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Research Article

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Influence of Nutrient Management Practices on Growth and Yield of Vegetable Cowpeain Northern Dry Zone of Karnataka (*Vigna unguiculata* L.)

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ABSTRACT

A cowpea (Vigna unguiculata Walp L.) cultivar trail was conducted at the University of Horticultural Sciences, Bagalkot during the monsoon season in 2016. The objective of this trail is to evaluate suitable variety and optimum dose of N, P, and K for the northern dry zone of Karnataka and also to evaluate nutrition quality (protein content) of vegetable cowpea as influenced by the different nutrient management practices. Cowpea seeds are sown on different treatment beds like 125%, 100%, 75%, 50 % recommend dose of fertilizers at a spacing of 45 cm row and 20 cm between the seeds. And observe for the growth parameters like plant height (cm), number of leaves, leaf area index at 30 and 60 days interval and observed yield parameters like number of pods per plant, number of cluster per plant, pod length (cm), pod fresh weight (g/plant), seed fresh weight (g/plant), total bio mass yield (kg/ha), pod yield (kg/ha) and seed yield per hectare (kg/ha) during harvest as influenced under different nutrient management practices. The result showed that the treatment of 125 % recommend dose of fertilizer along with variety Arka Suman showed significantly increase in growth parameters and yield parameters during crop growth period.

Key words: *Cowpea, Recommend dose of fertilizers (RDF)*

INTRODUCTION

Cowpea (*Vigna unguiculata* L.) is an important legume vegetable belongs to family Fabaceae[14]. The genus *Vigna* consists of 169 species out of which 120 are endemic to Africa, 28 to Asia, 14 to America and 7 to Australia. Cowpea has a chromosome number 2n=22. It has many synonyms like black eye pea, southern pea, field pea, china bean and crowder pea[10]. Cowpea is a warm-season crop well adapted to many areas of the humid tropics and sub tropical climate.

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It is a drought tolerant and warm weather crop. In India, the average productivity of our countries (465 Kg/ha) which was less than world average (1691 kg/ha). The production and productivity of vegetable cowpea crop is low, due to lack of proper nutrient management practices, among which integrated nutrient management (INM) is one of the major factor which helps in mitigating the scarcity of nutrients and improves the yield[3]. This accounts for considerable variation in fruit quality and yield parameters.The proper nutrient management is one of the major factorfor increasing the percentage of nutrients availability in the soil which influences better growth and development of the crop[9]. Variation in nutrient availability to the crop results in higher or lower yield, improved or reduced crop development and also fluctuates physiology of the crop.

Hence the present study was executed in different nutrient management practices of cowpea along with two varieties were evaluated for major yield attributing characters in *kharif* season of 2016 at University of Horticultural Sciences Bagalkot (UHSB).

MATERIAL AND METHODS

The present investigation was carried out during *kharif* season during 2016 at Haveli farm, University of Horticultural Sciences, Bagalkot. The experimental material consists of two vegetable type cowpea varieties (Arka Suman and Arka Garima) and different nutrient management practices (125 %, 100 %, 75 % and 50 % doses of RDF). The experiment was laid out in factorial randomized complete block design (RCBD) with three replications. The two varieties were sown with intra row spacing of 45 cm and inter row spacing of 20 cm with standardized package of practices to ensure healthy plant growth. Observations were recorded on five labelled plants for major growth and yield contributing characters *viz.,* plant height (cm), number of leaves, leaf area index and yield parameters like number pods per plant, number of cluster per plant, pod length (cm), pod fresh weight (g/plant), seed fresh weight (g/plant), total bio mass yield (kg/ha), pod yield (kg/ha) and seed yield per hectare (kg/ha) during harvest.

The analysis of variance was calculated by using Panse and Sukhatme[11] method.

