The Pharma Innovation Journal 2022; 11(2): 1293-1298

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(2): 1293-1298

www.thepharmajournal.com
Received: 04-12-2021
Accepted: 07-01-2022

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Influence of varieties and integrated nutrient management on growth, yield and quality of cowpea (*Vigna unguiculata* L.)

Neeraj Solanki, Mahendra Bairwa and Khushbu

Abstract
A field experiment entitled ''Influence of Varieties and Integrated Nutrient Management on Growth, Yield and Quality of Cowpea (*Vigna unguiculata* L.)'' was conducted at the Department of Horticulture MJRP College of Agriculture and Research, Jaipur during *kharif* season 2018-2019. The experiment consisted of sixteen treatment and Factorial Randomized Block Design with three replications. The individual varieties V2 (Pusa Sukomal) significantly increased in number of green pods per plant (14.58) and V1 (Pusa Komal) number of seeds per pod (13.08), seed yield per plant (42.82 g), seed yield per hectare (79.22), V1 (Pusa Komal) test weight (15.29 g) and V2 (Pusa Sukomal) crude protein content in seed (20.66 %) respectively as compared to control. With the application of nutrient levels (N4) significant increase in number of green pods per plant (14.25), number of seeds per pod (13.17), seed yield per plant (28.82 g), seed yield per hectare (45.30 q), test weight (15.23 g) and crude protein content in seed (20.67%) as compared to treatment N1 was recorded. The treatment combination V1N4 (Pusa Komal) + (Vermicompost 2.5 t + Rhizobium (10 g/kg of seeds) + PSB (10 g/kg of seeds) + N (30 kg) + P_2O_5 (60 kg) + K_2O (60 kg/ha). recorded the maximum yield parameters i.e. number of green pods per plant (19.00), number of seeds per pod (15.67), seed yield per plant (46.04 g), seed yield per hectare (85.55 q), and also qualitative parameters i.e. test weight (19.37 g) and crude protein content in seed (23.34%).

Keywords: Cowpea, influence of varieties, integrated nutrient management, growth, yield and quality

Introduction
Cowpea (*Vigna unguiculata* (L.) (2n=22) belonging to family Leguminosae/Fabaceae and known as "Lobia, Chowli" in Hindi. Cowpea is a nutritious vegetable consumed as tender pods, shelled beans as well as dry beans. It is also used as a fodder, green manure and cover crop. Vegetable Cowpea is considered to have been selected and developed in South East Asia from Cowpea (cultigroup *unguiculata*), which is considered to be orginated in Central Africa and widely distributed in India, Indonesia, Philippines and Sri Lanka. According to Verdcourt 1970, cowpea has five sub species which are *cylindrical*, *sesquipedalis*, *dekindtiana*, *unguiculata* and *menensis*. Among them *cylindrical*, *sesquipedalis* and *unguiculata* are cultivated species, whereas *dekindtiana* and *menensis* are wild ones. Cowpea is one of the most important vegetable crops grown during rainy and summer seasons. Tender pods as well as green shelled seeds are used as vegetable and as a pulse when dried. It is also suitable for green manuring, fodder, cover and catch crop. Chemical properties of cowpeas showed that protein ranged from 27.6-30.1%, carbohydrate 56.3-60.0%, ash 3.8-4.2%, fat 2.0-2.3% and moisture 5.9%, vitamin-C 13.0 mg The amounts of potassium, phosphorus (74 mg), calcium (0.08- 0.11%), sulphur, magnesium, iron (0.005%), zinc, manganese and copper were adequate to meet macronutrient and micronutrient demand in human diets. The ratios of 22 amino acids showed that methionine, tryptophan and tyrosine amino acids were limiting components. Harmankaya *et al*. (2015). Nitrogen being a major plant food nutrient plays a virtal role in plant growth system. It is integral part of protein, enzyme and nucleic acid and ultimately the nitrogen supply to plant is of the most importance in the crop (Jacob and Con 1963). In addition, N and P have a stimulating effect on root activity and rooting pattern of the crop. Available nitrogenous compound (also through a starter dose) enables seedlings to make a good start even before nitrogen fixation. Plants fed with organic nitrogen during vegetative periods are much larger by the onset of flowering than those dependent on symbiotic N-fixation. Application of nutrients through integrated approach reduce the cost of cultivation and also maintain as well as improve soil health by increasing the fertility, whereas, non-

monetary inputs like spacing also play an important role for boosting the yield by increasing the plant population per unit area (Biswan *et al.* 2002) [2].

