

Nutrient management for rainfed greengram (*Vigna radiata*)

R. SARASWATHY, R. KRISHNASAMY AND SINGARAM

Dept. of Soil Science and Agrl. Chem., Tamil Nadu Agrl. University, Coimbatore-641 003, Tamil Nadu

Abstract: A field experiment was conducted during Rabi season of 2001 to study the effect of NPK along with composted coirpith on biometric observations, yield and nutrient content of greengram. Application of NPK at 12.5:25:25 kg ha⁻¹ along with CCP at 12.5 t ha⁻¹ increased the yield attributes, dry matter, grain yield and 100 seed weight. Nitrogen content was significantly increased in P applied plot along with CCP. Application of K at 12.5 kg ha⁻¹ significantly increased P and K content in grain.

Key words : Greengram, Biometric observations, Yield, Nutrient content.

Introduction

Pulses occupy a significant place in India especially for vegetarian people as it is considered as rich source of protein. In our country, pulse crops are primarily grown under rainfed condition and on low fertility neglected soils. Even then, India is the largest producer and consumer of pulses in the world, accounting for 33 per cent of the world's area and 22 per cent of world's production (Singhal, 1999). But its productivity is far below that of other agricultural advanced countries. Among the pulses, greengram (*Vigna radiata*) occupies 10.2 lakh hectares (4.3% of total) with the production of 4.96 lakh t (3.6% of total) in India. Proper nutrient management is an important factor to be considered for sustaining pulse productivity. An attempt has been made to emphasize the production factors independently and collectively by major nutrients and composted coirpith (CCP) for increasing the pulse productivity.

Materials and Methods

A field experiment was conducted during rabi season of 2001 at Tamil Nadu Agricultural University Farm, Coimbatore. The soil was clay loam having pH 8.0; EC 0.16 dSm⁻¹; bulk density 1.25 mg m⁻³; particle density 2.5 mg m⁻³; pore space per cent of 50; organic carbon 4.08 g kg⁻¹; KMnO₄-N 71.4 mg kg⁻¹; Olsen's P 4.65 mg kg⁻¹ and NH₄OAC-K 188.9 mg kg⁻¹. The experiment was laid out in a

randomized block design with four replications. The treatments are as follows: T₁ = 12.5:25:0 kg NPK ha⁻¹; T₂ = 12.5:25:12.5 kg NPK ha⁻¹; T₃ = 12.5:25:25 kg NPK ha⁻¹; T₄ = 12.5:25:25 kg NPK ha⁻¹ + CCP @ 12.5 t ha⁻¹; T₅ = 0:25:0 + CCP @ 12.5 t ha⁻¹. Greengram (*Vigna radiata*) var. CO-4 was sown at a spacing of 30 cm x 10 cm and 470 mm rainfall was received during crop period.

Soil samples were collected after harvest of the crop and analyzed for organic carbon, KMnO₄-N, Olsen's P and NH₄OAC-K. The biometric observations, yield of haulm and grain were recorded. The content of N, P and K were analysed as per the standard procedures.

Results and Discussion

Germination percentage

It could be observed that the CCP treated plot recorded very low germination per cent (4-48%) and it required gap filling (Fig.1). It might be due to roughness of coirpith that inhibit the emergence of plumule. In later stages due to high water holding capacity and nutrient content of CCP (NPK = 1.45%, 0.19% and 1.50%), yield of greengram increased significantly.

Biometric attributes and yield of haulm and grain

Potassium application significantly increased the DMP on 30th day. Composted coir pith

