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Effect of Integrated Nutrient Management on growth, yield and quality of Cowpea

(*Vingna unguiculata* L.)

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Abstract

An investigation was carried out to study the Effect of Integrated Nutrient Management on growth, yield and quality of Cowpea (*Vigna unguiculata* L.). The experiment was conducted in Randomized Block Design at the Research farm of the Department of Horticulture, School of Agriculture Science, Technology & Research, Sardar Patel University, Balaghat (M.P.) during the *Rabi* season of 2022. The experiment was laid out in Randomized block design RBD) with three replications. The experiment consisted of INM, thus making 8 treatments. The better growth in terms of number of branches per plant and fresh weight of root nodules due to application of 1 as compared to other treatments. Application of fertility levels significantly increased the yield attributes such as number of pods/ plant and seeds/pod. The same trend was also observed in Test Weight and seed yield. The significantly highest values were obtained with 100% RDF over the rest of the treatments.

Keywords: Integrated, Nutrient, vermicompost, significantly increased, 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.

Biological nitrogen fixation, green manuring, forage yield, high-quality hay and silage production, nutritional product synthesis, weed suppression, food production, revenue generation, and a source of protein are some of the common ways it is utilized to improve soil fertility. Due to the availability of short-duration, high-yielding, and quickly growing cultivars, this crop is extremely important. Cowpea pods, which are soft green pods used as vegetables, are rich in calcium, phosphorus, and iron and contain 84.6% moisture, 4.3% protein, 8.0% carbohydrate, and 0.2% fat.

The basic concept underlying the integrated nutrient management system (INMS), nevertheless, remains the maintenance and possible improvement of soil fertility for sustained crop productivity on long term basis and also to reduce inorganic (fertilizer) input cost (Kumar and Chopra, 2010 and Kalhapure *et al*., 2013). Thus, integrated nutrient supply/management (INM) aims at the maintenance or adjustment of soil fertility and plant nutrient supply to an optimum level for sustaining the desired crop productivity through the optimization of benefits from all possible sources of plant nutrients in an integrated manner (Kannan *et al*., 2013 and Jat *et al*., 2015). In plant nutrition, organic matter level of a soil is the key property that decides the availability status of essential nutrients. The fertility status of soils in the semi-arid region of M.P. is also poor and low organic carbon status due to high temperature.

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 a beneficial effect on seed yield.

Vermicompost is a biofertilizer that is enriched with all beneficial soil microbes and contains all the essential plant nutrients, such as N, P, and K. It has been emerging as a significant source to supplement chemical fertilizer in agriculture in view of sustainable development following the Rio Conference. Because vermicompost promotes soil microbial activity, which in turn increases nutrient solubility and, ultimately, plant availability, microorganisms are known to modify soil pH at microsites, chelate the organic acids they produce, and facilitate intraday mobility in fungal filaments.

Vermicompost is eco-friendly low cost effective and an effective way to recycle agricultural and kitchen waste. Vermicompost is a recent innovation in composting technology. It is a mixture of earthworm castings, organic materials humus and other organisms. Agricultural residues, animal wastes, dairy and poultry wastes, food industry wastes, sludge can all be recycled to give vermicompost. In recent years, use of vermicompost has been advocated in integrated nutrient management system in field crops. Pioneers advise Vermicompost as organic compost and substitute for chemical fertilizer 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).

Material and methods

The study titled Effect of Integrated Nutrient Management on growth, yield and quality of Cowpea (*Vingna unguiculata* L.) was conducted during the *rabi* season of 2022-23 to meet the set objectives. The experimental plot had sandy loam soil with low nitrogen, moderate phosphorus and potassium levels. The soil had a moderately alkaline pH of conducive to crop growth. The experiment followed a Randomized block design (RBD) with 12 treatment combinations replicated thrice at the student Research farm of the Department of Horticulture (Vegetable Science), School of Agriculture Science, Technology & Research, Sardar Patel University, Balaghat (M.P.). The experiment consisted of INM, thus making 8 treatments. The experiment was laid out in a randomized block design comprising twelve treatments with three replications. Biometric

observations were obtained from the selection of five random plants within each plot. Analysis of Variance approach was employed to analyze the gathered data at 5 % level of significance.