Cowpea cultivation is mainly under traditional systems and cowpea grain yields in farmers' fields are low especially in the West African sub-region (0.025–0.3 Mg ha^{-1}), which is caused by severe attacks of pest complexes, diseases, low soil fertility, drought, inadequate planting systems, inappropriate cultivars and lack of inputs (Ajeigbe *et al.* 2010) [1].

It is grown extensively in the low lands and mid altitude regions of Africa (particularly in the dry savanna) sometimes as sole crop but more often intercropped with cereals such as sorghum or millet (Agbogidi, 2010).

Bio-fertilizer promotes fertilizer use efficiency. The seed inoculated with *Rhizobium* increase the number of rhizosphere and enhance microbiologically activities. Seed of pulses when inoculated with phosphate solubilizing bacteria (PSB) secret acetic substance which act as solubilizer to unavailable soil phosphorus (Khandelwal *et al.* 2012) [5]. Vermicompost is a organic compost and substitute for chemical fertilizer is advised by pioneers of organic farming. Earthworm processed organic waste, often referred to as vermicompost are finely divided peat like materials with high porosity, aeration, drain ability and water holding capacity (Khan *et al.* 2013) [6]. Phosphorus plays an important role in the plant metabolism and is a constituent of various organic substances. It is important role in photosynthesis, respiration and other physiological process of plant. Potassium has a direct and indirect impact on the plant growth. Using potassium directly causes the reduced transpiration, increasing water absorption or creating internal condition in order to endure the dryness. Integrated plant s nutrient management is the intelligent use of optimum combination of organic, inorganic and biological nutrient sources in a specific crop, cropping system and climatic situation so as to achieve and to sustain the optimum yield and to improve or to maintain the soil's physical, biological and chemical properties. Such a crop nutrition package has to be technically sound, economically attractive, practically feasible and environmentally safe. Jat *et al.* (2018) [4].

Materials and methods

A field experiment entitled Influence of Varieties and Integrated Nutrient Management on Growth, Yield and Quality of Cowpea (*Vigna unguiculata* L.) was conducted at Department of Horticulture MJRP College of Agriculture and Research, Jaipur during *kharif season* 2018-2019. The experiment was conducted at the Department of Horticulture and cultivation unit, Mahatma Jyoti Rao Phoole College of Agriculture and Research, Jaipur. Which lies in the semi-arid region of Rajasthan. Jaipur district is located at 26˚55‟ to 19.4520” N-Latitude and 75˚46‟ 43.9860” E- Longitude in Eastern Rajasthan. Agro-climatically, the district falls in Zone III-A, known as Semi-Arid Eastern Plain. Average rainfall in the region is 650 mm. Maximum temperature range in the summer is 33˚- 42˚C and minimum 0˚- 4˚C during winter season. The details of weather variable as observed under different growing environment are presented through. The present experiment was conducted in Factorial Randomised Block Design (Factorial RBD) with 16 treatments with three replication. Treatments details are-

Treatment Symbol	Treatment detail
Varieties (V)	
V1	Pusa Komal
V2	Pusa Sukomal
V3	RCV-7
V4	Arka Garima
Nutrient Levels (N)	
N1	Vermicompost 2.5 t + Rhizobium (10 g/kg of seeds) + PSB (10 g/kg of seeds) + N (0 kg) + P_2O_5 (60 kg) + K_2O (60 kg/ha)
N2	Vermicompost 2.5 t + Rhizobium (10 g/kg of seeds) + PSB (10 g/kg of seeds) + N (20 kg) + P_2O_5 (60 kg) + K_2O (60 kg/ha)
N3	Vermicompost 2.5 t + Rhizobium (10 g/kg of seeds) + PSB (10 g/kg of seeds) + N (25 kg) + P_2O_5 (60 kg) + K_2O (60 kg/ha)
N4	Vermicompost 2.5 t + Rhizobium (10 g/kg of seeds) + PSB (10 g/kg of seeds) + N (30 kg) + P_2O_5 (60 kg) + K_2O (60 kg/ha)