60th day30th dayTable 1. Biometric characters on 30th day and 60th day

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Treatments	30 th day					60 th day					
	Root length (cm)	Shoot length (cm)	No. of branches	No. of leaves	DMP (g plant ⁻¹)	Root length (cm)	Shoot length (cm)	No. of branches	No. of leaves	No. of clusters	No. of flowers
12.5:25:0 NPK kg ha ⁻¹	13.0	86	1	11	9.09	15.3	61.2	1.5	25	2.3	5.7
12.5:25:12.5 NPK kg ha ⁻¹	11.7	84	1	10	11.05	16.1	62.6	1.8	24	4.3	6.7
12.5:25:25 NPK kg ha ⁻¹	13.2	9.8	1	11	12.09	15.6	58.9	1.7	25	3.5	6.4
12.5:25:25+CCP @ 12.5 t ha ⁻¹	13.1	9.1	1.5	11	10.90	17.0	54.4	2.5	33	6.4	10.9
0:25:0+CCP @ 12.5 t ha ⁻¹	13.0	8.4	1	12	10.47	22.5	55.5	1.9	30	5.3	9.7
CD (P=0.05)	NS	NS	NS	NS	1.58	NS	NS	0.66	NS	2.13	1.82

Table 2. Yield attributes and yield of greengram

Treatments	No. of branches	No. of leaves	No. of pods plant ⁻¹	No. of grain pod ⁻¹	Filled grain	Haulm yield (kg ha ⁻¹)	Grain yield (kg ha ⁻¹)	100 seed weight (g)
12.5:25:0 NPK kg ha ⁻¹	2.8	7.5	2.3	4.5	1.0	5012	310	4.17
12.5:25:12.5 NPK kg ha ⁻¹	4.0	16.8	2.0	6.5	1.8	5112	396	4.17
12.5:25:25 NPK kg ha ⁻¹	3.8	13.0	3.3	5.0	2.0	5300	418	4.39
12.5:25:25+CCP @ 12.5 t ha ⁻¹	4.5	21.0	15.3	9.3	5.0	5468	473	4.43
0:25:0+CCP @ 12.5 t ha ⁻¹	3.0	12.8	6.3	5.5	1.3	4985	351	3.93
CD (P=0.05)	1.99	7.08	5.71	4.37	3.47	NS	34.49	0.03

along with N,P and K significantly influenced the number of leaves, clusters and flowers on 60th day after sowing (Table 1). Yield attributes significantly increased by the application of NPK with CCP and it was reflected in the yield (Table 2). The same result was earlier reported by Jain *et al.* (1987).

It could be observed that the application of 12.5 kg N + 25 kg P + 25 kg K along with CCP increased the grain yield of greengram significantly by 52.6 per cent as compared to 12.5 kg N + 25 kg P + 0 kg K. Haulm yield and 100 seed weight also followed the similar trend and it was increased by 9.1 per cent and 7.8 per cent respectively. The reason might be the major nutrient (K) regulates the utilization of other nutrient in the plant system (Ghonsikar and Shinde, 1997) and influenced the crop yield.

