.

RESULTS AND DISCUSSION

Nitrogen uptake

The N uptake was significantly higher at 40 and 60 DAS and at harvest. The highest variation in N uptake was recorded at 60 DAS during both the seasons. This stage was the critical period for greengram as far as N requirement was concerned. Harishankar and Kushwaha (1971) observed maximum N uptake and utilization at pod filling stage in blackgram. Highest N uptake of 78.8 and 79.8 kg.ha⁻¹ during kharif and summer respectively was recorded by foliar nutrition of urea twice with half basal dose of DAP (Table 1).

Phosphorus uptake

The treatments supplied with half basal application of DAP recorded significantly higher P uptake at 40 and 60 DAS and at harvest during both the seasons. The highest value of P uptake viz. 8.75 and 8.87 kg.ha⁻¹ during *kharif* and summer were recorded at harvest stage by foliar spraying of urea twice supplied with basal DAP application (Table 1). This might be due to high permeability nature of urea applied through foliage which would have increased the absorption of P from the soil.

Rate of N and P uptake

The rate of N uptake reached the peak at 60 DAS which coincided with pod filling stage. The highest rate of N were 1.30 and 1.28 kg.ha⁻¹ day⁻¹ during *kharif* and summer respectively and declined thereafter. Similar observations were made by Moula and Krishnamoorthy (1972) in greengram. The rate of P uptake reached the maximum at 40 DAS. The values were 0.191 and 0.183 kg.ha⁻¹.day⁻¹ during kharif and summer seasons. It was also observed that the rate of P uptake at 40 DAS was about eight times greater as that of 20 DAS. Rollin Baskar (1979) found the peak rate of P uptake at 45 DAS in greengram.

Grain Yield

The soil and foliar fertilized plots were significantly superior to absolute control and water spray recorded the lowest yield during both *kharif* and summer seasons. Foliar spraying with half basal fertilizer gave significantly higher grain yield than no basal application. Foliar nutrition of DAP twice with basal DAP application recorded the highest grain yield of 1171 and 967 kg.ha⁻¹ during *kharif* and summer respectively. However, urea spraying twice gave a grain yield of 1159 and 958 kg.ha⁻¹ which were on a par with DAP spray (Table 2). The results indicated the efficiency of foliar applied N (through urea or DAP) on grain yield of greengram which was in line with findings of Thandapani *et al.* (1982) in pigeon pea. Yield increase due to half basal plus half foliar fertilization was reported by Suryawanshi and Chaudhari (1979) in gram.

Economics

Foliar nutrition of urea twice with basal dressing of DAP recorded the highest net income

of Rs.3279 and Rs. 2480.ha⁻¹ during *kharif* and summer respectively. This treatment recorded the highest net return rupee⁻¹ investment viz. Rs.2.87 and Rs.2.41 during the two seasons. The DAP spray recorded marginally lesser values. This was due to reduced cost of urea. Foliar application of urea twice without basal DAP recorded a net income of Rs.2752 and Rs.2152 ha⁻¹ during *kharif* and summer respectively which was the highest among the treatments involving no basal application of DAP (Table 2).

The result of uptake of plant nutrients, grain yield and economics of fertilizer application showed that a basal application of DAP at 50 kg.ha⁻¹ followed by foliar nutrition of urea (0.98%) twice at flower initiation and pod development stages may be recommended to greengram Co.4 under irrigated condition. Urea was found to be handy and cheap fertilizer for foliar nutrition when compared to DAP spray.

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Table 1. Effect of soil and foliar nutrition on N and P uptake in greengram Co 4 (kg ha⁻¹).