Treatment combinations

T_1 : V_1N_1	T_2 : V_2N_1	T_3 : V_3N_1	T_4 : V_4N_1
T_5 : V_1N_2	T_6 : V_2N_2	T_7 : V_3N_2	T_8 : V_4N_2
T_9 : V_1N_3	T_{10} : V_2N_3	T_{11} : V_3N_3	T_{12} : V_4N_3
T_{13} : V_1N_4	T_{14} : V_2N_4	T_{15} : V_3N_4	T_{16} : V_4N_4

Experimental results

The results of the present experiment entitled "Influence of Varieties and Integrated Nutrient Management on Growth, Yield and Quality of Cowpea (*Vigna unguiculata* L.)" conducted during *Kharif* 2018-2019. Department of Horticulture Mahatma Jyoti Rao Phoole College of Agriculture and Research, Jaipur are presented and described in this chapter. The data pertaining to various characters have been statistically analysed using standard method. The results of all the main effect and significant interactions have been presented in this chapter.

Growth parameter

Plant height (cm)

A perusal of data Table indicated that plant height (cm) at days after sowing differed significantly response of cowpea

varieties. The maximum plant height (66.56 cm) at 60 days after sowing were observed under V1. Whereas, the minimum plant height (44.85 cm) at 60 days after sowing was observed in V4. The data presented in the Table indicated that plant height of cowpea was significantly influenced by nutrient levels of all treatments over control. The maximum plant height (64.50 cm) at 60 DAS was recorded in treatment N4 and the minimum plant height (52.32 cm) at 60 day after sowing was recorded in treatment N1. The interaction effect of varieties and nutrient levels (V x N) was found significant The treatment combination V1N4 showed the maximum plant height (45.64 cm). Whereas, the treatment combination V4N1 gave the minimum plant height (28.68 cm).

Number of leaves per plant

A perusal of data table indicated that number of leaves per plant at 60 days after sowing differed significantly response of cowpea varieties. The maximum number of leaves per plant i.e. 41.42 was recorded in variety V1 (Pusa Komal) was significantly at 60 days after sowing. The minimum number of leaves per plant i.e. 29.80 was recorded in V4 (Arka Garima) at 60 days after sowing. different levels of nutrient. The maximum number of leaves per plant i.e. 39.34 were found under nutrient level N4 at 60 DAS. It was followed by nutrient level N3 and N2 in descending order. The minimum number of leaves per plant i.e. 33.30 were found under nutrient level N1 at 60 DAS. Further, the interaction effect among varieties and nutrient level (V x N) was found significant. The treatment combination V1N4 had the maximum number of leaves per plant (72.17) and the minimum number of leaves per plant (42.01) was recorded in treatment combination V4N1.

Number of branches per plant

Among the varieties, V1 (Pusa Komal) recorded maximum number of branches per plant i.e. (8.08) at 60 days after sowing. Whereas, the minimum number of branches per plant i.e. (5.92) at 60 days after sowing were found with V4 (Arka Garima). Nutrient level N4 recorded maximum number of branches per plant i.e. 10.25 at 60 days after sowing. Whereas, the minimum number of branches per plant i.e. 5.00 were found with N1 60 days after sowing. Further, the interaction effect among varieties and nutrient level (V x N) was found significant. The treatment combination V1N4 had the maximum number of branches per plant (11.67) and the minimum number of leaves per plant (4.33) was recorded in treatment combination V4N1.

