



Effects of Integrated nutrient management on green pod yield of cowpea

Pooja Sonloi*, A S Choudhary, Shani Raj, Aaradhana Sonwani, Ankit Paswan

Department of Horticulture (Vegetable Science), Sardar Patel University, Balaghat, Madhya Pradesh, India

Abstract

A field experiment was conducted at the Instructional Farm of Sardar Patel University, Balaghat (M.P.), during *Kharif* season of 2020-21, to evaluate the influence of “Effect of nutrient management on growth and green pod yield of cowpea [*Vigna unguiculata* (L.) walp.]” Totally 08 different treatments consisting of different organic and inorganic and fertilizers, alone and in both combination have been tried. Among the different nutrient management practices, The application of nutrient management significantly enhanced yield parameters *viz.* number of green pods /plant, green pod length (cm), no. of green seeds per pod, green pods yield per plot (kg), green pods yield per hectare (q) were significantly superior in the treatment T₁ (100 % NPK ha⁻¹ (Recommended 25: 50: 25 NPK/ha). On the basis of above findings, treatment T₁ (100 % NPK ha⁻¹(Recommended 25: 50: 25 NPK/ha) stand first in position and T₇ (50 % NPK ha⁻¹ + FYM @ 2.5t ha⁻¹ + Vermicompost @ 1.25 t ha⁻¹ + Rhizobium @ 500g + PSB @ 2.5 kg ha⁻¹) stand in second order of preference. However, treatment T₆ comes in next in order. There for it may be concluded that treatment T₁ (100 % NPK ha⁻¹ (Recommended 25: 50: 25 NPK/ha) may be prefer for higher growth and yield in cowpea.

Keywords: nutrient management, cowpea, *Vigna unguiculata*

Introduction

Cowpea (*Vigna unguiculata* L. walp), belongs to the family Fabaceae, chromosome number 2n = 22 and originated from Central Africa. Cowpea is important *Kharif* pulse crop and grown in India for vegetable pods, grain, for age 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 adopted to many areas of humid tropics and subtropical zones. In India it is grown widely round the year.

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 particularly high in cowpea which greatly improves the protein quality of pulses (Gopalakrishnan, 2007) [3].

In India during the past 30 years, rigorous agriculture included thorough high yielding varieties has lead to heavy withdrawal of nutrients from the soil. Further more, improper use of chemical fertilizers by farmers has deteriorated soil health and decrease soil organic carbon content. FYM is being used as major resource of organic manure in field crops. Inadequate accessibility to some available source of FYM is however, an important limitation in its application as a source of nutrients.

Nitrogen plays an important role in various metabolic process of the plant growth. Nitrogen is a key constituent of protein and chlorophyll (Meena *et al.* 2014) [5]. In addition, N and P have a stimulating effect on root activity and rooting pattern of cowpea. Available nitrogenous compound (also through a starter dose) enables seedlings to make a good start even before nitrogen fixation by roots. Plants fed with organic nitrogen during vegetative periods are much larger by the onset of flowering than those dependent on symbiotic N-fixation. Phosphorus plays an important role in the plant metabolism and is a constituent of various organic substances. It is important role in the plant photosynthesis process, respiration and other physiological process of plant. Potassium has a direct and indirect impact on the plant growth. Using potassium directly causes the reduced transpiration, increasing water absorption or creating internal condition in order to endure the dryness.

Bio-fertilizer promotes fertilizer use efficiency. The seed inoculated with Rhizobium increase the number of rhizosphere and enhance microbiologically activities. Seed of pulses when inoculated with phosphate solubilising bacteria (PSB) secret acetic substances which act as a solubiliser to unavailable soil phosphorus (Khandelwal *et al.* 2012) [4].

Vermicompost is a very beneficial organic compost and substitute for other fertilizers for organic farming. Soil biological component is favorably influenced by the addition of vermicompost. Vermicompost increase water retention capacity and make the soil loose and porous. Vermicompost improves the water retention capacity of soil and promote the establishment of microorganisms. It also helps in maintaining the soil pH in acidic soil and thus helps to promote the activity of microbes in soil.