Treatments	Nitrogen uptake (kg ha ⁻¹)						Phosphorus uptake (kg ha ⁻¹)					
	Kharif 1983			Summer 1984			Kharif 1983			Summer 1984		
	40 DAS	60 DAS	At harvest	40 DAS	60 DAS	At harvest	40 DAS	60 DAS	At harvest	40 DAS	60 DAS	At harvest
Absolute control	27.1	49.1	68.2	28.0	50.2	69.7	3.68	5.54	6.61	3.74	5.66	6.68
Water spray DAP @ 50 kg ha ⁻¹ soil + FS DAP 25 kg ha ⁻¹ in two sprays (4.5 kg N)	27.0	49.2	68.3	28.0	50.2	69.7	3.67	5.57	6.69	3.76	5.68	6.71
DAP @ 50 kg ha ⁻¹ soil + FS DAP 25 kg ha ⁻¹ in two sprays (4.5 kg N)	31.3	57.3	77.1	32.6	58.0	78.3	3.98	6.80	7.92	4.02	5.91	8.04
DAP @ 50 kg ha ⁻¹ soil + FS urea 4.89 kg ha ⁻¹ one spray (2.25 kg N)	31.1	57.2	78.6	32.5	58.1	76.6	4.06	6.79	8.68	4.10	6.88	8.79
DAP @ 50 kg ha ⁻¹ soil + FS urea 9.78 kg ha ⁻¹ two sprays (4.5 kg N)	31.2	57.4	77.3	32.6	58.2	78.6	3.93	6.73	7.89	3.98	6.86	8.00
DAP @ 50 kg ha ⁻¹ soil + FS urea 9.78 kg ha ⁻¹ two sprays (4.5 kg N)	31.3	57.4	78.8	32.5	58.1	79.8	4.04	6.71	8.75	4.08	6.87	8.87
FS DAP 12.5 kg ha ⁻¹ one spray	27.2	51.9	72.1	28.6	53.2	73.6	3.69	5.72	7.11	3.75	5.99	7.22
FS DAP 25 kg ha ⁻¹ two sprays	27.0	51.9	73.5	28.5	53.1	74.9	3.67	5.86	7.64	3.77	6.01	7.88
FS urea 4.89 kg ha ⁻¹ one spray	27.1	52.0	72.3	28.6	53.2	73.5	3.68	5.81	7.10	3.76	5.97	7.19
FS urea 9.78 kg ha ⁻¹ two sprays	27.2	52.0	73.8	28.5	53.2	74.8	3.70	5.86	7.79	3.78	5.96	7.96
CD (5%)	0.2	0.3	1.1	0.2	0.3	0.8	0.16	0.20	0.21	0.19	0.22	0.16

FS-Foliar spray; DAS-days after sowing;
Foliar spray once at flower initiation and twice at flower initiation and pod development stages.

Response of greengram to soil and foliar nutrition

Table 2. Effect of soil and foliar fertilization on grain yield and economics of green gram Co 4.

Treatments	Kharif 1983			Summer 1984		
	Grain yield (kg.ha ⁻¹)	Net income (Rs.ha ⁻¹)	Return rupee ⁻¹ invest-ment Rs.	Grain yield (kg.ha ⁻¹)	Net income (Rs.ha ⁻¹)	Return rupee ⁻¹ invest-ment Rs.
Absolute control	743	1854	2.24	658	1521	2.02
Water spray	772	1933	2.26	680	1571	2.02
DAP @ 50 kg.ha ⁻¹ soil + FS DAP 12.5 kg.ha ⁻¹ one spray (2.25 kg N)	1102	2067	2.76	928	2373	2.36
DAP @ 50 kg.ha ⁻¹ soil + FS urea 4.89 kg.ha ⁻¹ one spray (2.25 kg.ha ⁻¹)	1094	3064	2.79	916	2357	2.38
DAP @ 50 kg.ha ⁻¹ soil + FS urea 9.78 kg.ha ⁻¹ two sprays (4.5 kg N)	1159	3279	2.87	958	2480	2.41
FS DAP 12.5 kg N) one sprays (4.5 kg N)	928	2519	2.60	802	1961	2.25
FS DAP 25 kg.ha ⁻¹ two sprays	985	2668	2.61	831	2059	2.24
FS urea 4.89 kg.ha ⁻¹ one spray	914	2495	2.62	798	2037	2.32
FS urea 9.78 kg.ha ⁻¹ two sprays	990	2752	2.73	838	2152	2.35
CD (5%)	52	*	*	23	*	*

FS - Foliar spray : * Data not statistically analysed

Wages for male labour Rs. 11.00
Wages for female labour Rs. 10.00

Value of one kg N - Rs. 4.50
-do- P - Rs. 5.50
-do- Grain - Rs. 4.00
-do- Stover - Rs. 0.10