Days to first flower initiation

Maximum days to first flower initiation i.e. 49.83 days were taken by variety V1 (Pusa Komal). It was followed by V4 (Arka Garima) and V3 (RCV-7) i.e., 43.58 and 40.42 days, respectively. Variety V2 (Pusa Sukomal) had recorded earliest flowering, it was taken 36.75 days to first flower initiation. Application of nutrient levels caused significant influence on days to first flower initiation. Maximum days to first flower initiation i.e. 45.67 days were taken under nutrient level N4. It was followed by N2 and N3 i.e., 44.08 and 41.50 days, respectively. Minimum days to first flower initiation i.e. 39.33 days were taken nutrient level N4.

Days to 50% flowering

Maximum days to 50% flowering i.e. 49.92 days were taken by variety V3 (RCV- 7). It was followed by V1 (Pusa Komal) and V4 (Arka Garima) i.e., 49.25 and 45.00 days respectively. Variety V4 (Arka Garima) had recorded earliest flowering it was taken 39.75 days to 50 % flowering. Application of nutrient levels caused significant influence on days to 50% flowering. Maximum days to 50% flowering (49.42) were taken under N1 nutrient level. It was followed by N3 and N2 i.e. 47.08 and 44.75 days, respectively. Minimum days to 50 % flowering i.e. 42.67 days were taken nutrient level N4. The interaction effect of varieties and nutrient levels (V x N) was found significant. The treatment combination V1N4 showed the days to 50% flowering 53.33 days. Whereas, the treatment combination V4N1 gave the minimum days to 50% flowering 37.33 days.

Days to harvesting

Maximum days to harvesting i.e. 86.66 days were taken by variety V1 (Pusa Komal). It was followed by V3 (RCV-7) and V2 (Pusa Sukomal) i.e. 85.87 and 75.27 days, respectively. Variety V4 (Arka Garima) had recorded earliest harvesting, it was taken 72.43 days to harvesting. Application of nutrient levels caused significant influence on days to harvesting. Maximum days to harvesting i.e. 81.30 days were taken under N4 nutrient level. It was followed by N3 and N2 i.e. 80.82 and 79.61 days, respectively. Minimum days to harvesting 78.50 were taken under nutrient level N1. The interaction effect of varieties and nutrient levels (V x N) was found significant. The treatment combination V1N4 showed the days to harvesting 89.20 days. Whereas, the treatment combination V4N1 gave the minimum days to harvesting 68.95 days.

Fresh weight (g) of plant

The perusal of data revealed that the varieties on fresh weight (g) of plant was significant. Varieties V1 gave significantly highest fresh weight (g) of plant (129.59 g) at 60 DAS. Whereas, the lowest fresh weight (g) of plant (99.83 g) was recorded in varieties V4. Nutrient levels were unable to exert a significantly on fresh weight (g) of plant was significantly influenced by different levels of nutrient. The treatment N4 gave the highest fresh weight (g) of plant (123.76 g). Whereas, the treatment N1 showed significantly the lowest fresh weight (g) of plant (117.36 g). The interaction effect of varieties and nutrient levels (V x N) was found significant. The treatment combination V1N4 showed the fresh weight (132.38 g). Whereas, the treatment combination V4N1 gave the minimum fresh weight (95.80 g).

Dry weight (g) of plant

The perusal of data indicated that the dry weight (g) of plant are differed significantly response of cowpea varieties. The varieties V1 gave significantly highest dry weight (g) of plant (53.26 g). Whereas, the lowest dry weight (g) of plant (34.89 g) was recorded in varieties V4. The data presented in the Table 4.4nindicated that the dry weight (g) of plant of cowpea was significantly influenced by nutrient levels. The treatment N4 gave the highest dry weight (g) of plant (47.83 g) was significantly influenced by different levels of nutrient. Whereas, the treatment N1 showed significantly the lowest dry weight (g) of plant (39.03 g).

The interaction effect of varieties and nutrient levels (V x N) was found significant. The treatment combination V1N4 showed the dry weight (57.61 g). Whereas, the treatment

combination V4N1 gave the minimum dry weight (31.65 g). The interaction effect of varieties and nutrient levels (V x N) was found significant with respect to days to first flower initiation (Table-4.2). The treatment combination V1N4 showed the days to first flower initiation (52.33) days. Whereas, the treatment combination V4N1 gave the minimum days to first flower initiation (32.33) days.

