International Journal of Agriculture Sciences
ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 10, Issue 18, 2018, pp.-7186-7188.
Available online at https://www.bioinfopublication.org/jouarchive.php?opt=&jouid=BPJ0000217

Research Article

EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON GROWTH AND YIELD OF COWPEA (*Vigna Unquiculata* L walp)

VERMA H.*, PARIHAR M.S., NAWANGE D.D. AND SAHU M.K.
Department of Horticulture, R.A.K. College of Agriculture, Sehore, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh, 474002, India
*Corresponding Author: Email - hemlataverma5@gmail.com

Received: September 10, 2018; Revised: September 25, 2018; Accepted: September 26, 2018; Published: September 30, 2018

Abstract: An experiment on effect of integrated nutrient management on growth and pod yield in cowpea was conducted with 12 treatment combination. The experiment was conducted in *Kharif* 2012-13 in Randomized Block Design at the Horticulture Research Farm, RAK College of Agriculture, RVSKVV Sehore. Among these treatments highest plant height, no of branches, no of nodules ,pod per cluster, number of pods per plant, pod length, pod girth, pod weight, number of seeds per pods, pod yield per hectare was noted in treatment combination T_9 (Vermicompost 5 t/ha + 60:80:75 kg NPK/ha through chemical fertilizer) . Whereas, the treatment combination T_1 (FYM 20 t/ha + No chemical fertilizer) was exhibited the lowest pod yield /ha. Under the treatment combination T_9 was obtain highest pod yield 151.59 q/ha with maximum net return of Rs. 105571 /ha and cost benefit ratio 1:3.29. However the lowest 50.36 q/ha pod yield along with net return of Rs. 15067/ha and cost benefit ratio 1:1.43 was observed in T_1 (FYM 20 t/ha + No chemical fertilizer).

Keywords: Vermicompost, FYM, Neem cake, Poultry manure, Cowpea, Growth, Yield

Citation: Verma H., *et al*., (2018) Effect of Integrated Nutrient Management on Growth and Yield of Cowpea (*Vigna unquiculata* L. Walp.). International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 10, Issue 18, pp.- 7186-7188.

Introduction

Cowpea (*Vigna unquiculata* L. Walp.) is one of the most important leguminous vegetable crops. Leguminous crops play an important role in Indian Agriculture. The protein in cowpea seed is rich in amino acids, *viz*. lycine and tryptophan as compared to cereal grains. However, it is deficient in methionine and cysteine as compared to cereals. Cowpea has unique ability of biological nitrogen fixation, deep root system, mobilization of insoluble soil nutrient and bringing qualitative changes in soil. Cowpea (*Vigna unquiculata* L.) belongs to the family leguminoceae and having chromosome number 2n=22 with genus Vigna. It is originated from Central Africa and mainly cultivated in Asia, Africa, Central and South America. In India it is grown in the states like Rajasthan and adjoining part of Himachal Pradesh have a good acreage under this crop. There is worldwide consensus that sole dependence on chemical input based agriculture is not suitable in long run and only integrated plant nutrient system (IPNS) involving a combination of fertilizer and organic manures are essential to sustain crop production, preserve soil health and biodiversity. There is an urgent need to reduce the usage of chemical fertilizers and in turn increase the usage of organics. Organic manures improve the soil physical conditions and promote microbial and soil organic matter, which is turn produces organic acids, which inhibits enzymes, particularly IAA oxidase resulting in enhancing the promotive effect of auxin- IAA which has direct effect on plant growth [3]. Organic manures *viz*., FYM, vermicompost, poultry manure and neem cake help in the improvement of soil structure, aeration and water holding capacity of soil. Further, it stimulates the activity of microorganisms that makes the plant to get the macro and micro-nutrients through enhanced biological processes, increase nutrient solubility, alter soil salinity, sodocity and pH [1]. The long term manorial studies conducted at many places have revealed the superiority of integrated nutrient supply system in sustaining crop productivity in comparison to chemical fertilizer alone [2]. Hence the present study was carried out to effect of integrated nutrient management on growth and yield of cowpea (*Vigna unquiculata* L. Walp.)

