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Effect of integrated nutrient management on economics of cowpea [*Vigna unguiculata* (L.) Walp.]

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Abstract
A field experiment was conducted at Research Farm of Suresh Gyan Vihar University, Jaipur (Rajasthan) during *kharif* 2023 on sandy loam soil, consisting nine treatments *viz.* control (T_0), 100% RDF (T_1), 75% RDF + biofertilizer (T_2), FYM @ 5 t ha^{-1} (T_3), FYM @ 2.5 t ha^{-1} + 50% RDF (T_4), vermicompost @ 2 t ha^{-1} + 50% RDF (T_5), vermicompost @ 1 t ha^{-1} + 50% RDF (T_6), FYM @ 75% + biofertilizer (T_7) and vermicompost @ 75% + biofertilizer (T_8) which were laid out in a randomized block design with three replications. Variety RC-19 was used for experiment.
Results clearly showed that highest net returns of ₹91916 ha^{-1} and B:C of 2.86 was significantly higher registered due to application of vermicompost @ 1 t ha^{-1} + 50% RDF (T_6) which remained at par with vermicompost @ 75% + biofertilizer (T_8) but significantly higher over control.

Keywords: Cowpea, vermicompost, RDF, biofertilizer, economics

Introduction
Cowpea (*Vigna unguiculata* L. Walp), belonging to the family Fabaceae is an important *kharif* pulse crop grown in India for vegetable pods, grain, forage and for green manure purpose. Cowpea is grown both for its tender pods and also for its dry seeds used as pulse for culinary purpose. Vegetable cowpea is one of the most ancient crops known to man. It is a popular vegetable grown throughout the world. It is a warm season crop, well adapted to many areas of humid tropics and subtropical zones. In India, it is grown widely round the year. Cowpea is also called as vegetable meat due to high amount of protein in grain with better biological value on dry weight basis. Cowpea grain contains 23.4 per cent protein, 1.8 per cent fat and 60.3 per cent carbohydrates on dry weight basis and it is rich source of calcium and iron. Apart from this, cowpea forms excellent forage and it gives a profused vegetative growth and covers the ground so well that it checks the soil erosion. Cowpea pods are good source of protein, fibre, minerals, calcium and vitamins particularly vitamin A and vitamin C. It contains 8 g carbohydrates, 43 g proteins and 0.6 g fat, 2 g fiber per 100 g of edible portion. Tender fruits contain 80 mg calcium, 74 mg phosphorus and 2.5 mg iron per 100 g fresh pod, amino acid profile is particularly high in cowpea which greatly improves the protein quality of pulses (Gopalakrishnan, 2007) [3]. The factors attributed for low yields of pulses in India as compared to the world productivity are non-availability of quality seeds of improved and short duration varieties, growing of pulses under marginal and less fertile soil with low inputs and without pest and disease management, growing of pulses under moisture stress, unscientific post harvest practices and storage under unfavorable conditions. Hence, there is a scope for improving the production potential economic feasibility of this crop by use of organic, inorganic and bio-fertilizers.

Materials and Methods
The field experiments was carried out during *kharif* season (2023) to study the "Effect of Integrated Nutrient Management on Economics of Cowpea [*Vigna unguiculata* (L.) Walp.]" in randomized block design with 9 treatments and 3 replications at Research Farm, Suresh Gyan Vihar University, Jaipur, Rajasthan. The experimental farm is geographically located at 75°

51'44" E longitude, 26°48'35'' N latitude and an altitude of 432 m above mean sea level (AMSL). The soil of experimental fields was sandy loam and the soil fertility status contained available nitrogen (137.8 kg ha^{-1}) by Subia and Asija 1996, available phosphorus (16.3 kg ha^{-1}) by Olsen *et al*. 1954 [5] and available potassium (250.12 kg ha^{-1}) by Jackson, 1973 [4]. The organic carbon content was from 0.34-0.38 per cent. The weekly mean maximum temperatures go as high as 48 °C during summers and minimum temperature falls as low as-1.0 °C during winters. The mean relative humidity fluctuated from 63 to 91 per cent during the crop season. The average rainfall is 400-500 mm per annum, which is mostly received during July to September. The sporadic showers during winters are also common, which are probably observed during this period. The experiment was laid out in randomized block design with three replications and nine treatments. The following treatments were included in the study, control (T_0), 100% RDF (T_1), 75% RDF + biofertilizer (T_2), FYM @ 5 t ha^{-1} (T_3), FYM @ 2.5 t ha^{-1} + 50% RDF (T_4), vermicompost @ 2 t ha^{-1} + 50% RDF (T_5), vermicompost @ 1 t ha^{-1} + 50% RDF (T_6), FYM @ 75% + biofertilizer (T_7) and vermicompost @ 75% + biofertilizer (T_8). The observations were analysed by Statistical methods (Fisher, 1950.) [2].