Yield parameters

Number of green pods per plant

The maximum number of green per plant (14.58) was recorded in V1 (Pusa Komal). Whereas, the minimum number of green pod per plant (7.08) was obtained in V4 (Arka Garima). Further, the data revealed that the number of green pods per plant was significantly influenced by different nutrient levels. The treatment N4 gave the highest number of green pods per plant (14.25) as compared to N1 showed significantly the lowest number of green pods per plant (7.33). The interaction effect of varieties and nutrient levels (V x N) was found significant. The treatment combination V1N4 showed the number of green pod per plant (19.00). Whereas, the treatment combination V4N1 gave the minimum number of green pod per plant (5.00).

Length of pod per plant

An analysis of data showed a significant influence of varieties on length of pods per pod (Table 4.5). The maximum length of pod per plant (15.17) was recorded in V1 (Pusa Komal). Whereas, the minimum length of pod per plant (10.25) was observed in V4 (Arka Garima). Further the data revealed that the length of pod per plant was significantly influenced by different levels of nutrients. The treatment N4 gave the highest length of pod per plant (15.17) as compared to N1 showed significantly the lowest length of pod per plant (11.25). The interaction effect of varieties and nutrient levels (V x N) was found significant. The treatment combination V1N4 showed the length of pod per plant (17.67). Whereas, the treatment combination V4N1 gave the minimum length of pod per plant (9.33).

Pod yield per plant (kg)

Among the varieties, maximum average pod yield per plant (3.18 kg) was found in variety V1 (Pusa Komal) significantly superior over all other varieties. It was followed by V2 (Pusa Sukomal) and V3 (RCV-7) i.e. 2.50 and 1.84 kg, respectively. Lowest pod yield per plant (1.54 kg) was observed under V4 (Arka Garima). Increase in pod yield per plant was noted with increase in nutrient level. Highest pod yield per plant (2.55 kg) was obtained with application of nutrient level N4 which was followed by nutrient level N3 > N2. Minimum pod yield per plant (2.01 kg) was recorded in case of nutrient level N1. The interaction effect of varieties and nutrient levels (V x N) was found significant. The treatment combination V1N4 showed the pod yield per plant (3.43 kg). Whereas, the treatment combination V4N1 gave the minimum pod yield per plant (1.37 kg).

Pod yield per hectare (q)

Among the varieties, maximum pod yield per hectare (78.55 q) was found in variety V1 (Pusa Komal). It was followed by V2 (Pusa Sukomal) and V3 (RCV-7) i.e. 61.88 and 45.47 q/ha respectively. Lowest pod yield per hectare (37.94 q) was observed under V4 (Arka Garima). Nutrient levels also had exerted significant effect on pod yield per hectare. There was increase in pod yield with increasing nutrient levels. Maximum pod yield per hectare (63.01 q) was observed with nutrient level N4. Whereas, the lowest pod yield per hectare (49.56 q/ha) was observed in case of nutrient level N1.The interaction effect of varieties and nutrient levels (V x N) was found significant with respect to pod yield per hectare (Table-4.6). The treatment combination V1N4 showed the pod yield per hectare (84.89 q). Whereas, the treatment combination V4N1 gave the minimum pod yield per hectare (33.86 q).

Quality parameters

Crude protein content in seed (%)

A perusal of data in Table 4.7 indicated that the crude protein content in seed (%) differed significantly response of cowpea varieties. The varieties V2 recorded significantly the highest crude protein content in seed (21.41%). Whereas, the lowest crude protein content in seed (13.29%) was recorded under treatment V3. Results indicated that the nutrient levels exhibited a significant influence on crude protein content in seed (%). Treatment N4 produced significantly the maximum crude protein content in seed i e. (29.21%) and the minimum crude protein content in seed i e. (14.47 %) was observed in treatment N1. The interaction effect of varieties and nutrient levels (V x N) was found significant with respect to crude protein content in seed (Table-4.7). The treatment combination V2N4 showed the crude protein content in seed (84.89 q). Whereas, the treatment combination V3N1 gave the minimum crude protein content in seed (33.86 q).