Materials and Methods

The experiment was carried out in *Kharif* season at Horticulture Research Farm, Department of Horticulture, RAK college of Agriculture, RVSKVV Sehore (M.P.) during the year 2012-13. The location stands at 27°12 North latitude and 77°0 East longitude at an altitude of 498.77 meters from mean sea level in Vindhyan Plateau of Madhya Pradesh. The climate is sub-tropical with maximum temperature is 46ºC and minimum temperature is 6.8ºC. The soil of the experimental field was medium black with 37% clay, 38% silt and 25 % sand with pH ranging from 7.2. The soil was low in available nitrogen, medium in available phosphorus and high in available potassium. The experiment was arranged in randomized block design and replicated three times. Treatment included T_1- (FYM @ 20 t/ha + No fertilizer), T_2- (FYM@ 20 t/ha+ RDF-50%), T_3- (FYM @ 20 t/ha+ RDF-100%), T_4- (Neem cake@ 5 q/ha+ No fertilizer), T_5-(Neem cake@ 5 q/ha+ RDF-50%), T_6-(Neem cake@ 5 q/ha+ RDF-100%), T_7-(Vermicompost @ 5 t/ha+ No fertilizer), T_8- (Vermicompost @ 5 t/ha+ RDF-50%), T_9-(Vermicompost @ 5 t/ha+ RDF-100%), T_{10}- (Poultry manure@ 5t/ha+ No fertilizer),T_{11}-(Poultry manure@ 5t/ha+ RDF-50%), T_{12}- (Poultry manure@ 5t/ha+ RDF-100%).

Results and Discussion

From the data presented in [Table-1], the treatment combination T_9-(Vermicompost @ 5 t/ha+ RDF-100%) was recorded maximum 107.32 cm plant height at 90 DAS. While it was recorded minimum 71.71 cm at 90 DAS in treatment combination T_1- (FYM @ 20 t/ha + No fertilizer). The treatment combination T_9-(Vermicompost @ 5 t/ha+ RDF-100%) was recorded maximum 21.77 branches per plant at 90DAS. While it was recorded minimum 18.25 in treatment combination T_1- (FYM @ 20 t/ha + No fertilizer). This may be due to application of major and minor nutrients, through different levels of organic manure and chemical fertilizers, increased the photosynthetic activity, chlorophyll formation, nitrogen metabolism and auxin contents in the plants which ultimately improving the plant height and no of branches per plant.

Table-1 *Effect of Integrated Nutrient Management on growth parameters of Cowpea*

Treatments	Plant Height at 90 DAS (cm)	No of branches per plant at 90DAS	No of leaves per plant at 90 DAS	No of nodules per plant at 90 DAS	Leaf Area Index at 90 DAS	Days to first flowering	Days to 50% flowering
T1- FYM @ 20 t/ha + No fertilizer	71.71	18.25	19.33	2.54	0.703	43.33	49.66
T2- FYM@ 20 t/ha+ RDF-50%	92.68	19.12	30.55	3.34	1.197	49.00	53.66
T3- FYM @ 20 t/ha+ RDF-100%	99.31	19.52	33.33	3.93	1.333	51.00	56.00
T4-Neem cake@5 q/ha+ No fertilizer	89.15	19.11	26.17	2.71	1.143	48.00	53.66
T5-Neem cake@ 5 q/ha+ RDF-50%	93.20	20.46	34.17	4.02	1.440	50.00	55.66
T6-Neem cake@ 5 q/ha+ RDF-100%	104.30	21.26	39.17	4.13	1.683	60.66	62.33
T7-Vermicompost @ 5 t/ha+ No fertilizer	93.46	20.46	29.07	3.71	1.333	49.33	54.00
T8- Vermicompost @ 5 t/ha+ RDF-50%	100.32	20.57	37.44	3.81	1.650	54.33	59.00
T9-Vermicompost @ 5 t/ha+ RDF-100%	107.32	21.77	44.26	4.17	2.223	55.33	66.00
T10- Poultry manure@ 5t/ha+ No fertilizer	78.39	18.97	25.26	2.98	1.007	46.66	52.00
T11-Poultry manure@ 5t/ha+ RDF-50%	86.96	20.16	31.44	3.75	1.260	46.66	53.33
T12- Poultry manure@ 5t/ha+ RDF-100%	106.15	21.04	35.77	3.71	1.610	56.66	60.00
SE	3.154	0.411	0.27	0.06	0.006	1.804	1.246
CD @ 5%	9.253	1.206	0.79	0.19	0.018	5.291	3.656

