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Influence of Nutrient Management Practices on Yield, Quality and Nutrient Uptake of N, P and K of Vegetable Cowpea (*Vigna unguiculata* L.) in Northern Dry Zone of Karnataka, India

H. Kaviraja[1*], R. P. Manjunath[2], C. P. Mansur[3], Vijayalakshmi Patil[1], Vijaymahantesh[4], Vilas D. Gasti[4] and E. Sangeev Reddy[4]

[1]Department of Vegetable science, College of Horticultural Sciences, Bagalkot, Karnataka, India
[2]Department of Vegetable science, College of Horticultural Sciences, Banglore, Karnataka, India
[3]College of Agriculture, Hanumanmatti, University of Agricultural Sciences, Dharwad -580 005, Karnataka, India
[4]College of Horticulture, Bagalkot, University of Horticultural Sciences, Bagalkot – 587 104, Karnataka, India

**Corresponding author*

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A B S T R A C T

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 30and 60 days interval and observe yield parameters like number pods per plant, number of cluster per plant, yield parameters like 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) and quality parameters like protein percent and stover yield 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, yield parameters and quality parameters during crop growth period.

Introduction

Cowpea (*Vigna unguiculata* L.) is an important legume vegetable belongs to family Fabaceae (Verdcourt, 1970). 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 respectively. Cowpea has a

chromosome number 2n=22. It has many synonyms like black eye pea, southern pea, field pea, china bean and crowder pea (Ng and Marechal, 1985). Cowpea is a warm-season crop well adapted to many areas of the humid tropics and sub-tropical climate. It is a drought tolerant and warm weather crop. In India, the average productivity of our country is (465 Kg/ha, Bharathi *et al.,* 1992) which was less than world average (1691 kg/ha, Bharathi *et al.,* 1992). The production and productivity of vegetable cowpea crop is low, due to lack of proper nutrient management practices, among which integrated nutrient management is one of the major factor which helps in mitigating the scarcity of nutrients and improves the yield (Anuja *et al.,* 2014). This accounts for considerable variation in fruit quality and yield parameters. The proper nutrient management is one of the major factor for increasing the percentage of nutrients availability in the soil which influences better growth and development of the crop (Meera *et al.,* 2011). 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.

Materials and Methods

The present investigation was carried out during *kharif* season during 2016 at Haveli farm, University of Horticultural Sciences, Bagalkot. The experimental material consist 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 yield contributing characters *viz.*, 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) and also observe some quality parameter like protein content during harvest.

The analysis of variance was calculated by using Panse and Sukhatme (1967) method.

Results and Discussion

Significant difference were observed in yield and quality parameters during crop growth period by adopting of varieties and different nutrient management practices. Result observed that at 30 DAS and 60 DAS, variety Arka Suman recorded significantly higher 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 was 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. 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. And 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.,* (2001) reported that the application of 50 kg P_2 O_5 /ha as diammonium phosphate (DAP) is the best source for getting higher pod length. Singh *et al.,* (2011) showed that Rhizobium inoculation, 30 kg N and 60 kg P_2 O_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 Arka Garima (16.88 g/plant) and (9.74 g/plant) at harvest respectively. 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.,* (2001) 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.,* (2010) 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. 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_1at 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 favourable 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.,* (2008) 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.

And in case of percent protein was differed significantly due to varieties and different nutrient management practices at harvest respectively. Higher percent of protein reported in variety Arka Suman (0.28 %) over Arka Garima (0.26%) at harvest respectively. The variation in percent protein due to nutrient management practices was significant at all the growth stages. Application of 125 percent RDF (F_1) resulted in significantly higher percent of protein (0.61%) over all other nutrients tested at harvest expect F_2- 50 percent RDF and F_5 -100 percent N supply through vermicompost which was on par with F_1 treatment at harvest respectively. And interaction effect of varieties and nutrient management practices on percent protein did not differ significantly at all growth stages.

Table.1 Influence of different levels of nutrients on pod and seed yield at harvest of vegetable cowpea varieties

Varieties (V)	Nutrient management practices (N)											
	Pod yield (kg /ha) at harvest						Seed yield (kg /ha)at harvest					
	F_1	F_2	F_3	F_4	F_5	Mean	F_1	F_2	F_3	F_4	F_5	Mean
V_1	1742.4	1545.4	1242.4	1210.1	1540.4	**1456.1**	1697.6	1498.2	1320.3	1187.6	1342.6	**1409.2**
V_2	1645.4	1493.9	1342.4	1187.5	1456.6	**1425.1**	1610.6	1421.2	1300.7	1165.4	1268.3	**1353.2**
Mean	**1693.9**	**1519.6**	**1292.4**	**1198.8**	**1498.5**	**1440.6**	**1654.1**	**1459.7**	**1310.5**	**1176.5**	**1305.4**	**1381.2**
For comparing means of	S.Em.±			CD at 5%			S.Em.±			CD at 5%		
Varieties	36			112			31			97		
Nutrients	55			158			51			154		
V × F	77			172			73			NS		

NS- Non-Significant DAS – Days After Sowing

Factor I: Varieties Factor II: Nutrient management practices

V_1- Arka Suman
V_2- Arka Garima
F_3-75 % RDF
RDF- Recommend dose of Fertilizer (25:75:60 kg NPK /ha^{-1} + *Rhizobium* 3.75 kg/ha^{-1} + PSB (10g/ kg of seed)