RESULTS AND DISCUSSION

Significant differences were observed in growth, yield and quality parameters during crop growth period by adopting of varieties and different nutrient management practices. The morphological characters like (plant height, number of leaves and leaf area index) differed due to varieties and different nutrient management practices at 30 and 60 days after sowing. Result showed that at 30 DAS, variety Arka Suman recorded significantly higher plant height (13.51 cm), number of leaves (20.00), leaf area index (0.64) as compared to Arka Garima (12.41 cm), (18.40) and (0.56). Similarly, at 60 DAS, significantly higher plant height was recorded with variety Arka Suman (25.21 cm), number of leaves (79.60) and leaf area index (0.72) over Arka Garima (23.39 cm), (77.13) and (0.67) respectively (Table-1 & 2). The variation in plant height, number of leaves and leaf area index due to nutrient management practices was significant at all the growth stages. At 30 DAS, application of 125 percent of RDF (F_1) recorded significantly higher plant height (15.35 cm), number of leaves (21.83) and leaf area index (0.65) over all other levels of nutrients tested. At 60 DAS, application of 125 percent of RDF (F_1) recorded significantly higher plant height (27.32 cm), number of leaves (80.50) and leaf area index (0.74) over all other nutrients management practices expect F_2- 100 per cent of RDF which was on par with F_1 and F_5.

Among varieties and nutrient management practices V_1 F_1 recorded significantly highest plant height (15.58 cm) and number of leaves (21.83) at 30 DAS. But in case of plant height, number of leaves and leaf area index there is no significant difference between varieties and nutrient management practices at 60 DAS respectively. These results are in line with findings of

Baboo and Mishra[4], reported that the plant height increased with increasing levels of N (40 kg N/ha) and P (90 kg/ha).

Choudhary *et al.*[6] reported that the application of fertilizers up to 100% RDF recorded significantly higher plant height over its preceding levels.

Shivran and Yadava[12], reported similar results application of nitrogen and phosphorus @ 40 and 80 kg per ha resulted in maximum and significantly higher plant height, dry matter accumulation, chlorophyll content, total effective fresh and dry weight of nodules per plant. This may be due to application of major nutrients through different levels of chemical fertilizers, increased the photosynthetic activity, nitrogen metabolism and auxin contents in the plants which ultimately improving the plant height, number of leaves and leaf area index.

Among yield components like number pods per plant, number of cluster per plant, pod length (cm), pod fresh weight (g/plant), seed fresh weight (g/plant), total bio mass yield (kg/ha), pod yield (kg/ha) and seed yield per hectare (kg/ha) was significantly influenced by varieties and different nutrient management practices at harvest respectively. Result revealed that in case of number of cluster per plant was not significantly differed due to varieties, nutrient management practices and their interaction effects. The pods per plant and pod length were significantly influenced by varieties and different nutrient management practices at harvest respectively. Higher pods per plant (8.37) and pod length (18.34 cm) recorded in both Arka Suman and Arka Garima at harvest respectively (Table-3). Among different nutrient management practices application of 125 percent RDF significantly showed higher number of pods (11.36) and higher pod length (17.16 cm) at harvest respectively. Interaction effect of varieties and nutrient management practice on number of pods and pod length did not differ significantly at all growth stages. This may be due to Nitrogen accelerates the development of growth and reproductive phases thus promoting pod length and number of pods. Similar results have been reported by Kumar *et al.*[8] reported that the application of 50 kg P_2O_5 /ha as diammonium phosphate (DAP) is the best source for getting higher pod length. Singh *et al.*[13] showed that Rhizobium inoculation, 30 kg N and 60 kg P_2O_5/ha produced significantly higher length of pod and number of pods over control.

Significantly higher fresh weight of pod (24.28 g/plant) and higher seed weight (10.51 g) was observed in variety Arka Suman as compare to Arka Garima (16.88 g/plant) and (9.74 g/plant) at harvest respectively (Table-4). Among nutrient management practices 125 percent RDF (F_1) recorded significantly higher fresh weight of pod (21.30 g/plant) and highest fresh weight of seed (10.68 g/plant) as compared to F_2, F_5 and F_3 at harvest respectively. Interaction effect of varieties and nutrient management practices on pod length did not differ significantly at all growth stages. This may be due to favorable effects of nitrogen on overall metabolic processes of the plant and beneficial effects on growth. The findings are in agreement with the findings of Chandrakar *et al.*[5] reported that application of FYM or cattle dung slurry played a great role for enhancing the weight of 1000 pods and low 100 seed weight. Gohari *et al.*[7] reported that the greatest seed yield, 100 seed weight, number of pods per plant and number of leaves per plant was showed highest by the use of 30 kg per ha nitrogen fertilizer.