Table-2 *Effect of Integrated Nutrient Management on Yield of Cowpea*

Treatments	Pods per cluster (no)	Pods per plant (no)	Pod length (cm)	Pod girth (cm)	Pod weight (gm)	Number of seeds/pod	Pod yield / hac (q)	Net income (Rs)	C:B ratio
T_1- FYM @ 20 t/ha + No fertilizer	2.45	5.37	16.90	0.64	10.20	9.10	50.36	15067	1:1.43
T_2- FYM@ 20 t/ha+ RDF-50%	2.50	7.31	18.52	0.76	12.03	10.70	84.19	46109	1:2.21
T_3- FYM @ 20 t/ha+ RDF-100%	3.25	7.99	20.16	0.96	12.61	11.20	94.06	53191	1:2.30
T_4-Neem cake@5 q/ha+ No fertilizer	2.84	6.68	19.62	0.88	11.31	10.16	77.03	37617	1:1.95
T_5-Neem cake@ 5 q/ha+ RDF-50%	3.35	8.98	20.80	0.97	14.62	12.98	115.30	73099	1:2.73
T_6-Neem cake@ 5 q/ha+ RDF-100%	3.70	9.31	21.60	1.05	16.52	14.31	144.93	99941	1:3.22
T_7-Vermicompost @ 5 t/ha+ No fertilizer	3.10	7.02	17.44	0.96	13.17	11.76	87.15	46677	1:2.15
T_8- Vermicompost @ 5 t/ha+ RDF-50%	3.51	7.71	23.13	1.01	15.80	13.71	132.09	88859	1:3.06
T_9-Vermicompost @ 5 t/ha+ RDF-100%	3.90	11.70	25.29	1.10	20.69	15.73	151.59	105571	1:3.29
T_{10}- Poultry manure@ 5t/ha+ No fertilizer	2.60	7.37	17.98	0.81	10.76	9.65	66.90	34182	1:2.04
T_{11}-Poultry manure@ 5t/ha+ RDF-50%	2.80	8.01	19.08	0.83	14.06	12.31	98.02	62514	1:2.76
T_{12}- Poultry manure@ 5t/ha+ RDF-100%	3.43	8.41	22.14	0.91	15.21	13.05	121.22	82926	1:3.17
SE	0.123	0.67	0.017	0.04	0.005	0.015	1.36	-	-
CD @ 5%	0.363	1.97	0.050	0.12	0.016	0.044	4.04	-	-