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

Table.2 Influence of different levels of Nutrients on stover yield at harvest of vegetable cowpea varieties

Varieties (V)	Nutrient management practices (N)					
	Stover yield (kg/ ha) at harvest					
	F_1	F_2	F_3	F_4	F_5	Mean
V_1	1912.3	1735.1	1425.3	1328.4	1678.2	**1615.8**
V_2	1769.2	1536.1	1410.4	1267.4	1501.3	**1496.8**
Mean	**1840.7**	**1635.6**	**1417.8**	**1297.9**	**1589.7**	**1556.3**
For comparing means of	S.Em.±			CD at 5%		
Varieties	33			98		
Nutrients	52			155		
V × F	74			NS		

NS- Non-Significant DAS – Days After Sowing

Factor I: Varieties Factor II: Nutrient management practices

V_1- Arka Suman
V_2- Arka Garima
F_3-75 % RDF
RDF- Recommend dose of Fertilizer (25:75:60 kg NPK /ha^{-1} + *Rhizobium* 3.75 kg/ha^{-1} + PSB (10g/ kg of seed)

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

Table.3 Influence of different levels of nutrients on fresh weight of pods and seeds at harvest of vegetable cowpea varieties

Varieties (V)	Nutrient management practices											
	Fresh weight (g /plant) of pods at harvest						Fresh seeds weight (g /plant) at harvest					
	F_1	F_2	F_3	F_4	F_5	Mean	F_1	F_2	F_3	F_4	F_5	Mean
V_1	25.25	24.69	25.04	21.67	25.75	**24.28**	10.72	10.61	10.42	10.30	10.52	**10.51**
V_2	17.35	16.49	16.97	16.45	16.72	**16.88**	10.64	9.87	9.66	8.90	9.65	**9.74**
Mean	**21.30**	**20.82**	**21.01**	**19.06**	**20.74**	**20.59**	**10.68**	**10.24**	**10.04**	**9.60**	**10.09**	**10.13**
For comparing means of	S.Em.±			CD at 5%			S.Em.±			CD at 5%		
Varieties	0.10			0.39			0.12			0.35		
Nutrients	0.15			0.62			0.19			0.56		
V × F	0.21			NS			0.27			NS		

NS- Non-Significant DAS – Days After Sowing

Factor I: Varieties Factor II: Nutrient management practices

V_1- Arka Suman

V_2- Arka Garima

F_1-125 % RDF

F_2-100 % RDF

F_3-75 % RDF

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

F_4-50 % RDF

F_5- 100 % Recommend dose of N supply through Vermicompost

Table.4 Influence of different levels of nutrients on total bio mass yield at harvest of vegetable cowpea varieties

Varieties (V)	Nutrient management practices (N)					
	Total bio mass (kg/ ha) at harvest					
	F_1	F_2	F_3	F_4	F_5	Mean
V_1	3654.7	3280.5	2667.7	2538.5	3218.6	**3072.0**
V_2	3414.6	3030.0	2752.8	2454.9	2957.9	**2922.0**
Mean	**3534.6**	**3155.2**	**2710.2**	**2496.7**	**3088.2**	**2997.0**
For comparing means of	S.Em.±			CD at 5%		
Varieties	38			156		
Nutrients	61			247		
V × F	86			NS		

NS- Non-Significant DAS – Days After Sowing

Factor I: Varieties Factor II: Nutrient management practices

V_1- Arka Suman

V_2- Arka Garima

F_1-125 % RDF

F_2-100 % RDF

F_3-75 % RDF

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

F_4-50 % RDF

F_5- 100 % Recommend dose of N supply through Vermicompost

Table.5 Influence of different levels of nutrients on number of pods per cluster and number of cluster per plant at harvest of vegetable cowpea varieties

Varieties (V)	Nutrient management practices (N)											
	Number of pods per cluster at harvest						Number of cluster per plant at harvest					
	F_1	F_2	F_3	F_4	F_5	Mean	F_1	F_2	F_3	F_4	F_5	Mean
V_1	2.00	2.00	2.00	2.00	2.00	**2.00**	5.67	5.33	4.33	3.67	4.67	**4.73**
V_2	2.00	2.00	2.00	2.00	2.00	**2.00**	4.00	4.00	3.67	3.33	4.00	**3.86**
Mean	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**5.3**	**4.50**	**4.15**	**4.03**	**4.33**	**4.63**
For comparing means of	S.Em.±		CD at 5%				S.Em.±		CD at 5%			
Varieties	0.09		NS				0.18		0.72			
Nutrients	0.14		NS				0.26		1.14			
V × F	0.20		NS				0.39		NS			

NS- Non-Significant DAS – Days After Sowing

Factor I: Varieties Factor II: Nutrient management practices

V_1- Arka Suman

V_2- Arka Garima

F_1-125 % RDF

F_2-100 % RDF

F_3-75 % RDF

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

F_4-50 % RDF

F_5- 100 % Recommend dose of N supply through Vermicompost

Table.6 Influence of different levels of nutrients on number of pods and pod yield at harvest of vegetable cowpea varieties