Materials and Methods

The experiment entitled “Effect of nutrient management on growth and green pod yield of cowpea [*Vigna unguiculata* (L.) Walp.]” was conducted during *khari*f 2020-21 at Research Area, Sardar Patel University, Balaghat (M.P). The Balaghat District looks like a flying bird and is situated in southern part of Jabalpur division. It occupies the south eastern region of the Satpura and Upper Wainganga Valley. Balaghat is in the south eastern portion of the state of Madhya Pradesh. The district is situated within 21.19' to 22.24' North latitude and 79.31 to 81.3' East longitude. It has an average elevation of 288 metres. The total area of the district is 924500 hectare and bounded by Rajnandgaon in the East, Seoni in the West, District Mandla in the North and District Bhandara of Maharashtra State in the south. The Wainganga River separates the district from Seoni while the rivers Bawanthadi and Bagh define the inter-state boundary.

The experiment consisted of 8 treatments *viz.* T₁: 100 % NPK ha⁻¹ (Recommended 25: 50: 25 NPK/ha), T₂: 50 % NPK ha⁻¹ + FYM @ 5t ha⁻¹ + PSB@ 2.5 kg ha⁻¹, T₃: 50 % NPK ha⁻¹ + Vermicompost @ 2t ha⁻¹ + PSB@ 2.5 kg ha⁻¹, T₄: 50% NPK ha⁻¹ + Rhizobium @ 500g ha⁻¹ + PSB@ 2.5 kg ha⁻¹, T₅: 50 % NPK ha⁻¹ + FYM @ 5t ha⁻¹ + Rhizobium @ 500g ha⁻¹, T₆: 50 % NPK ha⁻¹ + Vermicompost @ 2t ha⁻¹ + Rhizobium @ 500g ha⁻¹, T₇: 50 % NPK ha⁻¹ + FYM @ 2.5t ha⁻¹ + Vermicompost @ 1.25 t ha⁻¹ + Rhizobium @ 500g + PSB@ 2.5 kg ha⁻¹, T₈: Local control which was arranged in Randomized Block Design with three replications. The recommended dose of NPK @ 25: 50: 25 per ha was applied. The entire dose of all recommended doses of fertilizer and manures were applied manually in experimental plot. Seed is treated with biofertilizer before sowing of seed. Weeds were managed in the experimental field with the manual weeding 15-20 days interval to keep experimental plot weed free. Three hoeing and weeding were done in all. In order to protect the crop from insect pest and diseases, standard methods of plant protection measures were followed. To check the attack of aphid, mites, prophylactic measures were taken. Cowpea was harvested for seed when the pods become yellow, attained proper size and mature dried. Harvesting of cowpea done manually by hand. During harvesting the plants, pod was picked then threshed manually. After harvesting dried seed is stored.

Results and Discussion

Yield attributes

Number of green pods/plant, Green pod length (cm) and Number of green seeds/pod

The data on various yield attributes *viz.* number of green pods/plant, green pod length (cm) and number of green seeds/pod as influenced by the integrated nutrient management practices were recorded and presented in Table 1 and figure 1, 2 and 3. Significantly highest number of green pods/plant (10.18) was observed in treatment T₁ (100 % NPK ha⁻¹ (Recommended 25: 50: 25 NPK/ha), which remained at par with treatment T₇ (50 % NPK ha⁻¹ + FYM @ 2.5t ha⁻¹ + Vermicompost @ 1.25 t ha⁻¹ + Rhizobium @ 500g + PSB @ 2.5 kg ha⁻¹) and T₆ (50 % NPK ha⁻¹ + Vermicompost @ 2t ha⁻¹ + Rhizobium @ 500g ha⁻¹). Significantly lowest number of green pods/plant (7.10) was observed in treatment T₈ (Local control).

This is in conformity to the findings of Parihar M.S. *et al.*, (2018) ^[6] and Thomas *et al.* (2014).

Significantly highest green pod length (20.28 cm) was observed in treatment T₁ (100 % NPK ha⁻¹ (Recommended 25: 50: 25 NPK/ha), which remained at par with treatment T₇ (50 % NPK ha⁻¹ + FYM @ 2.5t ha⁻¹ + Vermicompost @ 1.25 t ha⁻¹ + Rhizobium @ 500g + PSB @ 2.5 kg ha⁻¹) and T₆ (50 % NPK ha⁻¹ + Vermicompost @ 2t ha⁻¹ + Rhizobium @ 500g ha⁻¹). Significantly lowest green pod length (14.98 cm) was observed in treatment T₈ (Local control).