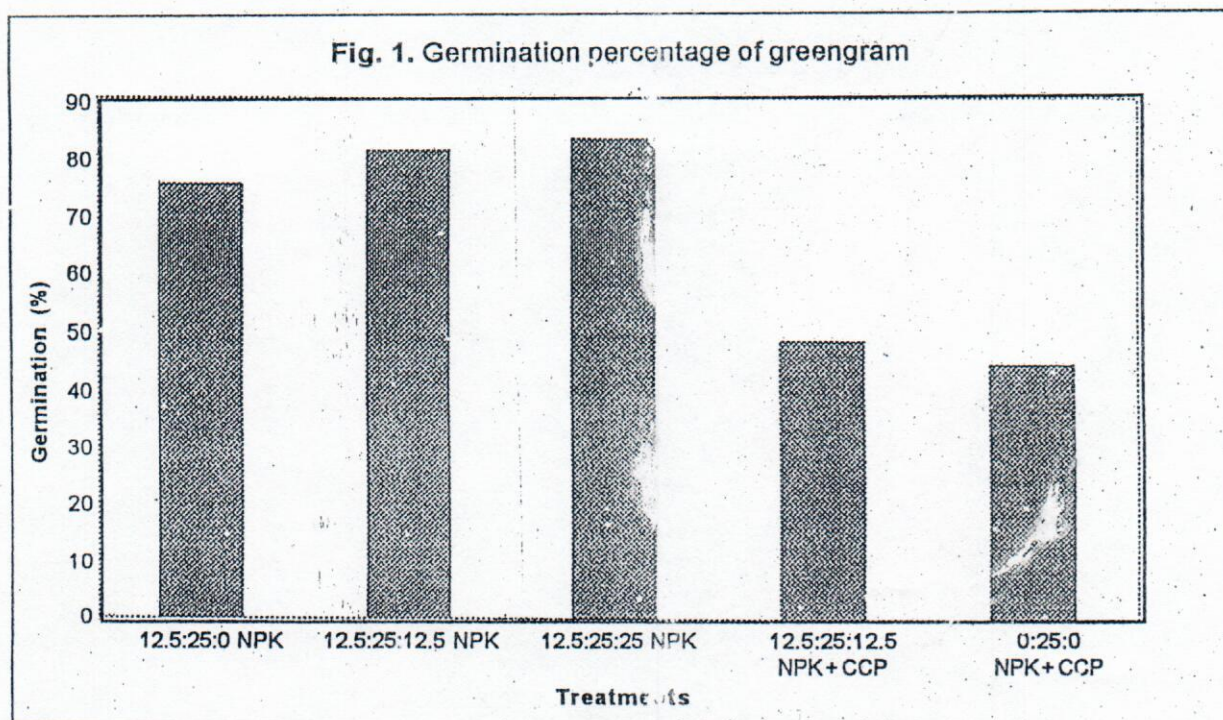
Nutrient content

Nitrogen content in plant was significantly increased by the application of CCP along with P as compared to 12.5:25:0 kg NPK ha⁻¹ on 60 or 90th day. It may be due to the application of P with minimum quantities of nitrogen increased nodulation and nitrogen fixation (Ssali and Keya, 1985). Addition of CCP highly influenced the

Table 3. Nutrient content (%) of greengram on 30th and 60th day

Treatment	30 th day			60 th day		
	N	P	K	N	P	K
12.5 : 25 : 0 NPK kg ha ⁻¹	2.58	0.20	1.38	1.74	0.15	1.16
12.5 : 25 : 12.5 NPK kg ha ⁻¹	2.97	0.19	1.16	1.79	0.18	1.20
12.5 : 25 : 25 NPK kg ha ⁻¹	3.02	0.17	1.20	1.85	0.14	1.11
12.5 : 25 : 25 + CCP @ 12.5 t ha ⁻¹	2.97	0.22	1.42	1.29	0.15	1.24
0 : 25 : 0 + CCP @ 12.5 t ha ⁻¹	2.69	0.2	1.16	1.85	0.16	1.07
CD (P=0.05)	0.02	0.007	0.04	0.01	0.01	0.03

Fig. 1. Germination percentage of greengram



content of P and K on 30th day whereas no influence could be noticed on 60th day (Table 3). Application of 12.5 kg K ha⁻¹ increased the K content in grain while 25 kg K significantly increased the K content in haulm on 60th day. N:K ratio in plants varied from 0.96 to 2.52. This value is increased in the case of grains (Table 4).