Varieties (V)	Nutrient management practices (N)											
	Number of pods at harvest						Pod yield (g /plant) at harvest					
	F_1	F_2	F_3	F_4	F_5	Mean	F_1	F_2	F_3	F_4	F_5	Mean
V_1	12.53	10.23	8.56	6.37	9.84	**9.50**	10.42	10.15	8.95	7.85	9.91	**9.45**
V_2	10.19	9.65	7.54	5.71	8.79	**8.37**	9.29	8.81	7.82	6.71	8.75	**8.27**
Mean	**11.36**	**9.94**	**8.05**	**6.04**	**9.32**	**8.94**	**9.86**	**9.48**	**8.39**	**7.28**	**9.33**	**8.87**
For comparing means of	S.Em.±		CD at 5%				S.Em.±		CD at 5%			
Varieties	0.41		1.22				0.41		1.22			
Nutrients	0.65		1.93				0.65		1.96			
V × F	0.92		NS				0.92		NS			

NS- Non-Significant DAS – Days After Sowing

Factor I: Varieties Factor II: Nutrient management practices

V_1- Arka Suman

V_2- Arka Garima

F_1-125 % RDF

F_2-100 % RDF

F_3-75 % RDF

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

F_4-50 % RDF

F_5- 100 % Recommend dose of N supply through Vermicompost

Table.7 Influence of different levels of Nutrients on pod length at harvest of vegetable cowpea varieties

Varieties (V)	Nutrient management practices (N)					
	Pod length (cm) at harvest					
	F_1	F_2	F_3	F_4	F_5	Mean
V_1	14.76	14.24	13.88	13.47	13.50	**13.96**
V_2	19.56	18.09	17.53	17	19.57	**18.34**
Mean	**17.16**	**16.17**	**15.70**	**15.25**	**16.52**	**16.16**
For comparing means of	S.Em.±			CD at 5%		
Varieties	0.24			0.70		
Nutrients	0.37			1.11		
V × F	0.53			NS		

NS- Non-Significant DAS – Days After Sowing

Factor I: Varieties Factor II: Nutrient management practices

V_1- Arka Suman
V_2- Arka Garima
F_3-75 % RDF
RDF- Recommend dose of Fertilizer (25:75:60 kg NPK /ha^{-1} + *Rhizobium* 3.75 kg/ha^{-1} + PSB (10g/ kg of seed)

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

Table.8 (a) Influence of different levels of Nutrients on nitrogen in plant sample (stem and root) at harvest of vegetable cowpea varieties

Varieties (V)	Nutrient management practices (N)											
	Nitrogen (%) in cowpea stem						Nitrogen (%) in cowpea root					
	F_1	F_2	F_3	F_4	F_5	Mean	F_1	F_2	F_3	F_4	F_5	Mean
V_1	1.05	0.97	0.96	0.94	1.02	**0.98**	1.10	0.92	0.91	0.86	0.87	**0.91**
V_2	0.98	0.96	0.92	0.89	0.92	**0.93**	0.85	0.84	0.83	0.82	0.84	**0.83**
Mean	**1.02**	**0.97**	**0.94**	**0.92**	**0.97**	**0.96**	**0.94**	**0.88**	**0.87**	**0.84**	**0.86**	**0.87**
For comparing means of	S.Em.±		CD at 5%				S.Em.±					CD at 5%
Varieties	0.01		0.03				0.01					0.03
Nutrients	0.02		0.05				0.02					0.05
V × F	0.02		NS				0.03					NS

NS- Non-Significant DAS – Days After Sowing

Factor I: Varieties Factor II: Nutrient management practices

V_1- Arka Suman
V_2- Arka Garima
F_3-75 % RDF
RDF- Recommend dose of Fertilizer (25:75:60 kg NPK /ha^{-1} + *Rhizobium* 3.75 kg/ha^{-1} + PSB (10g/ kg of seed)

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

Table.8 (b) Influence of different levels of Nutrients on nitrogen in plant sample (leaves and pod) at harvest of vegetable cowpea varieties

Varieties (V)	Nutrient management practices (N)											
	Nitrogen (%) in cowpea leaves						Nitrogen (%) in cowpea pods					
	F_1	F_2	F_3	F_4	F_5	Mean	F_1	F_2	F_3	F_4	F_5	Mean
V_1	2.73	2.71	2.68	2.66	2.70	**2.69**	2.70	2.64	2.62	2.58	2.65	**2.63**
V_2	2.69	2.65	2.63	2.58	2.61	**2.31**	2.60	2.56	2.42	2.33	2.45	**2.47**
Mean	**2.71**	**2.68**	**2.66**	**2.62**	**2.65**	**2.65**	**2.66**	**2.60**	**2.52**	**2.46**	**2.55**	**2.56**
For comparing means of	S.Em.±		CD at 5%				S.Em.±		CD at 5%			
Varieties	0.02		0.06				0.02		0.07			
Nutrients	0.03		0.10				0.04		0.11			
V × F	0.05		NS				0.05		NS			

NS- Non-Significant DAS – Days After Sowing

Factor I: Varieties Factor II: Nutrient management practices

V_1- Arka Suman

V_2- Arka Garima

F_1-125 % RDF

F_2-100 % RDF

F_3-75 % RDF

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

F_4-50 % RDF

F_5- 100 % Recommend dose of N supply through Vermicompost

Table.8 (c) Influence of different levels of Nutrients on phosphorus in plant sample (stem and root) at harvest of vegetable cowpea varieties

