INDIAN JOURNAL OF
ARID HORTICULTURE
2015, Vol. 10 (1-2):34-36

Effect of organic manures and NPK levels on yield and quality of Bottle gourd [*Lagenaria siceraria* (Mol.) Standl.]

Mukesh Nagar, A.K. Soni, S.K. Bairwa and P.K. Yadav
Department of Horticulture, College of Agriculture
S K Rajasthan Agricultural University, Bikaner
(Received: 25.07.2015; Accepted: 15.01.2016)

Abstract

A field experiment was conducted during *kharif*, season of 2012 to study the effect of organic manures and NPK levels on Bottle gourd. The experiment consisted 16 treatment *viz.*, Four levels of NPK (control, 100:50:50, 80:40:40 and 60:30:30) and organic manures (control, vermicompost, poultry manure and FYM) factorial RBD with three replications. Results indicated that the application of NPK (100:50:50) + vermicompost (5.0 t ha^{-1}) remaining at par with dose of NPK (80:40:40) + vermicompost (5.0 t ha^{-1}), exhibited maximum per cent fruit set, number of fruit per vine, fruit length, fruit weight, total yield per vine, total yield, protein content in fruit and crude fiber content in fruit.

Key Words : Bottle gourd, vermi compost, poultry manure.

Introduction

Bottle gourd [*Lagenaria siceraria* (Mol.) Standl.] synonymously called white flower gourd or calabash gourd is a member of Cucurbitaceae family. It is commonly grown in India, Ethiopia, Africa, Central America and other warmer regions of the world. The fruits are consumed as vegetable or for making sweets (*halwa, kheer, petha* and *burfi*) and pickles. *Kofta* is one of the most popular preparations of tender fruits of bottle gourd. The fruits have cardiatonic and diuretic properties and have cooling effect (Choudhary and Bairwa, 2014). It is good for patients suffering from biliousness and indigestion. The dry hard sell of fruits is used for making a wide range of articles like bowls, bottles, ladles, containers and musical instruments. It was named as bottle perhaps the shape of fruits resemble bottle. In addition, the seeds and seed oil are also edible. The fruits contain 0.2% protein, 2.9% carbohydrate, 0.5% fat and 11 mg vitamin C of per 100 g fresh weight. The effects of organic and inorganic fertilizers are complementary to each other in terms of soil fertility improvement and sustainable agriculture. Therefore, it is necessary to make their judicious use in right proportion for harvesting better yield of different crops in cropping sequence and for sustaining soil fertility. The Integrated nutrient management helps in restoring and sustaining soil fertility and crop productivity. It also helps in arresting the emerging deficiencies of macro, secondary and micronutrients favorably by optimizing the physical, chemical and biological environment of soil and achieving economy and efficiency in fertilizer use. Hence, the present study was undertaken to find out the combined effect of organic manures and inorganic fertilizers on the yield and quality of bottle gourd.

Materials and Methods

The experiment was laid out at Horticulture Farm, College of Agriculture, Bikaner, during *kharif* season 2012. The soil was loamy sandy with pH 8.2 and contained 0.09 % organic carbon, 80.19 kg ha^{-1} available N, 17.34 kg ha^{-1} available P, 185.42 kg ha^{-1} available K. The experiment was laid out in Randomized Block Design (Factorial) with three replications. There were sixteen treatment combinations, which included various combination of NPK (control,100:50:50, 80:40:40 and 60:30:30) and organic manures (control, vermicompost, poultry manure and FYM). The well rotten farm yard manure (10.0 t ha^{-1}), vermicompost (5.0 t ha^{-1}) and poultry manure (5.0 t ha^{-1}) were applied and spread uniformly in the plots as per treatment. Three seeds per hill were sown manually by dibbling method on 3rd August 2012. The seeds were soaked in cold water overnight before sowing for better germination. The sowing was done in the rows keeping 2.5 m inter-row spacing and 0.80 m plant-to-plant spacing. At each hill and seeds were sown at a depth of 1.5 to 2.0 cm. Germination took place within six days after sowing. One third dose of N, full doses of phosphorus and potassium were applied at the time of sowing. The remaining doses of nitrogen were applied 30 and 60 days into standing crop. The sources of N, P and K were used as urea, single super phosphate and muriate of potash, respectively the recommended dose of NPK was 80:40:40 kg ha^{-1} (Anonymous, 2010). Data were taken five plants were selected randomly from each plot and tagged.

