Advances in Bioresearch
Adv. Biores., Vol 10 (4) July 2019: 25-28

Print ISSN 0976-4585; Online ISSN 2277-1573
Journal's URL:http://www.soeagra.com/abr.html
CODEN: ABRDC3
DOI: 10.15515/abr.0976-4585.10.4.2528

Advances in Bioresearch

ORIGINAL ARTICLE

Effect of Integrated Nitrogen Management on Productivity, Quality and Economics of Chilli - Cowpea Cropping System

***V. Hariharasudhan[1] and P.M.Shanmugam[2]**
[1]Teaching Assistant (Agronomy), Institute of Agriculture, Trichy - 621 712
[2]Associate Professor (Agronomy), Institute of Agriculture, Trichy - 621 712

ABSTRACT
Investigation was carried out to study the effect of integrated nitrogen management in chilli - cowpea. The experiment comprise of eight treatments combinations, viz., organic nutrient management (EFYM, Neem cake and vermicompost), inorganic fertilizer and biofertilizer (PSB) were evaluated in randomized block design with four replications. Application of required N to both chilli and cowpea in an integrated manner with 50% N as EFYM and 50% N as inorganic nutrient produced higher green chilli yield (8975 kg ha^{-1}), cowpea grain yield (652 kg ha^{-1}), chilli equivalent yield (11148 kg ha^{-1}) and net return (Rs. 72813/ha). With regard to chilli quality, higher oleoresin content was recorded in the application of EFYM + vermicompost + neem cake as 1/3rd each) practices in combination with 3% Panchakavya foliar spray thrice.
Keywords: *Chilli, cowpea, E FYM, oleoresin, vermicompost, neem cake*

Received 24.05.2019 Revised 24.06.2019 Accepted 05.07.2019

How to cite this article:
V. Hariharasudhan and P.M.Shanmugam.Effect of Integrated Nitrogen Management on Productivity, Quality and Economics of Chilli - Cowpea Cropping System. Adv. Biores., Vol 10 [4] July 2019. 25-28.

INTRODUCTION

Green revolution technologies with greater use of synthetic agrochemicals like fertilizers and pesticides, adoption of nutrient-responsive, high-yielding varieties of crops, greater exploitation of irrigation potentials etc., has boosted the production output in most crops. However, continuous and indiscriminate use of these high energy inputs now leads to decline in production and productivity of various crops as well as deterioration of soil health and environment. Organic agriculture is one among the broad spectrum of production methods that are supportive of the environment. In India, Chilli is grown in almost all the states across the length and breadth of the country. Andhra Pradesh is the largest producer of chilli in India contributes about 30% to the total area followed by Karnataka (20%) Maharashtra (11%), Orissa (9%), Tamil Nadu (8%) and other states contributing 18%. Cowpea (*Vigna unguiculata* L. Walp*)* is an important source of dietary protein in developing countries of Asia and Africa. Enrichment of FYM with natural phosphorus source like rock phosphate in an anaerobic system would improve the availability of nitrogen and phosphorus. Vermicompost and neem cake are the other sources of organic nutrient supply system. These organic manures contain plant nutrients fairly in more concentration compared to FYM and offers scope to reduce the requirement of FYM when used in proper proportions. Combined application of EFYM compost, enriched poultry manures and vermicompost recorded higher yield and quality of rice [1]. Comparison of different organic nutrient and other management practices with integrated and inorganic nutrient sources would bring useful information on yield stabilization and sustainability of crops and cropping systems, quality, soil health care, environmental benefits, etc. in the organic production systems. Keeping all the above information in view, a field experiment was carried out to study the effect of organic management practices on productivity in chilli - cowpea system.

MATERIALS AND METHODS

Field experiment was laid out in randomized block design (RBD) with eight treatments and replicated four times. The treatments were: T_1: 100 % N as enriched farm yard manure (EFYM) + Vermicompost + Neem cake (1/3rd each), T_2: T_1 + Biofertilizer + Phosphorus solublising bacteria (PSB), T_3: T_1 + Panchakavya 3% foliar

spray thrice, T_4: T_1 + (Chilli + Onion) - (Cowpea + Coriander), T_5: T_1 + One mechanical weeding and one hand weeding, T_6: 50% N as EFYM + Biofertilizer + Phosphorus solublising bacteria, T_7: 50% N as EFYM + 50% NPK as chemical fertilizer, T_8: 100% recommended NPK as chemical fertilizers. The soil of experimental site was clay loam in texture with low in available nitrogen (256 kg ha^{-1}), medium in available phosphorus (20.7 kg ha^{-1}) and high in available potassium (412 kg ha^{-1}) and 0.6% organic carbon. The organic manures were applied on N equivalent basis to the respective treatments in chilli only. The recommended doses of nutrients for chilli are 120:60:60 kg N: P_2O_5: K_2O ha^{-1}. The entire inorganic source of P and K and 25 percent N were applied as basal. The remaining 75% N was top dressed at 30, 60 and 90 days after transplanting (DAT) in three equal splits.