Results revealed that higher total bio mass (693 kg/ha), pod yield (631.7 kg/ha) and seed yield (613.5 kg/ha) was observed in variety Arka Suman as compare Arka Garima with total biomass yield (664kg/ha), pod yield (606.1 kg/ha) and seed yield (613.5 kg/ha) at harvest respectively (Table-5). Among different nutrient management practices application of 125 percent RDF (F_1) at harvest resulted in significantly total bio mass yield (3534.6 kg/ha), pod yield1693.9 kg/ha) and seed yield (1654.1 kg/ha). Among varieties and nutrient management practices V_1 F_1recorded highest pod yield (1742.4 kg/ha) over other nutrient management practices

expect V_2F_1 which was on par with V_1 F_1 at harvest respectively. But in case of total bio mass yield and seed yield per hectare did not differ significantly between varieties and nutrient management practices. This may be due to favorable effects of nitrogen on overall metabolic processes of the plant and beneficial effects on growth. The findings are in agreement with the findings of Abayomi *et al.*[1] opined that application of 150 kg NPK per ha^{-1} significantly increase the plant height, number of pods per plant, pod yield, seed yield, number of flowers and total dry matter respectively.

Table 1: Influence of different levels of nutrients on plant height no of leaves at 30 and 60 days after sowing of vegetable cowpea varieties

Fertilizer level	Plant height 30DAS (cm)			Plant height 60DAS (cm)			No. of Leaves/pl 30DAS			No. of Leaves/pl 60DAS		
	Variety		Mean of Fertilizer	Variety		Mean of Fertilizer	Variety		Mean of Fertilizer	Variety		Mean of Fertilizer
	V_1	V_2		V_1	V_2		V_1	V_2		V_1	V_2	
125%RDF	15.58	15.12	**15.35**	28.04	26.60	**27.32**	23.33	20.33	**21.83**	80.67	80.33	**80.50**
100%RDF	13.61	12.34	**12.97**	27.07	25.00	**26.04**	20.00	19.00	**19.50**	80.00	79.67	**79.84**
75%RDF	12.84	11.61	**12.23**	25.33	22.09	**23.71**	19.33	18.67	**19.00**	79.67	74.67	**77.17**
50%RDF	12.48	10.92	**11.70**	20.11	19.13	**20.02**	18.33	15.67	**17.00**	78.33	73.33	**75.83**
Organic	13.08	12.10	**12.59**	25.70	23.33	**24.52**	19.00	18.33	**18.67**	79.33	77.67	**78.50**
Mean	**13.51**	**12.41**	**13.08**	**25.21**	**23.39**	**24.32**	**20.00**	**18.40**	**19.20**	**79.60**	**77.13**	**78.37**
	Variety (V)	Fertilizer level (F)	F x V	Variety (V)	Fertilizer level (F)	F x V	Variety (V)	Fertilizer level (F)	F x V	Variety (V)	Fertilizer level (F)	F x V
S.Em±	0.25	0.39	0.56	0.55	0.87	1.23	0.44	0.70	0.98	0.61	0.96	1.35
C.D. (5%)	0.74	1.17	0.87	1.63	2.58	NS	1.31	2.07	2.92	1.80	2.85	NS

NS- Non-Significant DAS – Days After Sowing

Factor I: Varieties

V_1- Arka Suman
V_2- Arka Garima

RDF- Recommend dose of Fertilizer (25:75:60 kg NPK /ha^{-1} + *Rhizobium* 3.75 kg/ha^{-1} + PSB (10g / kg of seed) Vermicompost

Factor II: Nutrient management practices

F_1-125 % RDF
F_2-100 % RDF
F_3-75 % RDF
F_4-50 % RDF
F_5- 100 % Recommend dose of N supply through

Table 2: Influence of different levels of nutrients on stem, leaves, root and pod dry weight at harvest of vegetable cowpea varieties