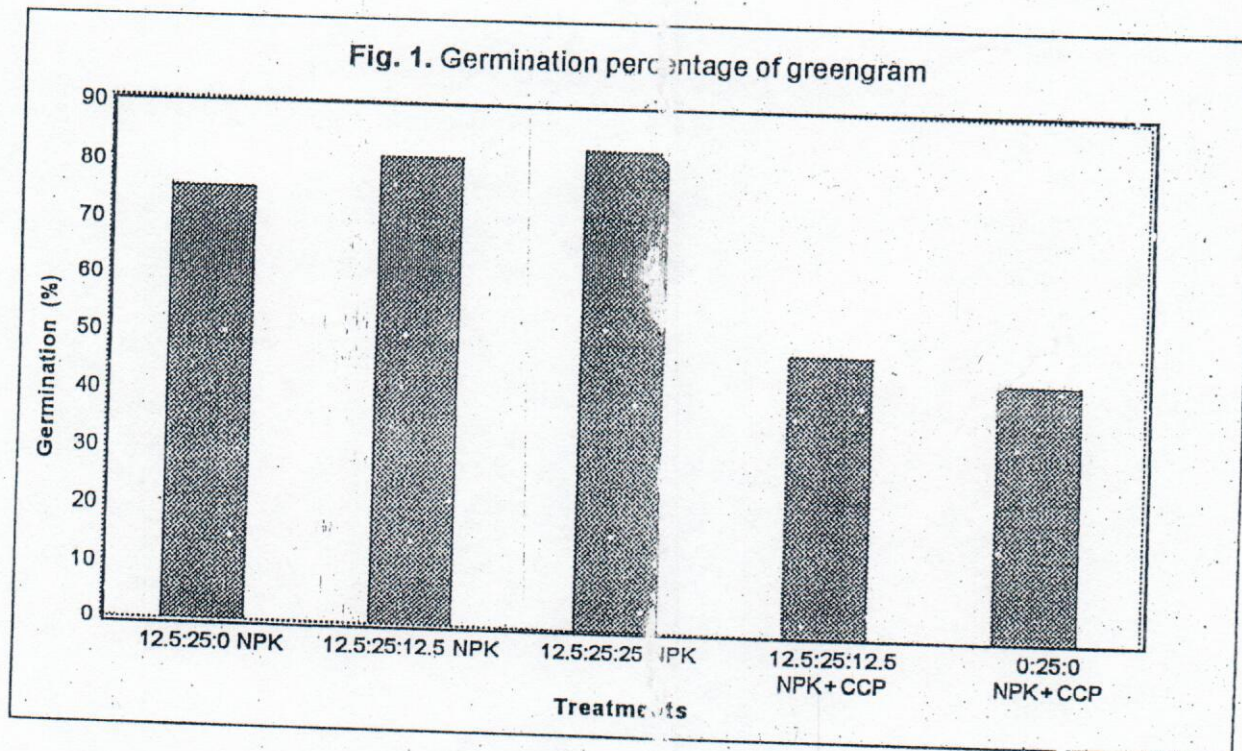
Post harvest soil fertility

Organic carbon and available K was high in NPK treated plot at the rate of 12.5 :

12.5:25 kg ha⁻¹. CCP treated plot along with N recorded high amount of available N when compared to other treatments. The reason being symbiotic nitrogen fixation does not occur efficiently when large quantities of N are added to legumes. It was observed that application of low level of starter nitrogen with P improved early root development which in turn stimulate subsequent nodule formation and N fixation (Ssali and Keya, 1985 and Ghonsikar and Shinde, 1997). Available P was more in CCP treated plot along with NPK as compared to other treatments (Table 4).

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Treatment	30 day		60 th day			
	N	K	N	P	K	
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12.5 : 25 : 12.5 NPK kg ha ⁻¹	2.97	0.19	1.16	1.79	0.18	1.20
12.5 : 25 : 25 NPK kg ha ⁻¹	3.02	0.17	1.20	1.85	0.14	1.11
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Table 4. Nutrient content of greengram and soil fertility status

Treatments	Nitrogen		Phosphorus		Potassium		Organic carbon (g kg ⁻¹)	KMnO ₄ -N (mg kg ⁻¹)	Olsen's P (mg kg ⁻¹)	NH ₄ OAC-K (mg kg ⁻¹)
	Haulm	Grain	Haulm	Grain	Haulm	Grain				
12.5 : 25 : 0 NPK kg ha ⁻¹	0.67	2.58	0.19	0.46	0.70	0.82	4.85	72.7	6.08	176.0
12.5 : 25 : 12.5 NF ⁻¹ kg ha ⁻¹	1.29	1.51	0.19	0.54	0.86	0.86	4.72	72.0	5.55	179.8
12.5 : 25 : 25 NPK kg ha ⁻¹	1.40	2.58	0.22	0.48	0.99	0.82	5.65	71.3	7.70	195.6
12.5 : 25 : 25 + CCP @ 12 t ha ⁻¹	1.23	2.91	0.18	0.49	0.90	0.82	4.94	71.6	8.20	186.6
0 : 25 : 0 + CCP @ 12.5 t ha ⁻¹	1.79	3.19	0.15	0.53	0.86	0.86	5.38	74.1	5.00	190.7
CD (P=0.05)	0.02	0.02	0.01	0.01	0.13	0.05	0.8	NS	0.13	2.13

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