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Original Research Article

Effect of Integrated Nutrient Management on growth and Yield of Cowpea (*Vigna unguiculata* L.)

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Keywords

Growth and yield attributes, Rhizobium, Vermicompost, NPK and Cowpea

A B S T R A C T

A field experiment was conducted at central research farm department of Soil Science and Agricultural Chemistry, SHUATS, Allahabad in *kharif* 2016-17 to assess the effect of integrated nutrient management on growth and yield of cowpea (*Vigna unguiculata* L.). The experiment was laid out in randomized block design with three replications. The experiment comprised nine treatments combination were applied to the cowpea. The best results revealed that treatment combination T_8=N_1+R_1 @ 100% RDF + 20g kg^{-1} seed Rhizobium. Showed significantly better growth, yield and net returns of cowpea.

Introduction

Cowpea [*Vigna unguiculata* (L.)] is also known as black eye pea, southern pea and Crowder pea. It is an important legume vegetable crop. The crop is used for variety of ways, as vegetable it is grown for its long tender green pods which are used as a vegetable.

Mature but green seeds are also used as a vegetable purpose. Commonly it is used for soil fertility improvement through biological nitrogen fixation, green manuring, forage yield, production of high quality hay and silage, synthesis of nutritional products, suppression of weeds, food, and a source of protein and income generation (Kimiti *et al.*, 2011).

Cowpea is short duration, high yielding and quick growing crop and provided quick and thick cover on the ground thus helping in conservation of soil. It is grown as alternative crop in dry land farming. The basic concept of integrated nutrient management system is the maintenance of plant nutrients supply to achieve a given level of crop production by optimizing the benefits from all possible sources of plant nutrients in an integrated manner, appropriate to each cropping system and farming system (Mahajan and Sharma 2005).

Nutrients are directly related with the growth and yield of cowpea. 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).

Organic compost is a very important method of providing the plants with their nutritional requirements without having an undesirable impact on the environment (Adeoye *et al.*, 2011*).* There has been much discussion on the effect of organic fertilizer and waste compost from pig manure, farmyard manure (FYM), crop residues and ashes on soil properties and crop quality (Abdel-Rahman *et al.,* 2009).

Rhizobium inoculation increased the root nodulation through better root development and more nutrient availability, resulting in vigorous plant growth and dry matter production which resulted in better flowering, fruiting and pod formation and ultimately there was beneficial effect on seed yield (Sardana *et al.*, 2006*).*

Vermicompost has been emerging as an important source in supplementing chemical fertilizer in agriculture in view of sustainable development after Rio Conference, vermicompost is a bio fertilizer enriched with all beneficial soil microbes and also contains all the essential plant nutrients like N, P and K. Since vermicompost helps in enhancing the activity of microorganisms in soil which further increase solubility of nutrients and their consequent availability to plants is known to be altered by microorganism by reducing soil pH at microsites, chelating action of organic acids produced by them and intraphyl mobility in the fungal filaments (Parthasarathi *et al.*, 2008).

Objectives

To study the interaction effect of different levels of NPK, *Rhizobium* and Vermicompost on growth and yield of cow pea.

Materials and Methods

A field experiment was conducted on research farm of Department of Soil Science and Agricultural Chemistry, Naini Agricultural Institute, SHUATS Allahabad, (U.P.) India. The soil of experimental area falls in order Inceptisol and the experimental field is alluvial in nature. The design applied for statistical analysis was carried out with 3x3 randomized block design having three factors with levels of N: P: K @50 and 100 % ha^{-1}, Levels of Rhizobium @ 50 and 100 % ha^{-1}, Level of Vermicompost @ 50 and 100 % ha^{-1} respectively. The source of NPK, *Rhizobium* and Vermicompost as Urea, DAP, MOP respectively. Basal dose of fertilizer was applied in respective plots according to treatment allocation unifurrows opened by about 5cm. depth before sowing seeds in soil at the same time sowing of seeds was sown on well prepared beds in shallow furrows, at the depth of 5cm, row to row distance was maintained at 30cm and plant to plant distance was 10cm, during the course of experiment, observations were recorded as mean values of the data.

Results and Discussion

The table shows the interaction effects of N P K, Rhizobium, and Vermicompost are generally influenced growth and yield of cowpea.

The statistically analyzed data presented in table. The result of the data shows that No. of pod per plant, Weight of green pod, Length of pod, No. of Seed/Pod, of cowpea.

Table.1 Treatment Combinations

S. No.	Symbol Treatment	Combination
1	(T_0= Control)	(Control)
2	(T_1=N_2 + V_2)	(@ 50%RDF + 3 t/ha. Vermicompost)
3	(T_2=N_1 + V_2)	(@ 100%RDF + 3 t/ha. Vermicompost)
4	(T_3=N_2 + V_1)	(@ 50%RDF + 6 t/ha. Vermicompost)
5	(T_4=N_1 + V_1)	(@ 100%RDF + 6 t/ha. Vermicompost)
6	(T_5= N_2+ R_2)	@ 50%RDF + 10g/kg seed Rhizobium)
7	(T_6= N_1+ R_2)	(@ 100%RDF + 10g/kg seed Rhizobium)
8	(T_7= N_2+ R_1)	(@ 50%RDF + 20g/kg seed Rhizobium)
9	(T_8= N_1+ R_1)	(@ 100%RDF + 20g/kg seed Rhizobium)

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Treatment combination	No. Pod/Plant 50 DAS	75 DAS	Weight of green pod	Length of pod	No. of seed/pod
T_0 **(Control)**	10.57	4.67	47.94	10.73	7.03
T_1**(N_2+V_2)**	11.77	4.90	50.69	10.87	7.40
T_2**(N_1+V_2)**	12.23	5.47	51.57	11.40	7.83
T_3**(N_2+V_1)**	13.88	6.10	53.49	11.87	8.07
T_4**(N_1+V_1)**	15.72	6.87	58.33	13.13	8.34
T_5**(N_2+R_2)**	17.36	8.33	61.27	14.10	8.73
T_6**(N_1+R_2)**	18.38	9.30	64.31	14.32	9.01
T_7**(N_2+R_1)**	20.33	10.50	67.52	15.17	10.20
T_8**(N_1+R_1)**	21.38	12.03	73.49	16.57	11.83
F- test	S	S	S	S	S
S. Em (±)	0.757	0.319	1.283	0.385	0.131
C. D. at 5%	1.563	0.658	2.649	0.796	0.271

The maximum found in T_8 – N_1+R_1 (100% RDF @ $N_{20}P_{60}K_{40}$ + 20g kg^{-1} seed *Rhizobium*) followed by T_7 - N_2 + R_1 **(@** 50% RDF + 20g kg^{-1} seed Rhizobium). Similar result were observed by Meena *et al.,* (2016) and Upadhyay *et al.,* (2016).

It was concluded from trial that the various level of N P K, Rhizobium and Vermicompost from different sources in the experiment, the treatment combination T_8 (N_{20} P_{60} K_{40} Kg ha^{-1}, Rhizobium 200 g/ 10 kg seed, VC-6 t/ha).Thus it could be recommended for profitable production of Cowpea [*Vigna unguiculata* (L.)] Integrated nutrient management is better for soil health and Cowpea production.

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