Results and discussion

The reason for better growth and development in the above treatments might be due to increased availability of nitrogen and phosphorus to the plant initially through fertilizers and then through vermicompost in the cropping season. The better growth in terms of number of branches per plant and fresh weight of root nodules due to application of 100% RDF as compared to other treatments. Vermicompost plays an important role in root development and proliferation resulting in better nodule formation and nitrogen fixation by supplying assimilates to the roots, better environment in rhizosphere for growth and development. Since the fertility being a store house of almost all the plant nutrient required for proper growth and development of plants, its addition the soil enhances the availability of these nutrients. Higher population of the desired organisms will always have greater possibilities of infection and consequently formation of more healthy and effective root nodules having higher amount of leghaemoglobin content.

Thus, the improvement in soil environment resulted in encouraged proliferation of plant roots, which helped to draw more water and nutrients from larger area and deeper layers and thus owing to higher availability of nutrients, synthesis of more carbohydrates and their translocation to different plant parts resulted in increased vegetative growth including the reproductive structures. These results corroborate with the finding of Das *et al.,* (2002), Kumar *et al.,* (2003), More *et al.,* (2008).

The efficiency of inorganic fertilizer is much pronounced when it is combined with organic manures (vermicompost). The increased vegetative growth and the balanced C:N ratio might have increased the synthesis of carbohydrates, which ultimately promoted yield. The increased growth in terms of plant height, dry matter accumulation and number of branches per plant might also provided better sites for pod formation and grain development. As a result, almost all yield attributes of crop resulted into significant improvement due to organic manures and fertilizer in combination.

The significant improvement in seed yield under the influence of combined application of fertilizer and vermicompost was largely a function of improved growth and the consequent increase in different yield attributes as mentioned above. The higher yield of cowpea seemed to be the effect of yield attributes such as number of pods/plant and seeds/pod which were significantly enhanced due to application of 100% RDF. Similar results due to application of organic manures alone were also obtained by Yadav (2001), Das *et al.* (2002).

The application of 100% RDF to cowpea crop significantly increased the net return over others levels of vermicompost Likewise inoculations of cowpea seeds with Vermicompost also significantly increased inoculations (Table 1). It is clear that in both the treatments there was significant increase in seed and straw yield which ultimately gave more net returns over the input cost incurred in these treatments in comparison to others treatments.

Conclusion

It may be concluded that, based on one-year experimentation, the Application of 100% RDF improved Test weight and seed yield, soil fertility status, and net returns significantly.

Table 1: Effect of Integrated Nutrient Management on growth, yield and quality of Cowpea (*Vingna unguiculata* L.)

Treatments	Plant height (cm) at harvest	Numbers of pods per plants	Numbers of Seeds per pod	Seed Yield (q/ha)	Benefit cost ratio
Control	57.33	10.26	9.83	9.36	2.64
5ton FYM/ha	61.83	11.75	11.14	10.90	2.63
50% RDF + 50% vermicompost/ha	63.71	12.07	11.54	11.71	2.78
75% RDF + 25% vermicompost/ha	67.18	12.62	12.19	12.42	2.75
100% RDF	67.60	12.88	12.42	12.98	2.86
5ton vermicompost/ha	63.04	11.88	11.35	11.35	2.73
50% RDF + 50% FYM/ha	64.19	12.20	11.68	11.98	2.83
75% RDF + 25% FYM/ha	64.68	12.40	11.97	12.12	2.72
S.Em. ±	**1.64**	**0.33**	**0.37**	**0.33**	
C.D. 5%	**4.80**	**0.97**	**1.09**	**0.97**	

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