Similar result was observed by Subbarayappa *et al.* (2017) ^[9] and Gavaskar *et al.*, (2020) ^[2].

Significantly highest number of green seeds/pod (15.26) was observed in treatment T₁ (100 % NPK ha⁻¹ (Recommended 25: 50: 25 NPK/ha), which remained at par with treatment T₇ (50 % NPK ha⁻¹ + FYM @ 2.5t ha⁻¹ + Vermicompost @ 1.25 t ha⁻¹ + Rhizobium @ 500g + PSB @ 2.5 kg ha⁻¹) and T₆ (50 % NPK ha⁻¹ + Vermicompost @ 2t ha⁻¹ + Rhizobium @ 500g ha⁻¹). Significantly lowest number of green seeds/pod (10.25) was observed in treatment T₈ (Local control).

The similar findings have also been reported by Meena *et al.* (2014) ^[5] and Sharma *et al.* (2015) ^[8].

Green pods yield/plot (kg) and Green pods yield/hectare (q)

The effect of integrated nutrient management practices on green pods yield/plot (kg) and green pods yield/hectare (q). The data presented in Table 2 and Figure 4 and 5 depicts that Significantly highest green pods yield/plot (7.29 kg) was observed in treatment T₁ (100 % NPK ha⁻¹ (Recommended 25: 50: 25 NPK/ha), which remained at par with treatment T₇ (50 % NPK ha⁻¹ + FYM @ 2.5t ha⁻¹ + Vermicompost @ 1.25 t ha⁻¹ + Rhizobium @ 500g + PSB @ 2.5 kg ha⁻¹) and T₆ (50 % NPK ha⁻¹ + Vermicompost @ 2t ha⁻¹ + Rhizobium @ 500g ha⁻¹). Significantly lowest green pods yield/plot (5.76 kg) was observed in treatment T₈ (Local control).

The results obtained in the present studies are support by the Sharma *et al.* (2015) ^[8], Satodiya *et al.* (2015) ^[7] and Chauhan *et al.* (2016) ^[1].

Significantly highest green pods yield/hectare (101.25 q) was observed in treatment T₁ (100 % NPK ha⁻¹ (Recommended 25: 50: 25 NPK/ha), which remained at par with treatment T₇ (50 % NPK ha⁻¹ + FYM @ 2.5t ha⁻¹ + Vermicompost @ 1.25 t ha⁻¹ + Rhizobium @ 500g + PSB @ 2.5 kg ha⁻¹) and T₆ (50 % NPK ha⁻¹ + Vermicompost @ 2t ha⁻¹ + Rhizobium @ 500g ha⁻¹). Significantly lowest green pods yield/hectare (72.36q) was observed in treatment T₈ (Local control).

The results obtained in the present studies are support by the Sharma *et al.* (2015) [8], Satodiya *et al.* (2015) [7] and Chauhan *et al.* (2016) [11].

Table 1: Number of green pods/plant, Green pod length (cm) and Number of green seeds/pod

Tr. No.	Treatment Details	Number of green pods/plant	Green pod length (cm)	Number of green seeds/pod
T ₁	100 % NPK ha ⁻¹ (Recommended 25: 50: 25 NPK/ha)	10.18	20.28	15.26
T ₂	50 % NPK ha ⁻¹ + FYM @ 5t ha ⁻¹ + PSB @ 2.5 kg ha ⁻¹	7.85	16.37	11.37
T ₃	50 % NPK ha ⁻¹ + Vermicompost @ 2t ha ⁻¹ + PSB @ 2.5 kg ha ⁻¹	8.69	17.29	12.17
T ₄	50% NPK ha ⁻¹ + Rhizobium @ 500g ha ⁻¹ + PSB @ 2.5 kg ha ⁻¹	7.37	15.96	10.94
T ₅	50 % NPK ha ⁻¹ + FYM @ 5t ha ⁻¹ + Rhizobium @ 500g ha ⁻¹	8.11	16.90	11.90
T ₆	50 % NPK ha ⁻¹ + Vermicompost @ 2t ha ⁻¹ + Rhizobium @ 500g ha ⁻¹	9.00	18.00	13.00
T ₇	50 % NPK ha ⁻¹ + FYM @ 2.5t ha ⁻¹ + Vermicompost @ 1.25 t ha ⁻¹ + Rhizobium @ 500g + PSB @ 2.5 kg ha ⁻¹	9.40	18.67	13.65
T ₈	Local control	7.10	14.98	10.25
	SEm (±)	0.50	1.002	0.73
	CD (5%) =	1.52	3.04	2.22
	CV (%) =	10.25	10.03	10.30