Results and Discussion

The data presented in Table 1 that organic manures, NPK levels and their combined effect significantly affected per cent fruit set, number of fruits per vine, fruit length, fruit weight, total fruit yield per vine, yield, protein content in fruit and crude fiber on fruit.

Table 1. Effect of organic manure and NPK level and their treatment combinations on yield and quality of Bottle gourd

Treatment	Fruit set %	No. of fruits per vine	Fruit length (cm)	Fruit weight (g)	Total yield per vine (kg)	Yield (q/ha)	Protein content in fruit	Crude fiber content in fruit
Control	41.75	5.6	37.66	537.03	3	134.93	0.193	1.100
Vermicompost	48.61	8	37.82	814.7	6.51	195.11	0.212	1.117
Poultry manure	46.62	7.8	38.17	831.01	6.48	182.96	0.237	1.123
FYM	48.81	7.9	38.22	842.22	6.65	191.32	0.231	1.113
S.Em±	0.27	0.2	0.17	18.25	0.15	0.27	0.007	0.003
C.D. (P=0.05)	0.79	0.58	0.49	52.72	0.46	0.78	NS	NS
NPK (60:30:30)	45.73	7.5	38.85	844.33	6.33	192.56	0.218	1.137
NPK (80:40:40)	49.16	8.7	38.98	862.31	7.49	193.83	0.237	1.123
NPK (100:50:50)	46.17	8	40.69	875.09	7	231.56	0.268	1.137
S.Em±	0.27	0.2	0.17	18.25	0.15	0.27	0.007	0.003
C.D. (P=0.05)	0.76	0.58	0.49	52.72	0.46	0.78	0.021	0.009
Vermicompost + NPK (60:30:30)	49.3	8.8	39.18	881.11	7.75	211.33	0.243	1.13
Vermicompost + NPK (80:40:40)	59.23	10.1	42.35	982.96	9.91	265.98	0.281	1.14
Vermicompost + NPK (100:50:50)	65.3	12.2	42.6	1138.45	11.8	298.39	0.331	1.16
Poultry manure + NPK (60:30:30)	49.6	8.9	39.4	888.41	7.9	215.77	0.256	1.127
Poultry manure + NPK (80:40:40)	62.17	11.1	40.79	980.16	10.87	270.57	0.281	1.127
Poultry manure + NPK (100:50:50)	50.79	9.7	39.86	963.41	9.34	231.36	0.262	1.13
FYM+ NPK (60:30:30)	50.59	9.3	39.72	908.37	8.44	228.19	0.256	1.133
FYM+ NPK (80:40:40)	60.95	10.6	42.5	1052.83	11.15	238.44	0.287	1.15
FYM+ NPK (100:50:50)	50.06	9.8	40.26	965.86	9.45	235.09	0.262	1.13
S.Em±	0.55	0.4	0.34	36.5	0.31	0.54	0.015	0.006
C.D. (P=0.05)	1.59	1.16	0.99	105.44	0.92	1.56	0.043	0.018

Effect of organic manure

The yield and quality attributes of bottle gourd significantly influenced with the use of vermicompost followed by poultry manure (Table 1). The application of vermicompost (5.0 t ha^{-1}) being at par with poultry manure (5.0 t ha^{-1}) recorded maximum per cent fruit set, number of fruits per vine, fruit length, fruit weight, total fruit yield per vine and total yield. The beneficially effect of vermicompost on yield attributes on yield might be due to enhanced supply of micro and macro- nutrients during entire growing season, significant increased yield under the influenced of vermicompost was largely function of improve growth and the consequent increase in different yield attributes and yield as mention above. The significant improvement in yield account of vermicompost along with nutrients from soil particularly at later stage of crop growth might have encases the rate of photosynthesis with further increased vegetative growth and provided more site for translocation of photosynthesizes with ultimately increased the yield. The results are in the conformity with the findings of Arancon *et al.*, (2003) in tomato crops, Reddy and Rao (2004) in bitter gourd, Choudhary *et al.*, (2012) in sprouting broccoli.