Fertilizer level	Stem dry weight (g)			Leaves dry weight (g)			Root dry weight (g)			Pod dry weight (g)		
	Variety		Mean of Fertilizer	Variety		Mean of Fertilizer	Variety		Mean of Fertilizer	Variety		Mean of Fertilizer
	V_1	V_2		V_1	V_2		V_1	V_2		V_1	V_2	
125%RDF	12.64	11.21	**12.55**	13.65	11.21	**12.43**	2.70	1.94	**2.32**	9.87	8.23	**9.05**
100%RDF	12.40	12.20	**12.33**	12.61	12.20	**12.40**	1.92	1.91	**1.98**	8.23	7.93	**8.08**
75%RDF	12.25	11.97	**12.11**	11.37	11.99	**11.68**	1.90	1.84	**1.87**	7.77	7.44	**7.61**
50%RDF	12.20	11.73	**11.97**	11.03	10.93	**10.98**	1.41	1.83	**1.62**	7.45	6.77	**7.11**
Organic	12.49	12.10	**12.30**	12.92	11.73	**12.33**	2.09	2.28	**2.18**	8.23	7.73	**7.89**
Mean	**12.39**	**12.10**	**12.25**	**12.29**	**11.63**	**11.96**	**2.03**	**1.96**	**1.98**	**8.27**	**7.62**	**7.95**
	Variety (V)	Fertilizer level (F)	F x V	Variety (V)	Fertilizer level (F)	F x V	Variety (V)	Fertilizer level (F)	F x V	Variety (V)	Fertilizer level (F)	F x V
S.Em±	0.06	0.09	0.13	0.22	0.35	0.50	0.10	0.16	0.22	0.10	0.15	0.21
C.D. (5%)	0.18	0.29	NS	0.66	1.05	NS	0.29	0.46	0.65	0.39	0.62	0.82

NS- Non-Significant DAS – Days After Sowing

Factor I: Varieties

V_1- Arka Suman
V_2- Arka Garima

RDF- Recommend dose of Fertilizer (25:75:60 kg NPK /ha^{-1} + *Rhizobium* 3.75 kg/ha^{-1} + PSB (10g / kg of seed)

Factor II: Nutrient management practices

F_1-125 % RDF
F_2-100 % RDF
F_3-75 % RDF
F_4-50 % RDF
F_5- 100 % Recommend dose of N supply through Vermicompost

Table 3: Influence of different levels of nutrients on number of pods per cluster, number of cluster per plant and pods length at harvest of vegetable cowpea varieties

Fertilizer level	Pods per plant			Number of cluster per plant			Pod length (cm)		
	Variety		Mean of Fertilizer	Variety		Mean of Fertilizer	Variety		Mean of Fertilizer
	V_1	V_2		V_1	V_2		V_1	V_2	
125%RDF	2.00	2.00	**2.00**	5.67	4.00	**5.30**	14.76	19.56	**17.16**
100%RDF	2.00	2.00	**2.00**	5.33	4.00	**4.50**	14.24	18.09	**16.17**
75%RDF	2.00	2.00	**2.00**	4.33	3.67	**4.15**	13.88	17.53	**15.70**
50%RDF	2.00	2.00	**2.00**	3.67	3.33	**4.03**	13.47	17.00	**15.25**
Organic	2.00	2.00	**2.00**	4.67	4.00	**4.33**	13.50	19.57	**16.25**
Mean	**2.00**	**2.00**	**2.00**	**4.73**	**3.86**	**4.63**	**13.96**	**18.34**	**16.16**
	Variety (V)	Fertilizer level (F)	F x V	Variety (V)	Fertilizer level (F)	F x V	Variety (V)	Fertilizer level (F)	F x V
S.Em±	0.09	0.14	0.20	0.18	0.26	0.39	0.24	0.37	0.53
C.D. (5%)	NS	NS	NS	0.72	1.14	NS	0.70	1.11	NS

Table 4: Influence of different levels of nutrients on number of pods fresh weight, seed fresh weight and total bio mass yield at harvest of vegetable cowpea varieties

Fertilizer level	Pod fresh weight (g/plant)			Seed fresh weight (g/plant)			Total bio mass yield (kg/ha)		
	Variety		Mean of Fertilizer	Variety		Mean of Fertilizer	Variety		Mean of Fertilizer
	V_1	V_2		V_1	V_2		V_1	V_2	
125%RDF	25.25	17.35	**21.30**	10.72	10.64	**10.68**	365.47	3141.6	**3534.6**
100%RDF	24.69	16.49	**20.82**	10.61	9.87	**10.24**	3280.5	3030.0	**3155.2**
75%RDF	25.04	16.97	**21.01**	10.42	9.66	**10.04**	2666.7	2752.8	**2710.2**
50%RDF	21.67	16.45	**19.06**	10.30	8.90	**9.60**	2538.5	2454.9	**2496.7**
Organic	25.75	16.72	**20.74**	10.52	9.65	**10.09**	3218.6	2957.9	**3088.2**
Mean	**24.28**	**16.88**	**20.59**	**10.51**	**9.74**	**10.13**	**3072.0**	**2922.0**	**2997.0**
	Variety (V)	Fertilizer level (F)	F x V	Variety (V)	Fertilizer level (F)	F x V	Variety (V)	Fertilizer level (F)	F x V
S.Em±	0.10	0.15	0.21	0.12	0.19	0.27	38	61	86
C.D. (5%)	0.39	0.62	NS	0.35	0.56	NS	156	247	NS