Varieties (V)	Nutrient management practices (N)											
	Phosphorus (%) in cowpea stem						Phosphorus (%) in cowpea root					
	F_1	F_2	F_3	F_4	F_5	Mean	F_1	F_2	F_3	F_4	F_5	Mean
V_1	0.30	0.24	0.22	0.20	0.25	**0.24**	0.49	0.48	0.46	0.41	0.45	**0.45**
V_2	0.24	0.21	0.18	0.15	0.23	**0.20**	0.47	0.39	0.40	0.38	0.46	**0.42**
Mean	**0.27**	**0.23**	**0.20**	**0.18**	**0.24**	**0.22**	**0.48**	**0.44**	**0.43**	**0.40**	**0.46**	**0.44**
For comparing means of	S.Em.±		CD at 5%				S.Em.±		CD at 5%			
Varieties	0.01		0.03				0.01		0.03			
Nutrients	0.01		0.04				0.02		0.05			
V × F	0.02		NS				0.02		NS			

NS- Non-Significant DAS – Days After Sowing

Factor I: Varieties Factor II: Nutrient management practices

V_1- Arka Suman

V_2- Arka Garima

F_1-125 % RDF

F_2-100 % RDF

F_3-75 % RDF

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

F_4-50 % RDF

F_5- 100 % Recommend dose of N supply through Vermicompost

Table.8 (d) Influence of different levels of Nutrients on phosphorus in plant sample (leaves and pod) at harvest of vegetable cowpea varieties

Varieties (V)	Nutrient management practices (N)											
	Phosphorus (%) in cowpea leaves						Phosphorus (%) in cowpea pod					
	F_1	F_2	F_3	F_4	F_5	Mean	F_1	F_2	F_3	F_4	F_5	Mean
V_1	0.54	0.45	0.41	0.35	0.47	**0.44**	0.85	0.84	0.82	0.79	0.84	**0.82**
V_2	0.45	0.39	0.37	0.34	0.43	**0.39**	0.79	0.75	0.76	0.72	0.78	**0.76**
Mean	**0.49**	**0.42**	**0.39**	**0.34**	**0.45**	**0.42**	**0.82**	**0.80**	**0.79**	**0.76**	**0.81**	**0.79**
For comparing means of	S.Em.±		CD at 5%				S.Em.±		CD at 5%			
Varieties	0.01		0.04				0.01		0.02			
Nutrients	0.02		0.07				0.01		0.04			
V × F	0.03		NS				0.02		NS			

NS- Non-Significant DAS – Days After Sowing

Factor I: Varieties Factor II: Nutrient management practices

V_1- Arka Suman

V_2- Arka Garima

F_1-125 % RDF

F_2-100 % RDF

F_3-75 % RDF

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

F_4-50 % RDF

F_5- 100 % Recommend dose of N supply through Vermicompost

Table.8 (e) Influence of different levels of Nutrients on potassium in plant sample (stem and root) at harvest of vegetable cowpea varieties

Varieties (V)	Nutrient management practices (N)											
	Potassium (%) in cowpea stem						Potassium (%) in cowpea root					
	F_1	F_2	F_3	F_4	F_5	Mean	F_1	F_2	F_3	F_4	F_5	Mean
V_1	1.58	1.34	0.85	0.87	0.98	**1.12**	0.71	0.67	0.60	0.58	0.61	**0.63**
V_2	0.98	0.87	0.94	0.89	0.96	**0.92**	0.56	0.55	0.52	0.51	0.54	**0.53**
Mean	**1.28**	**1.11**	**0.89**	**0.88**	**0.97**	**1.03**	**0.64**	**0.61**	**0.56**	**0.55**	**0.58**	**0.59**
For comparing means of	S.Em.±		CD at 5%				S.Em.±		CD at 5%			
Varieties	0.06		0.18				0.01		0.03			
Nutrients	0.10		0.29				0.02		0.05			
V × F	0.14		NS				0.02		NS			

NS- Non-Significant DAS – Days After Sowing

Factor I: Varieties Factor II: Nutrient management practices

V_1- Arka Suman

V_2- Arka Garima

F_1-125 % RDF

F_2-100 % RDF

F_3-75 % RDF

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

F_4-50 % RDF

F_5- 100 % Recommend dose of N supply through Vermicompost

Table.8 (f) Influence of different levels of Nutrients on potassium in plant sample (leaves and pod) at harvest of vegetable cowpea varieties

Varieties (V)	Nutrient management practices (N)											
	Potassium (%) in leaves						Potassium (%) in pod					
	F_1	F_2	F_3	F_4	F_5	Mean	F_1	F_2	F_3	F_4	F_5	Mean
V_1	0.63	0.62	0.60	0.57	0.61	**0.60**	0.85	0.82	0.78	0.73	0.79	**0.79**
V_2	0.59	0.58	0.56	0.54	0.57	**0.56**	0.77	0.76	0.79	0.72	0.77	**0.75**
Mean	**0.61**	**0.60**	**0.58**	**0.56**	**0.59**	**0.59**	**0.81**	**0.79**	**0.78**	**0.72**	**0.77**	**0.77**
For comparing means of	S.Em.±			CD at 5%			S.Em.±			CD at 5%		
Varieties	0.01			0.02			0.01			0.03		
Nutrients	0.01			0.03			0.02			0.05		
V × F	0.01			NS			0.02			NS		