Effect of inorganic fertilizers

Application of different NPK levels significantly influenced the yield and quality of bottle gourd. The maximum per cent of fruit set, number of fruit per vine, fruit length and total fruit yield per vine were recorded under NPK (80:40:40) fruit weight, total fruit yield, protein content in fruit and crude fiber content in fruit were recorded under NPK (100:50:50) in Table 1. This might be due to the fact that increased NPK levels, helped in the expansion of leaf area and chlorophyll content which coupled with increased net photosynthetic rates and in turn increased the supply of carbohydrates to plants. The application of NPK favoured the metabolic and auxin activities in plant and ultimately results in increased weight of fruit yield per vine and total yield. However, potassium does not increase the yield of plant but indirectly supported to yield. The results are also in close conformity the findings Singh *et al.*, (2004), Singh and Krishana (2007) and Ouda and Mahadeen (2008).

Interactive effect of organic manures and Inorganic fertilizers

Significant variation in fruit set per cent, number of fruits per vine, fruit length, fruit weight, total fruit yield per vine, total yield, protein content in fruit, crude fiber content in fruit, nitrogen content in fruit, phosphorus content in fruit and potassium content in fruit were observed due to execution of different treatments. The maximum per cent of fruit set was found in treatment vermicompost + NPK (100:50:50) followed by FYM + NPK (80:40:40). The maximum number of fruits per vine was found significant in treatment vermicompost + NPK (100:50:50) followed by Poultry manure + NPK (80:40:40). The fruit length, fruit weight and total yield per vine were significantly influenced by different treatment combinations (Table 1). The longest fruit (42.06), maximum weight (1138.45) and highest total yield per vine (11.80) in treatment vermicompost + NPK (100:50:50) followed by FYM + NPK (80:40:40). The fruit yield per ha of bottle gourd was significantly influenced by organic manure and fertilizers treatment combination. It is generally increased fruit yield from 134.93 to 298.39 q/ha in this experiment. The maximum yield produced by vermicompost + NPK

(100:50:50) treatment was mainly due to cumulative effects of in fruit set per cent, number of fruits per vine, fruit length, fruit weight and total fruit yield per vine. Protein content in fruit and crude fiber content were calculated by multiplying nitrogen per cent in fruit the factor 6.25 as suggested by Gupta *et al.* (1972) and (A.O.A.C., 1960). Table 1 clearly indicated that the combined effect of organic manures and NPK levels significantly influenced the protein content of fruit. Data indicated that the treatment combination vermicompost + NPK (100:50:50) resulted in significantly higher (0.331 %) protein content. whereas the maximum (1.160%) crude fiber content in fruit was observed under vermicompost + NPK (100:50:50) treatment combination. The results have been observed due to availability of adequate amount of NPK at longer period and sustain, maintain and improve the fertility levels of soil. The application of vermicompost + NPK (80:40:40) treatment combination reduces the quantity of inorganic fertilizer for the crops and also reduces the residual effect of these inorganic fertilizers. The vermicompost has nitrogen, phosphorus and other micro-nutrients solubilizing bacteria. They solublized the nitrogen, phosphorus and other micro-nutrients in soil near the root zone of the crop. They provide nutrients it's in the readily available chelated from to the plants such as nitrate, exchangeable phosphorus, soluble K, Ca and Mg. They also contain biologically active substance such as plant growth regulators. It may be also due to the reason as vermicompost having a material which has high porosity, aeration, drainability and water holding capacity, thus it is capable to improve the physical condition of soil with yield of vegetable crop, when applied in the combination of chemical fertilizers. These finding are agreement with those of Raut *et al.*, (2003) in tomato crops and Singh and Krishana (2007) in point gourd. The combined effect of organic fertilizer and inorganic fertilizer increased the yield attributes and yield. This is due to the fact that application of fertilizers alone have supplied only one or two nutrient but combined use of organic and inorganic fertilizers have provided all the essentials nutrient in proper amount, required by plants for its growth and development. These finding are agreement with those of Kalalbandi *et al.*, (2007) in cabbage and Eifediyi and Remison (2010) in cucumber.