Table 1.

Treatments	Plant height (cm)	Number of leaves per plant	Number of branches per plant	Day to first flower initiation	Days to 50% flowering
Varieties (V)					
V1 (Pusa Komal)	41.42	65.24	8.08	36.75	49.25
V2 (Pusa Sukomal)	38.38	58.25	8.00	40.42	39.75
V3(RCV-7)	36.13	62.50	7.33	43.58	49.92
V4(Arka Garima)	29.80	44.91	5.92	49.83	45.00
S.Em±	0.14	0.14	0.17	0.15	0.12
CD at 5%	0.41	0.40	0.48	0.42	0.34
Nutrient levels (N)					
N1	33.30	52.22	5.00	45.67	49.42
N2	35.54	55.83	6.17	44.08	47.08
N3	37.64	59.68	7.92	41.50	44.75
N4	39.24	63.18	10.25	39.33	42.67
S.Em±	0.14	0.14	0.17	0.15	0.12
CD at 5%	0.41	0.40	0.48	0.42	0.34

Interaction (V x N)					
V1 N1	37.54	58.06	5.33	40.33	52.33
V1N2	39.87	62.90	6.67	38.67	50.67
V1N3	42.61	67.82	8.67	35.67	48.67
V1N4	45.64	72.17	11.67	32.33	45.33
V2N1	34.80	52.99	5.67	42.33	42.67
V2N2	38.15	54.77	7.33	41.33	40.67
V2N3	39.91	60.13	8.67	39.33	38.33
V2N4	40.64	65.11	10.33	38.67	37.33
V3N1	32.16	55.81	4.67	47.67	53.33
V3N2	34.39	61.86	6.33	45.67	51.33
V3N3	38.07	64.90	8.67	42.33	48.67
V3N4	39.88	67.43	9.67	38.67	46.33
V4N1	28.68	42.01	4.33	52.33	49.33
V4N2	29.73	43.77	4.33	50.67	45.67
V4N3	29.97	45.87	5.67	48.67	43.33
V4N4	30.81	48.00	9.33	47.67	41.67
S.Em±	0.28	0.27	0.33	0.29	0.24
CD at 5%	0.81	0.79	0.97	0.84	0.69

Table 2.

Treatments	Days to harvesting)	Fresh weight (g)	Dry weight (g)	Number of green pod per plant	Length of pod per plant
Varieties (V)					
V1 (Pusa Komal)	86.66	129.59	53.26	14.58	15.17
V2 (Pusa Sukomal)	75.27	127.84	43.54	12.58	13.83
V3(RCV-7)	85.87	125.70	43.37	8.75	13.83
V4(Arka Garima)	72.43	99.83	34.89	7.08	10.25
S.Em±	0.20	0.15	0.19	0.23	0.16
CD at 5%	0.57	0.43	0.54	0.67	0.47
Nutrient levels (N)					
N1	78.50	117.36	39.03	7.33	11.33
N2	79.61	120.07	43.15	9.42	12.75
N3	80.82	121.79	45.06	12.00	13.83
N4	81.30	123.76	47.83	14.25	15.17
S.Em±	0.20	0.15	0.19	0.23	0.16
CD at 5%	0.57	0.43	0.54	0.67	0.47
Interaction (V x N)					
V1 N1	83.98	126.58	48.86	9.67	12.67
V1N2	85.72	128.28	51.93	13.00	14.67
V1N3	87.75	131.13	54.65	16.67	15.67
V1N4	89.20	132.38	57.61	19.00	17.67
V2N1	71.92	124.51	36.81	8.00	11.67
V2N2	74.36	127.54	42.65	10.33	13.33
V2N3	76.16	128.61	44.96	14.33	14.67
V2N4	78.63	130.72	49.72	17.67	15.67
V3N1	89.13	122.54	38.79	6.67	11.67
V3N2	87.71	125.77	43.09	8.00	13.33
V3N3	84.97	126.49	44.85	9.33	14.67
V3N4	81.64	127.100	46.76	11.00	15.67
V4N1	68.95	95.80	31.65	5.00	9.33
V4N2	70.64	98.69	34.91	6.33	9.67
V4N3	74.38	100.91	35.76	7.67	10.33
V4N4	75.73	103.92	37.24	9.33	11.67
S.Em±	0.39	0.30	0.37	0.46	0.33
CD at 5%	1.13	0.86	1.07	1.33	0.94

Table 3.