NS- Non-Significant DAS – Days After Sowing

Factor I: Varieties Factor II: Nutrient management practices

V_1- Arka Suman
V_2- Arka Garima
F_3-75 % RDF
RDF- Recommend dose of Fertilizer (25:75:60 kg NPK /ha^{-1} + *Rhizobium* 3.75 kg/ha^{-1} + PSB (10g/ kg of seed)

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

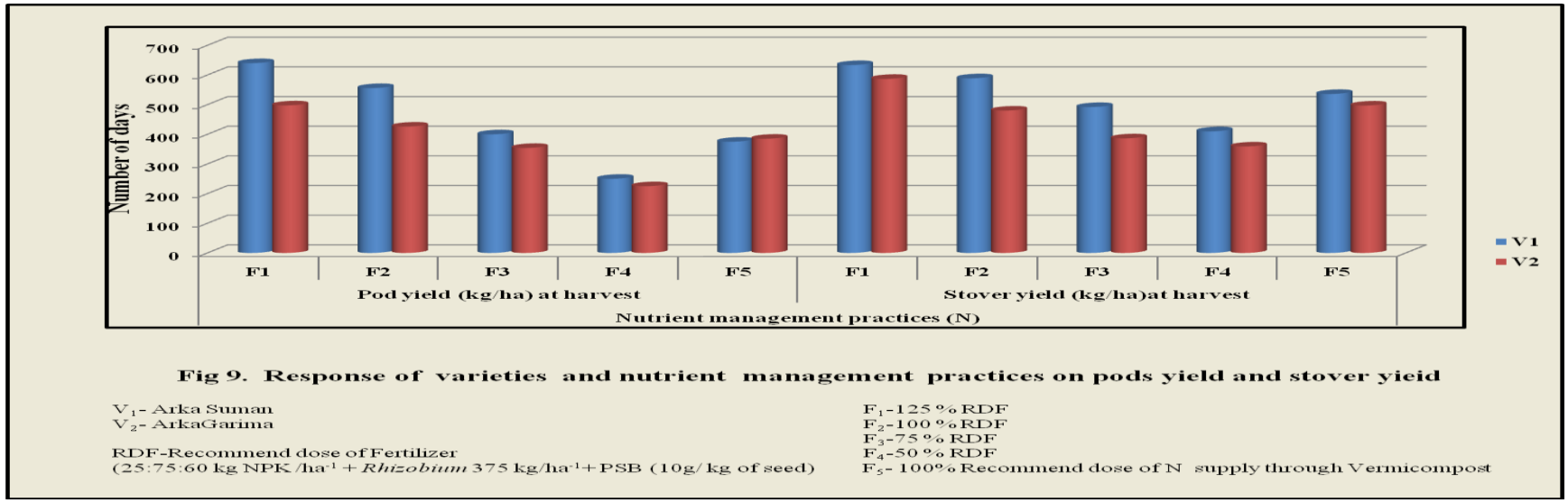

Fig 9. Response of varieties and nutrient management practices on pods yield and stover yieid

V_1- Arka Suman
V_2- ArkaGarima

RDF-Recommend dose of Fertilizer
(25:75:60 kg NPK /ha^{-1} + *Rhizobium* 375 kg/ha^{-1}+ PSB (10g/ kg of seed)