References

A.O.A.C. 1960. Official Method of Analysis, 18th Endn. Association of Official Agricultural Chemists, 1608. Broadnon Drive. Champaign Illinois, USA.

Arancon, N.Q.; Edwards, C.A.; Bierman, P. and Metzger 2003. Effects of vermicompost on growth and marketable fruit of field grown tomatoes, peppers and strawberries. 7th *International Symposium on Earthworm Ecology, Cardiff, Wales*, 47 (5-6) : 731-735.

Anonymous, 2010. Package and Practices of Horticultural crops in Rajasthan. Directorate of Horticulture, Pant Krishi Bhavan, Government of Rajasthan, Jaipur.

Choudhary, B.R. and Bairwa, S.K. 2014. Scientific cultivation of Bottle gourd (*Lagenaria siceraria*), Advances of vegetable agronomy, Edited by: Choduary *et.al.*, 2014, Post graduate school, IARI, New Delhi and ICAR, DARE, Ministry of agriculture, GoI, New Delhi:: 116-122.

Choudhary, S., Soni, A.K. and Jat, N.K. 2012. Effect of organic and inorganic sources of nutrients on growth, yield and quality of sprouting broccoli *cv.* CBH-1. *Indian J. Hort.*, 69 (4): 550-554.

Eifediyi, E.K, and Remison, S.U. 2010. Growth and yield of cucumber (*Cucumis sativus*) as influenced by farmyard manure and inorganic fertilizer. *Sciencepub.net/report*, 2 (4).

Gupta, S.B., Pathak., R.K.; Bhan, S. and Singh, A. 1972. Effect of NPK on yield, nutrient uptake and quality of toria. *Indian J. Agronomy*, 17 (1) : 88-91.

Kalabandi, B.M., Dabhade, R.S. and More, S.S. 2007. Effect of organic and inorganic fertilizer on growth, yield, quality of cabbage (*Brassica oleracae* var. *capitata*). *Asian J. Hort.*, 2 (2) : 144-147 .

Raut, R.L., Naidu, A.K., Jain, P.K., and Rajwade, V.B. 2003. Influence of organic and chemical sources of nutrients on the yield, fruit quality and storage of tomato in Madhya Pradesh, India. *JNKVV Res. J.*, 37(1) : 30-33.

Reddy, P.K. and Rao, P.V. 2004. Growth and yield of bitter gourd (*Momordica charantia* L.) as influenced by vermicompost and nitrogen management practices. *J. Res. ANGRAU.*, 32 : 3, 15-20.

Samawat, S., Lakzian, A. and Zamirpour, A. 2001. The effect of vermicompost on growth characteristics of tomato. *Agriculture Sciences and Technical.*, 15 (2) : 83-89.

Sharu, S. R. and Meerabhai M. 2001. Effect of integrated nutrient management on yield and quality in chilli (*Capsicum annum* L.), *Veg. Sci,*. 28 (2) : 184-185

Singh, K.P and Mohan, Krishan 2007. Integrated nutrient management for sustainable production of pointed gourd (*Trichosanthes dioica* Roxb.) under Ganga diara of Bihar. *Asian J. Hort.*, **2** (1) : 99-101.

Singh, Hadip, Srivastava, V.K. and Mangal, J.L. 2004. Effect of different doses of nitrogen and pphosphorus on growth, flowering, seed yield and quality of tinda. Department of Vegetable Crops, Haryana Agricultural University, Hissar.

Ouda, B. A. and Mahadeen, A.Y. 2008. Effect of fertilizers on growth, yield, yield components, quality and certain nutrient contents in broccoli (*Brassica oleracea.*). *Int. J. Agri. Biol.*, 10 : 627-132 .