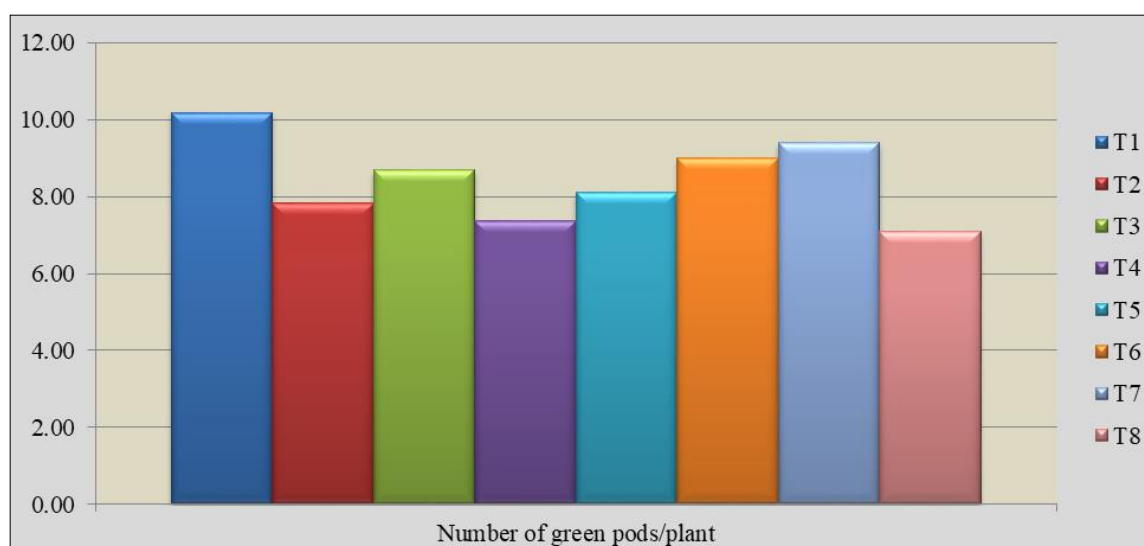


Fig 1: Number of green pods/plant

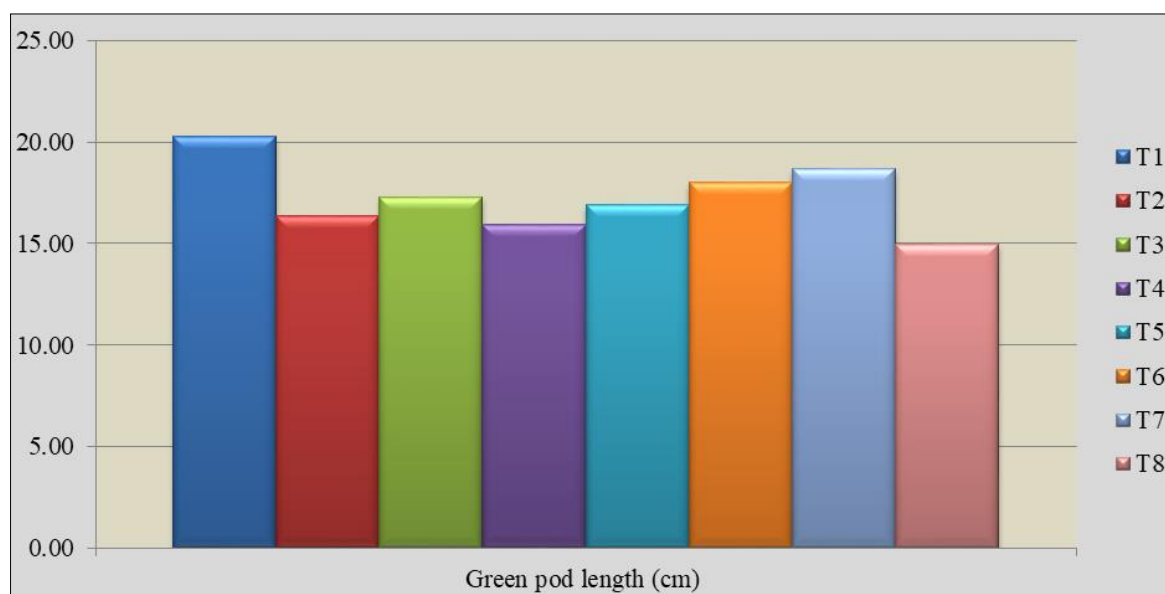


Fig 2: Green pod length (cm)

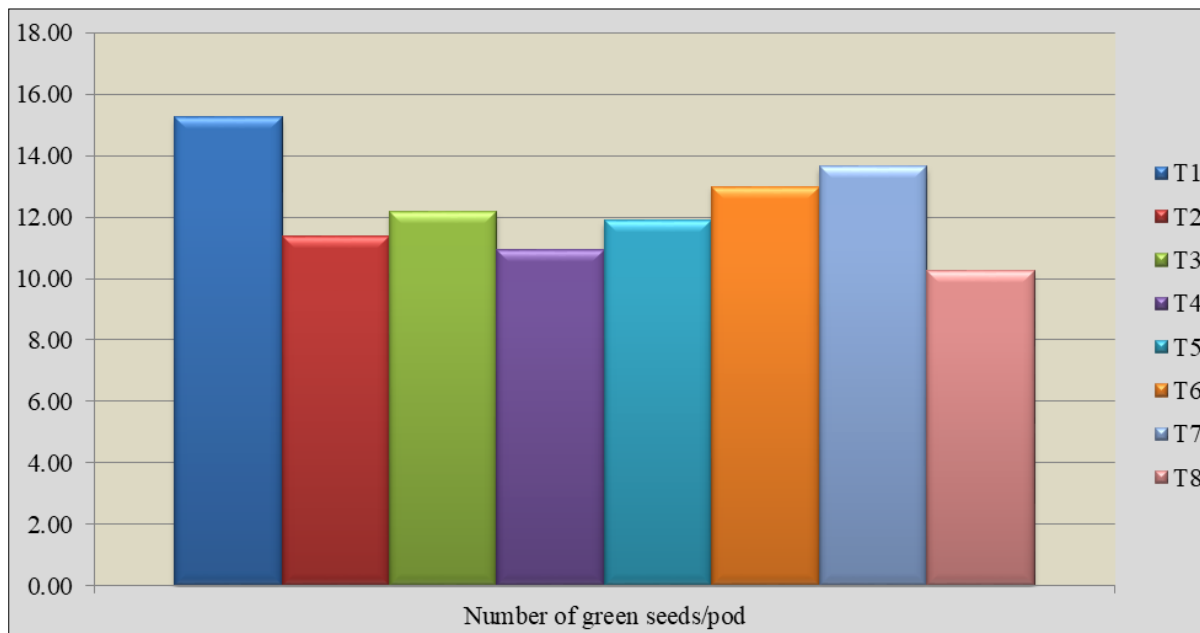


Fig 3: Number of green seeds/pod

Table 2: Green pods yield/plot (kg) and Green pods yield/hectare (q)

Tr. No.	Treatment Details	Green pods yield/plot (kg)	Green pods yield/hectare (q)
T ₁	100 % NPK ha ⁻¹ (Recommended 25: 50: 25 NPK/ha)	7.29	101.25
T ₂	50 % NPK ha ⁻¹ + FYM @ 5t ha ⁻¹ + PSB@ 2.5 kg ha ⁻¹	5.98	90.00
T ₃	50 % NPK ha ⁻¹ + Vermicompost @ 2t ha ⁻¹ + PSB@ 2.5 kg ha ⁻¹	6.48	94.80
T ₄	50% NPK ha ⁻¹ + Rhizobium @ 500g ha ⁻¹ + PSB @ 2.5 kg ha ⁻¹	5.86	79.15
T ₅	50 % NPK ha ⁻¹ + FYM @ 5t ha ⁻¹ + Rhizobium @ 500g ha ⁻¹	6.30	91.63
T ₆	50 % NPK ha ⁻¹ + Vermicompost @ 2t ha ⁻¹ + Rhizobium @ 500g ha ⁻¹	6.73	95.45
T ₇	50 % NPK ha ⁻¹ + FYM @ 2.5t ha ⁻¹ + Vermicompost @ 1.25 t ha ⁻¹ + Rhizobium @ 500g + PSB @ 2.5 kg ha ⁻¹	6.86	99.54
T ₈	Local control	5.76	72.36
	SEm (±)	0.32	5.26
	CD (5%) =	0.98	15.98
	CV (%) =	8.69	10.08