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

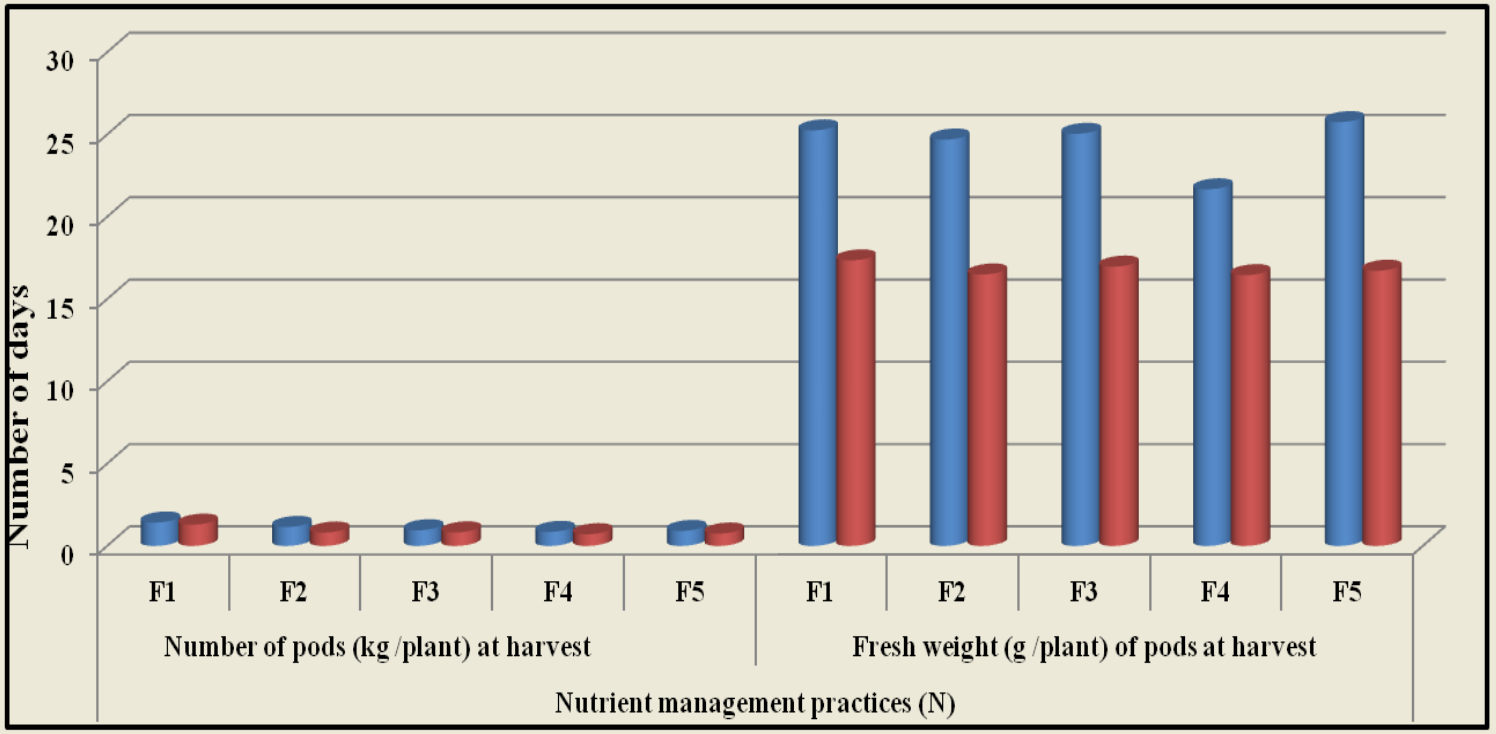

Fig 8. Response of varieties and nutrient management practices on pods per plant and fresh weight of pod

V_1- Arka Suman
V_2- ArkaGarima

RDF-Recommend dose of Fertilizer
(25:75:60 kg NPK /ha^{-1} + *Rhizobium* 375 kg/ha^{-1}+PSB (10g/ kg of seed)

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

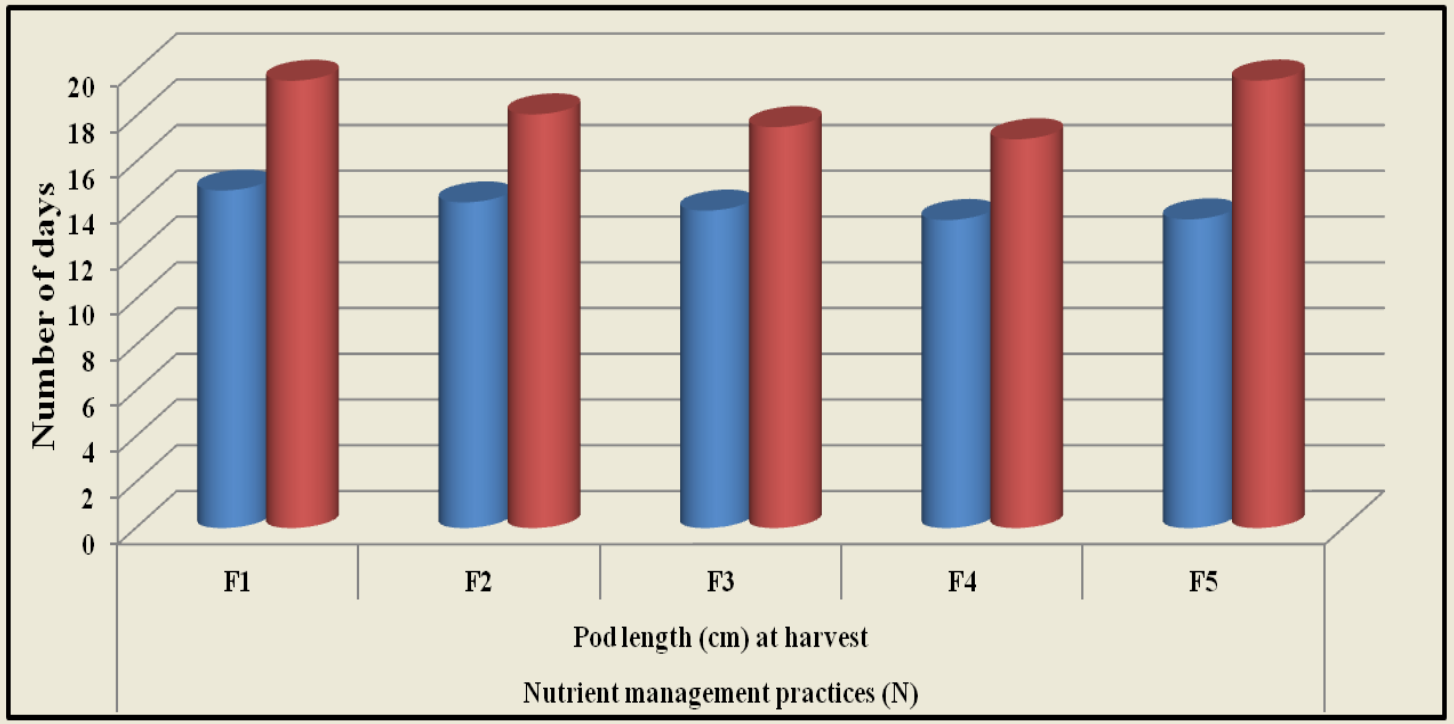

Fig 7. Response of varieties and nutrient management practices on pod length

V_1- Arka Suman
V_2- ArkaGarima

RDF-Recommend dose of Fertilizer
(25:75:60 kg NPK /ha^{-1} + *Rhizobium* 375 kg/ha^{-1}+PSB (10g/ kg of seed)