RESULTS AND DISCUSSION

Productivity of chilli

Green chilli yield of 8975 kg ha^{-1} was realized when the required N to chilli was provided in an integrated manner with 50% N as EFYM and 50% N as chemical fertilizer (Table 1). The green chilli yield obtained with 100% N applied through chemical fertilizer was 8305 kg ha^{-1} was statistically on par with the application of required N as EFYM, Vermicompost and neem cake (1/3rd each) + foliar spray of 3% Panchakavya thrice (8215 kg ha^{-1}), 100% organic + biofertilizer + PSB (8205 kg ha^{-1}) and 100% organic alone (8100 kg ha^{-1}). The green chilli yield was increased in the 100% inorganic nutrient management practices alone were only to the tune of 2.53% compared to 100% organic management practices. However, significant reduction in green chilli yield (5820 kg ha^{-1}) was recorded when the nitrogen requirement to chilli crop was reduced by 50% and supplied through EFYM along with biofertilizer and Phosphorous solubilzing bacteria. It is clear that integration of organic with inorganic sources of nutrition proved superior over recommended dose of fertilizer [2]. This might be due to the availability of more plant nutrients by improving soil physical conditions and solubilizing the nutrients in soil by applying organic sources of nutrition which ultimately reflected in terms of yield attributing characters and yield of chilli.

Productivity of cowpea

Integrated N management with 50% N as EFYM and 50% N as chemical fertilizer applied to cowpea produced the highest grain yield of 652 kg ha^{-1} and it was followed by the 100% inorganic alone which recorded 617 kg ha^{-1}. Integrated N management resulted in higher yield attributes in cowpea than 100% inorganic or 100% organic alone and it was presented Table [1]. Better supply of nutrients by the integrated practices might have helped for more enzymatic activity and physiological process of plant, which resulted into better translocation of the photosynthetic and portioning of dry matter to the sink (grain). This might have helped in increasing the number of pods $plant^{-1}$ (20.6), pod length (11.9 cm) and number of seeds pod^{-1} (15.4). Better availability of nutrients as indicated by uptake of nutrients has contributed to increased yield characters and yield [3].

Chilli equivalent yield

When the recommended N to both chilli and cowpea crops were applied in an integrated manner of 50% N as EFYM and 50% N as inorganic recorded highest chilli equivalent yield of 11148 kg ha^{-1} (Figure; 1) which was significant over the other organic and inorganic practices. Integrated N management practices significantly influenced the yield of chilli - cowpea cropping system. Due to balanced supply of nutrients from the inorganic fertilizers and EFYM throughout the crop growth period and organic sources undergo decomposition during which series of nutrient transformation takes place and helps in their higher availability to the crops. Higher uptake of nutrients by the crops will result in higher yield. As all the essential elements are released by the organic manures, the released essential elements play a vital functional role in crops and thus ultimately increase the yield with balanced nutrition [4,5].

Quality (Oleoresin) parameters of chilli

The oleoresin content of green chilli ranged from 17.2 to 18.8% in different organic, integrated and inorganic treatments presented in Table [1]. The highest oleoresin content of 18.8% in chilli fruit was recorded when 100% N was applied at 1/3rd each of EFYM + vermicompost + neem cake in combination with 3% Panchakavya foliar spray thrice. The oleoresin content was slightly lower in chilli fruits when N application was resorted to inorganic sources either alone or in an integrated manner with EFYM or with reduced N supply at 50% level with EFYM +biofertilizer +PSB. Fruit quality enhancements were also observed through the application of organic sources alone or in combination with inorganic components [6].

Economics

Combined application of 50% N as EFYM + 50% N as inorganic increased the net returns compared to organic treatments (Table 1). The highest net return was recorded with integrated application of 50% N as organic + 50% N as inorganics (Rs.72, 813). Among organic treatments, 100% N through EFYM +

vermicompost + neem cake with biofertilzer + PSB recorded higher net return (Rs.57,889) over other organic treatments and t presented in Table [1]. The cost of cultivation per hectare of organic management practices was relatively higher due to purchase of organic manures from outside sources. Where high benefit cost ratio was found in the treatments where organic source of fertilizers were used in the combination of inorganic fertilizers [7].