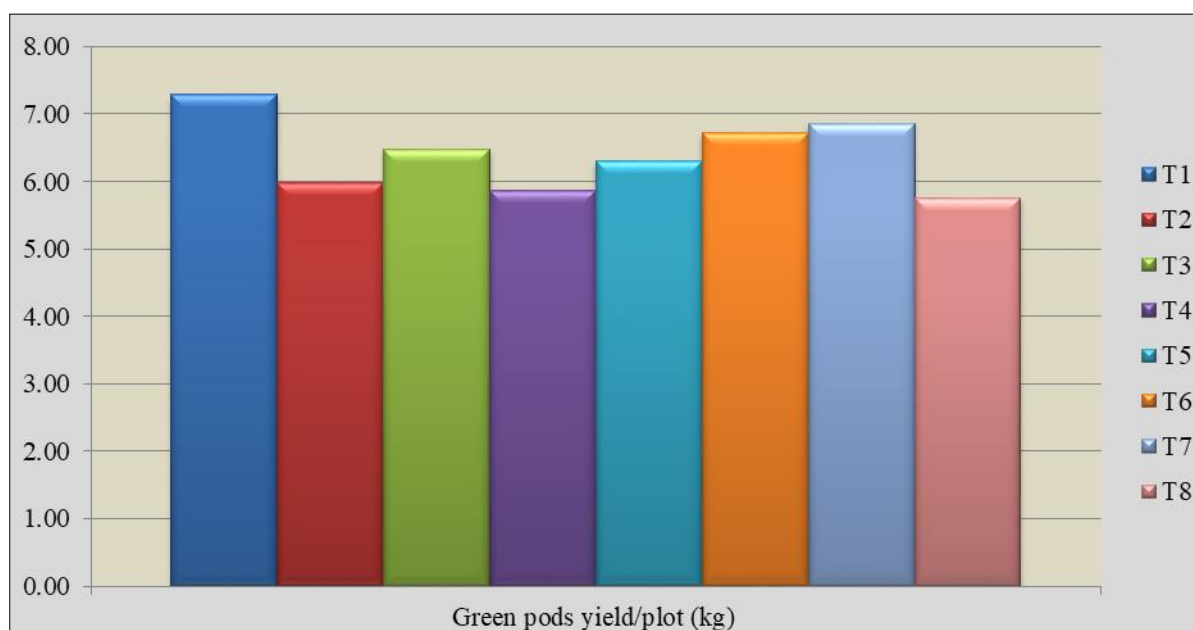


Fig 4: Green pods yield/plot (kg)