The findings are also in agreement with the findings of [4]. The treatment combination T_9-(Vermicompost @ 5 t/ha+ RDF-100%) was recorded maximum 44.26 leaves per plant and the minimum 19.33 leaves per plant was recorded in the treatment combination T_1- (FYM @ 20 t/ha + No fertilizer) at 90 DAS. Probable reasons for enhanced more number of leaves, may be due to promotive effects of macro and micro nutrients on vegetative growth which ultimately lead to more photosynthetic activities. These findings are in agreement with the findings of [7]. The treatment combination T_9-(Vermicompost @ 5 t/ha+ RDF-100%) was recorded maximum 4.17 nodules per plant at 90 DAS as compared to other treatment combinations. Among interaction of both treatments, the treatment combination T_9-(Vermicompost @ 5 t/ha+ RDF-100%) was recorded maximum 2.223 leaf area index at 90 DAS as compared to other treatment combinations. Treatment combination T_1- (FYM @ 20 t/ha + No fertilizer) was recorded first flowering and 50% flowering as compared to other treatment combinations. This may be due to the fact that nitrogen in plants increased cell division and cell differentiation. Thus, plant remained in vegetative phase and resulted in imbalance between C:N ratio thus delayed flowering at higher nitrogen level. From the data presented in [Table-2], highest 3.90 pods per cluster was noted in treatment combination T_9-(Vermicompost @ 5 t/ha+ RDF-100%). Whereas, the treatment combination T_1- (FYM @ 20 t/ha + No fertilizer) was exhibited the lowest 2.45 pods per cluster. The treatment combination T9-(Vermicompost @ 5 t/ha+ RDF-100%) was recorded maximum 11.70 pods per plant. While it was minimum (5.37) under the treatment combination T_1- (FYM @ 20 t/ha + No fertilizer). This may be due to increased supply of major plant nutrients are required in larger quantities for growth and development of plants. Nitrogen accelerates the development of growth and reproductive phase and protein synthesis, thus promoting pods per plant. Similar results have been reported by [5]. Among the treatment combination T_9-(Vermicompost @ 5 t/ha+ RDF-100%) was recorded significantly superior as compared to other treatment combination, while the lowest pod yield per plant was noted in treatment T_1- (FYM @ 20 t/ha + No fertilizer). The probable reason for enhanced vegetative yield may be due to cumulative effects of nutrient (macro and micro) on vegetative growth while ultimately lead to more photosynthetic activities. While, application of organic manure and chemical fertilizers enhance carbohydrate and nitrogen metabolism of pectic substances, as well as improve the water metabolism and water relation in the plants. Finding corroborates with their results obtained by [6]. Under the treatment combination T_9-(Vermicompost @ 5 t/ha+ RDF-100%) was obtain maximum net returns of Rs. 105571/ ha and cost benefit ratio 1:3.29. However the lowest 50.36 q/ha pod yield along with net return of Rs. 15067/ ha and cost benefit ratio 1:1.43 was observed in T_1- (FYM @ 20 t/ha + No fertilizer).

Conclusion:

From the above results, it is concluded that treatment combination T_9-(Vermicompost @ 5 t/ha+ RDF-100%) was exhibited significantly maximum growth parameters(plant height, number of branches per plant, number of leaves per plant ,no of nodules per plant and leaf area index) and yield parameters (*i.e.* pod per cluster, number of pods per plant, pod length, pod girth, pod weight , number of seeds per pod) as compare to other treatment combinations. In accordance with the finding of present investigation it is revealed that application of Vermicompost @ 5 t/ha+ RDF-100% as the best treatment for sustainable yield of cowpea.

Application of research: To find out the suitable combination of organic and inorganic fertilizer for higher yield of cowpea.

Research Category: Vegetable Science

Abbreviations: RVSKVV –Rajmata Vijyaraje Scindia Krishi Viswa Vidyalaya

Acknowledgement / Funding: Author are thankful to Department of Horticulture, R.A.K. College of Agriculture, Sehore, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh, 474002, India.

***Research Guide or Chairperson of research: Dr M.S. Parihar**
University: Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh, 474002
Research project name or number: M.Sc. Thesis

Author Contributions: All author equally contributed

Author statement: All authors read, reviewed, agree and approved the final manuscript.

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animal performed by any of the authors.

References:

[1] Alabadan B.A., Adeoye P.A. and Folorunso E.A. (2009) *Caspian J. Environ. Sci*., 7, 31-35.
[2] Gaur A.C. (1991) *Bulky Organic Manures and Crop Residues. In: Fertilizers, organic matter recyclable wastes and biofertilizer H.L.S. Tandon, Fertilizer development and consultation Organization, New Delhi*.
[3] Leopold A.C. (1974) *Plant growth and development. Tata McGraw Hill Publishing Company Ltd., New Delhi. pp.* 169-181.
[4] Parasuraman P. (2001) *Indian Journal of Agronomy*, 46 (1),131-134.
[5] Samawat S. and Borah B.C. (2001) *Agri. Sci. Tech*., 15 (2), 83-89.
[6] Sannigrahi A.K. and Borah B.C. (2001) *Agric. Sci. Digest*, 21(1), 67-68.
[7] Wagh Bapi Das A.P., Dod V.N.., Nagre P.K. and Bawkar S.O.(2011) *Asian Journal of Horticulture* 6(2),402-405.