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

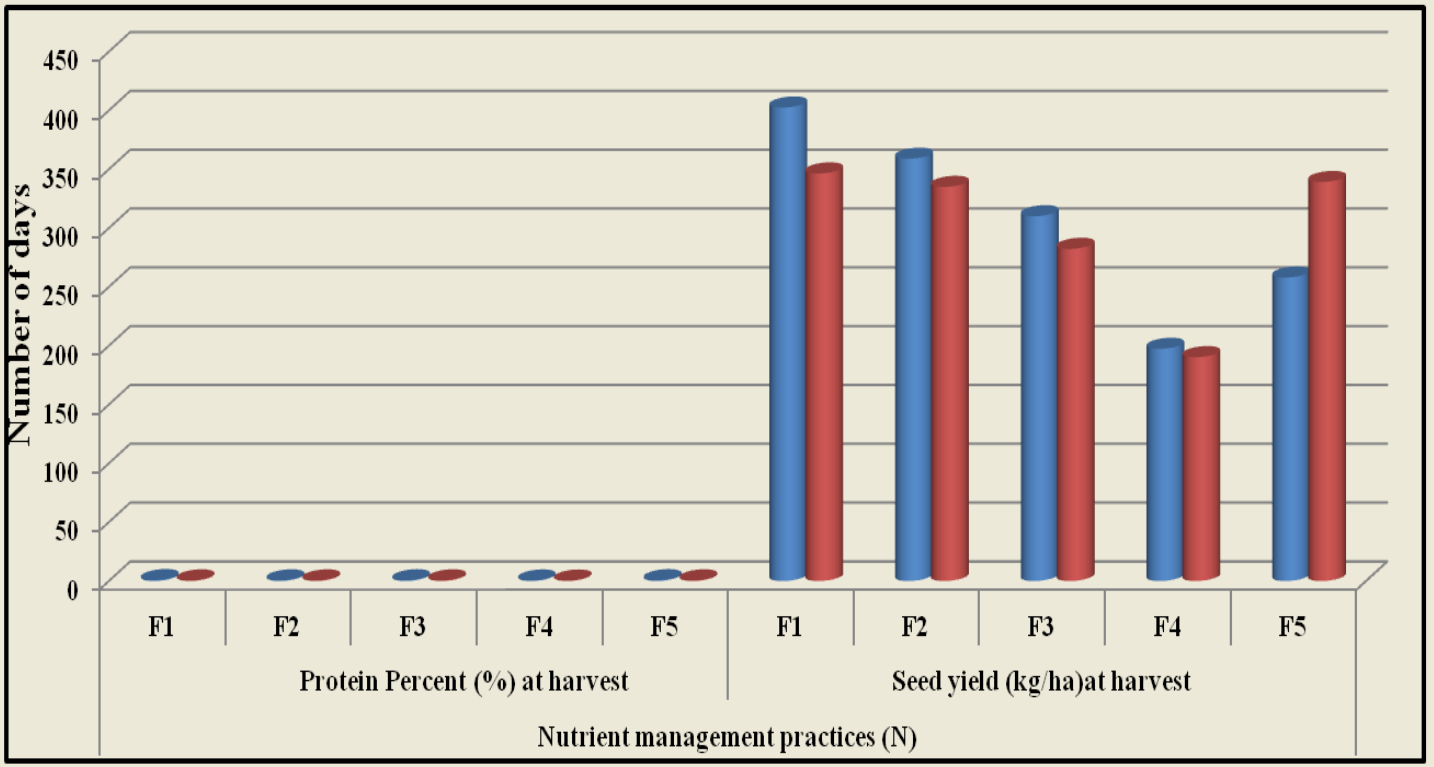

Fig 10. Response of varieties and nutrient management practices on protein percent and seed yield

V_1- Arka Suman
V_2- ArkaGarima

RDF-Recommend dose of Fertilizer
(25:75:60 kg NPK /ha^{-1} + *Rhizobium* 375 kg/ha^{-1}+PSB (10g/ kg of seed)

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

This may be due to adoption of higher levels of nutrient management practices was attributed to better growth, higher crude fiber development of cowpea varieties. These results are confirmed with findings of Anjua *et al.,* (2006) opined that application of 70 kg phosphorus and 70 kg per ha potassium significantly increased the pod yield per plot, higher crude protein content and total dry matter content. And in case of Nitrogen content in plant was significantly differed by the varieties and different nutrient management practices (Table 16 a & b). Significantly higher nitrogen per cent in stem (0.98 %), root (0.91 %), leaves (2.69 %) and pod (2.63 %) were recorded in variety Arka Suman as compare to Arka Garima in stem (0.93 %), root (0.83 %), leaves (2.31 %) and pod (2.47 %) after harvest respectively.

The variation in per cent nitrogen due to nutrient management practices was significant at all the growth stages. Application of 125 per cent of RDF (F_1) showed significantly highest per cent of nitrogen in stem (1.02 %), root (0.94 %), leaves (2.71 %) and pod (2.66 %) over all other nutrient management practices expect F_2- 100 per cent RDF, F_5-100 per cent N supply through vermicompost and F_3- 75 per cent RDF treatment after harvest.