Treatments	Pod yield per plant (kg)	Pod yield per hectare (q)	Crude protein content in seed (%)	Dry weight (g)	Pod yield per plant (kg)	Pod yield per hectare (q)
Varieties (V)						
V1 (Pusa Komal)	3.18	78.55	9.10	53.26	3.18	79.22
V2 (Pusa Sukomal)	2.50	61.88	0.92	43.54	2.50	61.64
V3(RCV-7)	1.84	45.47	13.29	43.37	1.84	10.69
V4(Arka Garima)	1.54	37.94	18.80	34.89	1.54	11.66
S.Em±	0.01	0.16	0.13	0.19	0.01	0.20

CD at 5%	0.02	0.47	0.38	0.54	0.02	0.59
Nutrient levels (N)						
N1	2.01	49.56	14.47	39.03	2.01	35.89
N2	2.16	53.30	16.90	43.15	2.16	38.85
N3	2.34	57.92	19.06	45.06	2.34	43.16
N4	2.55	63.06	21.69	47.83	2.55	45.30
S.Em±	0.01	0.16	0.13	0.19	0.01	0.20
CD at 5%	0.02	0.47	0.38	0.54	0.02	0.59
Interaction (V x N)						
V1 N1	2.96	73.02	15.44	48.86	2.96	73.69
V1N2	3.09	76.52	18.08	51.93	3.09	76.86
V1N3	3.23	79.79	20.51	54.65	3.23	81.79
V1N4	3.43	84.89	22.38	57.61	3.43	84.55
V2N1	2.24	55.23	16.81	36.81	2.24	54.93
V2N2	2.42	59.84	19.90	42.65	2.42	59.18
V2N3	2.64	65.18	21.93	44.96	2.64	65.18
V2N4	2.72	67.26	25.06	49.72	2.72	67.26
V3N1	1.46	36.14	10.86	38.79	1.46	6.18
V3N2	1.66	41.01	12.83	43.09	1.66	8.34
V3N3	2.01	49.76	13.98	44.85	2.01	13.01
V3N4	2.23	54.97	15.48	46.76	2.23	15.22
V4N1	1.37	33.86	14.75	31.65	1.37	8.77
V4N2	1.45	35.84	16.78	34.91	1.45	11.03
V4N3	1.49	36.94	19.81	35.76	1.49	12.68
V4N4	1.83	45.14	23.86	37.24	1.83	14.15
S.Em±	0.01	0.33	0.26	0.37	0.013	0.406
CD at 5%	0.04	0.94	0.76	1.07	0.038	1.172

Conclusion

It may be concluded that variety, V1 (Pusa Komal) recorded superior performance for growth attributes, yield attributes and quality attributes. Variety V1 (Pusa Komal) had taken minimum days to first flowering, days to 50% flowering had taken minimum V2 (Pusa Sukomal) and days to harvesting whereas, variety V4 (Arka Garima) had taken maximum days. Among the nutrient levels N4 resulted in the highest growth parameters, yield and yield parameters and quality parameters of Cowpea seed. Though, it caused delay in commencement of first flower initiation, 50% flowering and harvesting. Combination of varieties and nutrient levels was significant. However, numerically treatment combination V1N4 showed superior performance for growth parameters, yield parameters and quality parameters On the basis of economic returns it may be concluded that treatment V1N4 (Pusa Komal + Vermicompost 2.5 t + Rhizobium (10 g/kg of seeds) + PSB (10 g/kg of seeds) + N (30 kg) + P2O5 (60 kg) + K2O (60 kg)/ha) was more beneficial for farmer's point of view.

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