Table 1; Integrated N management practices on productivity, quality and economics of chilli-cowpea cropping system

Treatments	Grenn chilli (kg ha^{-1})	Cowpea (kg ha^{-1})	Oleoresin (%)	*Gross income (Rs. ha^{-1})	*Net return (Rs. ha^{-1})	*B:C ratio
T_1 : 100% EFYM + Vermicompost + Neem cake (1/3rd each)	8100	565	18.2	147330	55930	1.61
T_2 : T_1 + BF + PSB	8205	602	18.3	150789	57889	1.62
T_3 : T_1 + Panchakavya 3% foliar spray thrice	8215	606	18.8	151212	56812	1.60
T_4 : T_1 + (Chilli + Onion) - (Cowpea + Corriander)	7875	585	18.1	145136	37736	1.35
T_5 : T_1 + One mechanical weeding and one hand weeding	7945	549	18.5	144306	55906	1.63
T_6: 50% N as EFYM+ BF+PSB	5820	505	17.2	111276	45414	1.69
T_7 : 50% NPK as chemical fertilizer + 50% N as EFYM	8975	652	17.3	138255	72813	2.11
T_8 : 100% NPK	8305	617	17.2	128269	69406	2.18
CD (P=0.05)	516	45	0.8	-	-	-

*Data not statistically analysed

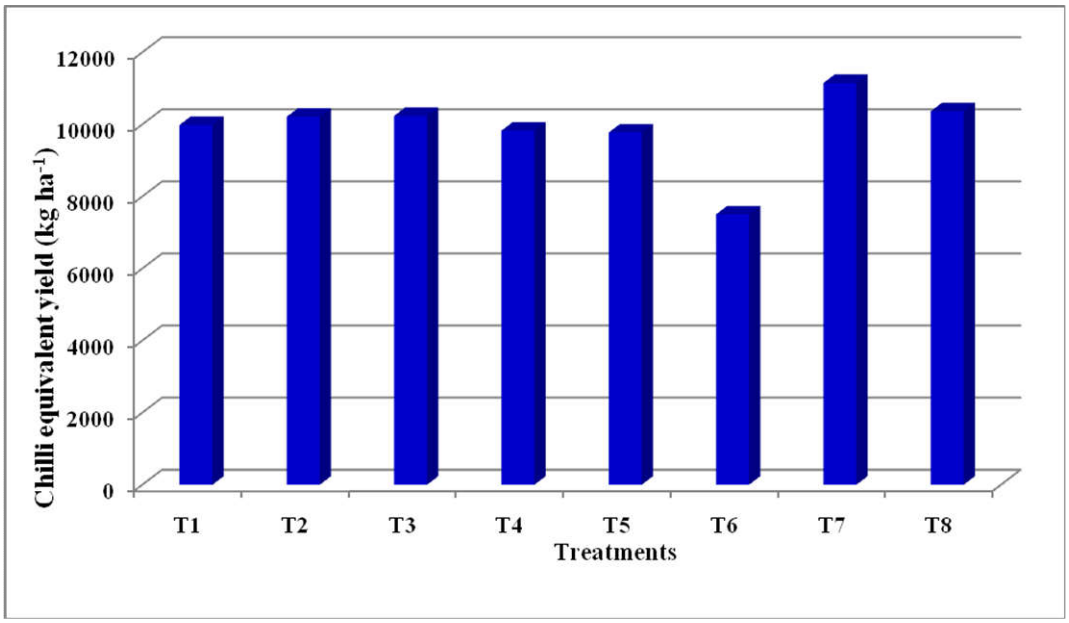

Fig.1. Integrated N management practices on Chilli equivalent yield of chilli - cowpea cropping systems

CONCLUSION

Among the different organic practices, 100% recommended N to chilli applied as EFYM + vermicompost + neem cake(1/3rd each) with 3% Panchakavya foliar spray thrice was registered higher oleoresin content in chilli. Application of 50% N as EFYM + 50% N as inorganic fertilizers realized higher productivity and profitability in chilli-cowpea cropping systems.

REFERENCES

1. Sangeetha, S.P., Balakrishnan, A., Devasenapathy, P. (2013). Influence of organic manures on yield and quality of rice (*Oryza sativa* L.) and Blackgram (*Vigna mungo* L.) in Rice-Blackgram Cropping Sequence. *American J. Plant Sci*., 4: 1151-1157.

2. Bagale, M.M., Kale, V.S., Kharde, R.P., Alekar, A.N. (2014). Integrated nutrient management studies in tomato. *Bioinfolet* **11** (4 A): 1054- 1057.
3. Yadav, S.K., Khokhar, U.U., Yadav, R.P. (2010). Integrated Nutrient Management for Strawberry Cultivation. Indian Journal of Horticulture. 67 (4): 445-49.
4. Javaria, S., and Khan, M.Q. (2011). Impact of integrated nutrient management on tomato yield quality and soil environment. *Journal of Plant Nutrition*, 34:140–149.
5. Manohar, S.V.S., Paliwal. (2016). Interactive Effect of FYM and Inorganic Fertilizers on Performance of Tomato (*Lycopersicon esculentum* Mill). Annals of Arid Zone 55(1&2): 47-49.
6. Avhad, A.B., Shirsagar, D.B., Shinde, S.R., Bhalekar, M.N. (2016). Effect of integrated nutrient management on growth, yield, quality and nutrient uptake in tomato *Asian J. Sci. Tech*. 07(4): 2731-2733.
7. Singh, D., Mukhi, S.K., Mishra, S.N. (2016). Impact of integrated nutrient management on tomato yield under farmers field conditions. *International J. Agric. Environ. Biotechnol.* 9(4): 567-572.