Interaction effect of varieties and nutrient management practices on per cent nitrogen did not differ significantly at all growth stages.

Phosphorus content in plant was significantly influenced by varieties and different nutrient management practices (Table 16 c &d). Significantly higher per cent phosphorus in stem (0.24 %), root (0.45 %), leaves (0.44 %) and pod (0.82 %) were recorded in variety Arka Suman as compare to Arka Garima in stem (0.20 %), root (0.42 %), leaves (0.39 %) and pod (0.76 %) after harvest respectively. The variation in phosphorus per cent due to nutrient management practices was significant at all the growth stages. Application of 125 per cent of RDF (F_1) showed highest per cent of phosphorus in stem (0.27 %), root (0.48 %), leaves (0.49 %) and pod (0.82 %) over all other nutrient management practices expect F_2- 100 per cent RDF and F_5-100 per cent N supply through vermicompost treatment after harvest.

Interaction effect of varieties and nutrient management practice on per cent phosphorus per cent did not differ significantly at all growth stages.

The data mentioned in (Table 16 e & f) indicates that, per cent potassium in plant sample significantly differed by varieties and different nutrient management practices. Significantly higher per cent potassium in stem (1.12 %), root (0.63 %), leaves (0.60 %) and pod (0.79 %) were recorded in variety Arka Suman as compare to Arka Garima in stem (0.92 %), root (0.53 %), leaves (0.56 %) and pod (0.75 %) after harvest.

The variation in potassium per cent due to nutrient management practices was significant at all the growth stages. Application of 125 per cent of RDF (F_1) showed highest per cent of potassium in stem (1.28 %), root (0.64 %), leaves (0.61 %) and pod (0.81 %) over all other nutrient management practices expect F_2- 100 per cent RDF and F_5-100 per cent N supply through vermicompost treatment after harvest. Interaction effect of varieties and nutrient management practice on per cent potassium did not differ significantly at all growth stages.

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

References

Abayomi, Y. A., Ajibadc, T.V., Sammucl, O. F. and Saadudccn, B.F., 2008, Growth and yield responses of cowpea (*Vigna Unguiculata* L.) genotypes to nitrogen fertilizer (NPK) in the Southern Guinea Savanna Zone of Nigeria. *Asian. J. Plant Sci.*, 7 (2): 170-176.

Anuja, S. and Vijayalakshmi, C.N., 2014, Effect of organic nutrients on growth and yieldof vegetable cowpea. Asian J. Horti., 9 (1): 136-139.

Anuja, S., Iiavarasi, K., Arumugam and Angayarkanni, A., 2006, Effect of different levels of phosphorus and potassium on the yield and quality of vegetable cowpea. Plant Archi, 6 (1): 297- 299.

Baboo, R. and Mishra S.K., 2004, Growth and pod production of cowpea (*Vigna cinensis* L.) as affected by inoculation, nitrogen and phosphorus. *Annals. Agric. Res.*, 22 (1):104-106.

Chandrakar, Sarnaik, D.A. and Gupta, 2001, Effect of organic, chemical and liquid manuring in garden pea (*Pisum sativum* L.). *J. Agric. Issues*. 6 (2): 79-82.

Choudhary, S. K., Choudhary, G. L. and Prajapat, K., 2013, Response of cowpea [*Vigna unguiculata* L.) to fertility levels and mulching. *Environment and Ecology*. 31 (2): 492-495.

Gohari, A., Amiri, E., Gohari, M. and Bahari, B., 2010, Optimization of nitrogen andpotassium fertilizer consumption in cowpea production. *Indian. J. Hort.*, 36 (3): 240-244.

Kumar, C. P., Nagaraju, A. P. and Yogananda, S. B., 2001, Effect of phosphorus sources and zinc levels on growth and yield of cowpea (*Vigna unguiculata*). *J. Ecobiology.*, 13 (4): 275-278.

Meera, V., Menon, D., Bhaskarreddy, P., Prameela and Jayasreekrishnankutty, 2010, seedproduction in vegetable cowpea (*Vigna unguiculata* L.) under integrated nutrient management. Legume Res., 33 (4): 299 – 301.

Ng, N. Q. and Marechal, R., 1985, Cowpea taxonomy, origin and germplasm. Cowpeare search, production and utilization. UK, pp 11-12.

Panse, V. C. and Sukhatme P. V. (1967). Statistical methods for agricultural workers. ICAR Publications, New Delhi. pp 155.

Shivarn. N. and Yadava, R. B., 2015, Growth and nodulation of cowpea (*Vigna unguiculata* L.) as influenced by phosphorus levels and bio-inoculants. Veg. Sci., 25 (6): 125-129.

Singh, A., Baoule, A. L., Ahmed, H. G., Dikko, A. U. and Aliyu, U., 2011, Influence ofphosphorus on the performance of cowpea (*Vigna unguiculata* L.) varieties in thesudan savanna of Nigeria. Agricultural Sci., 2 (3): 313-317.

Verdcourt, B., 1970, Studies in the Leguminosae- Papilionoideae for the flora of tropical East Africa. IV. Kew Bulletin, 24: 507-569.

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