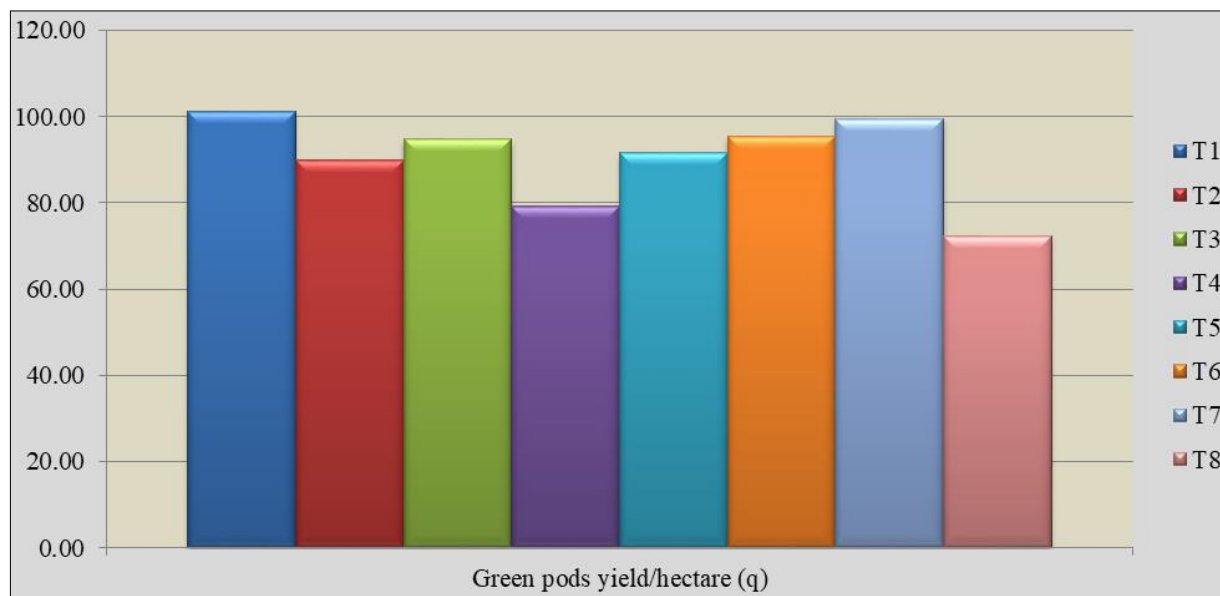


Fig 5: Green pods yield/hectare (q)

Conclusion

On the basis of above findings, treatment T₁ (100 % NPK ha⁻¹(Recommended 25: 50: 25 NPK/ha) stand first in position and T₇ (50 % NPK ha⁻¹ + FYM @ 2.5t ha⁻¹ + Vermicompost @ 1.25 t ha⁻¹ + Rhizobium @ 500g + PSB @ 2.5 kg ha⁻¹) stand in second order of preference. However, treatment T₆ comes in next in order. There for it may be concluded that treatment T₁ (100 % NPK ha⁻¹ (Recommended 25: 50: 25 NPK/ha) may be prefer for higher growth and yield in cowpea.

References

1. Chauhan J, Paithankar DH, Khichi P, Ramteke V, Srinivas J, Baghel MM. Studies on Integrated Nutrient Management in Cowpea, Research. Journal of Agricultural Sciences,2016:7(2):256-259.
2. Gavaskar, Arun Alfred David, Tarence Thomas and Narendra Swaroop and Meraj Ahmed. Assessment of Integrated Nutrient on Soil Properties and Yield of Cowpea (*Vigna unguiculata* L.). *Int. J.Curr.Microbiol. App.Sci*,2020:9(08):3484-3493
3. Gopalakrishnan TR. Vegetable Crops. New India Publishing Agency, New Delhi (India), 2007.
4. Khandelwal R, Choudhary SK, Khangarot SS, Jat MK, Singh R. Effect of inorganic and bio-fertilizers on productivity and nutrients uptake incowpea [*Vigna Unguiculata* (L.) Walp]. *Leg. Res*,2012:35(3):235-238.
5. Meena JS, Verma HP, Pincholi P. Effect of fertility levels and biofertilizers on yield, quality and economic of cowpea. *Agriculture for Sustainable Development*,2014:2(2):162-164.
6. Parihar MS, Verma H, Nawange DD, Sahu MK. Effect of integrated nutrient management on growth and yield of cowpea (*vigna unguiculata* L walp). *International Journal of Agriculture Sciences*. ISSN: 0975-3710 & E-ISSN: 0975-9107,2018:10(18):7186-7188.
7. Satodiya BN, Patel HC, Soni NV. Effect of planting density and integrated nutrient management on flowering, growth and yield of vegetable cowpea [*Vigna unguiculata* (L.).Walp]. *Asian Journal of Horticulture*,2015:10(2):232-236.
8. Sharma SK, Prajapati S, Raghuwanshi O. Effect of organic manures and inorganic fertilizers on yield and economics of cowpea production [*Vigna unguiculata* (L.)]. *Indian Res. J Biotech*,2015:7(1):152-155.
9. Subbarayappa CT, Sivaprasad PN, Reddy MR, Meena HM. Development of Critical Limits for Different Crops Grown in Different Soils and Its use in Optimizing Fertilizer Rates. *International Journal of Current Microbiology and Applied Sciences*,2017:6(6):241-249.