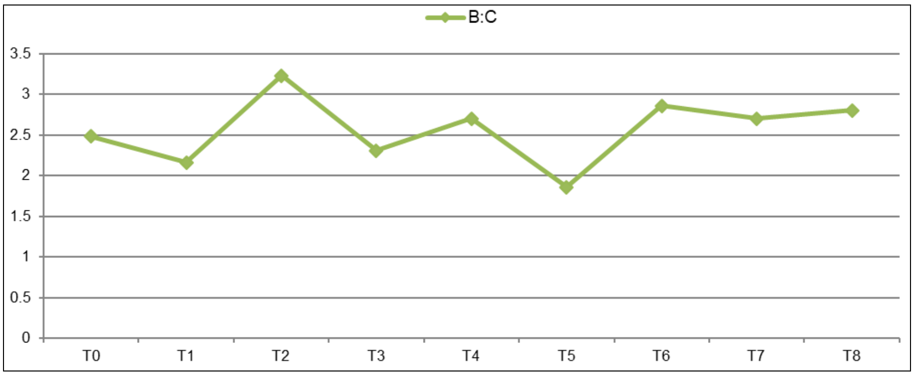
Results and Discussion

It is clear from the results of present study that integrated nutrient management had significant influence on the economics of mungbean. Application of vermicompost @ 1 t ha^{-1} + 50% RDF (T_6) recorded significantly higher net returns of ₹91916 ha^{-1} and B:C of 2.86 over control (T_0) which was remained statistically at par with FYM @ 75% + biofertilizer (T_7) and vermicompost @ 75% + biofertilizer (T_8). Significantly higher net returns achieved with the application of T_6 (V.C. 1 t ha^{-1} + 50% RDF) which was statistically at par with V.C. 75% + Biofertilizer (T_8) are directly correlated with the considerably higher seed and straw yields corresponding to these treatments. Slightly lower net returns and B:C ratio recorded under the treatment involving 100% RDF than the corresponding levels of FYM and biofertilizer could be explained with the fact that vermicompost is comparatively costlier than FYM. Similar results were also obtained by Singh *et al*. (2021) [9] and Patil *et al*. (2022) [6].

Table: Effect of integrated nutrient management on economics of cowpea

Treatments	Economics	
	Net returns (₹ ha^{-1})	**B:C**
T_0: Control	65797.5	2.48
T_1: RDF (20-40) 100%	81825.7	2.16
T_2: RDF 75% + Biofertilizer	88720.2	3.23
T_3: FYM @ 5 t ha^{-1}	66921.2	2.31
T_4: FYM 2.5 t ha^{-1} + RDF 50%	76653.9	2.70
T_5: V.C. 2 t ha^{-1}	69180.9	1.86
T_6: V.C. 1 t ha^{-1} + 50% RDF	91916.4	2.86
T_7: FYM 75% + Biofertilizer	72936.3	2.70
T_8: V.C. 75% + Biofertilizer	85001.2	2.80
S.Em±	30471.6	0.09
CD at (p= 0.05)	8663.01	0.30
CV (%)	8.20	7.87

A) Net returns



(b) Benefit:Cost (B:C)

Fig 2: Effect of integrated nutrient management on economics of cowpea

Conclusion

In light of the results obtained from the present investigation, it may be concluded that the treatments either V.C. 1 t ha^{-1} + 50% RDF (T_6) or vermicompost 75% + Biofertilizer were effective in increasing net returns and B:C of cowpea as compared to other treatments.

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