Table 5: Influence of different levels of nutrients on number of pods yield and seed yield at harvest of vegetable cowpea varieties

Fertilizer level	Pod Yield (kg/ha)			Seed Yield (kg/ha)		
	Variety		Mean of Fertilizer	Variety		Mean of Fertilizer
	V_1	V_2		V_1	V_2	
125%RDF	1742.4	1645.4	**1693.9**	1697.6	1610.6	**1654.1**
100%RDF	1545.4	1493.9	**1519.6**	1498.2	1421.2	**1459.7**
75%RDF	1242.4	1342.4	**1292.4**	1320.3	1300.7	**1310.5**
50%RDF	1210.1	1187.5	**1198.8**	1187.6	1165.4	**1176.5**
Organic	1540.4	1456.6	**1498.5**	1342.6	1268.3	**1305.4**
Mean	**1456.1**	**1425.1**	**1440.6**	**1409.2**	**1353.2**	**1381.2**
	Variety (V)	Fertilizer level (F)	F x V	Variety (V)	Fertilizer level (F)	F x V
S.Em±	36	55	77	31	51	73
C.D. (5%)	112	158	172	97	154	NS

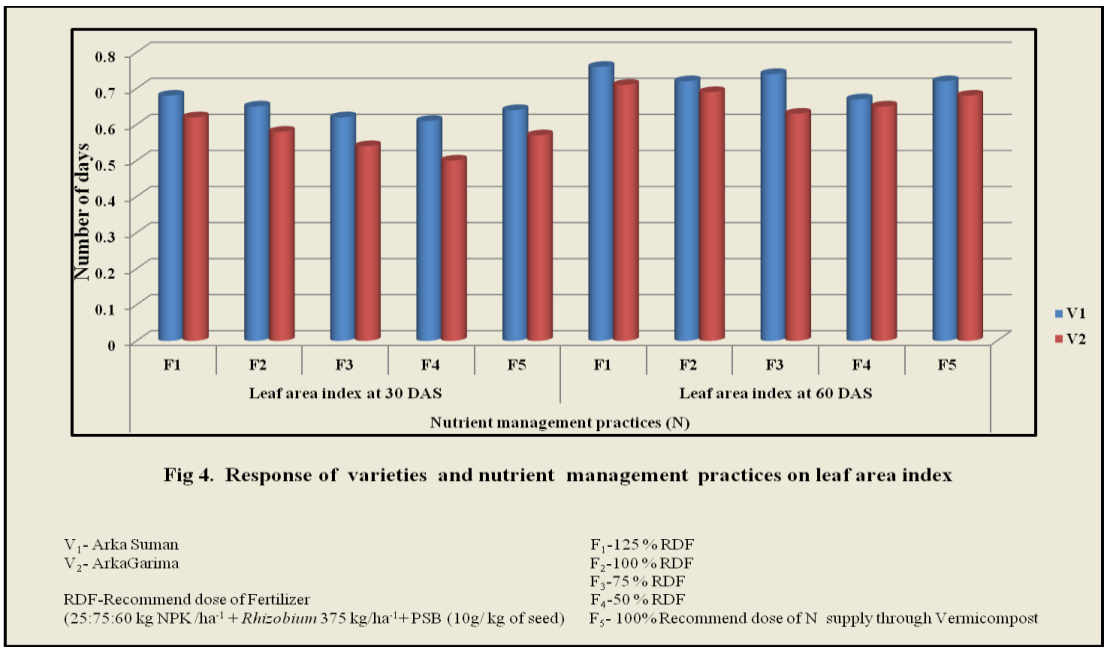

Fig 4. Response of varieties and nutrient management practices on leaf area index

Fig. 1: Influence of different levels of nutrients on leaf area index at 30 and 60 DAS of vegetable cowpea varieties

CONCLUSION

From the above investigations it can be inferred that adoption variety Arka Suman along with 125 RDF (F_1) significantly increase in growth and yield over other different nutrient management practices.

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