



Effect of Organic Manures and Inorganic Fertilizers on Growth, Yield and Quality of Bottle Gourd (*Lagenaria siceraria* L.)

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

The present experiment was carried out in Research field, Department of Horticulture, SHUATS, Prayagraj. The experiment was conducted in Randomized Block Design (RBD), with 12 treatments, replicated thrice with Organic manures and inorganic fertilizers. The treatments rendered their significant effect on growth, flowering and yield characters as well as fruit yield of bottle gourd. Treatment consists of 25%NPK+75% Vermicompost was recorded maximum performances with respect to almost all the characters viz., growth, flowering and yield. It is concluded from the investigation that the treatment 25%NPK+ 75% vermicompost was found suitable for application in *kharif* season bottle gourd cultivation for better yield (50.59 t ha⁻¹).

Keywords: *Bottle gourd; vermicompost; FYM; poultry manure; goat manure; NPK.*

1. INTRODUCTION

Bottle gourd (*Lagenaria siceraria* Mol. Standl.) belongs to the family Cucurbitaceae with

chromosome number of 2n=22. Its native is tropical Africa and Asia. It is commonly known as white-flowered gourd, *Lauki*, *Kaddu*, *Ghiya* and *Dudhi*. Among cucurbits, bottle gourd [*Lagenaria*

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siceraria (Mol.) Standl.] is considered as nutrition rich fruit vegetable is extensively grown in India and fruits are available throughout the year. Fruits at tender stage are used as a cooked vegetable and for preparation of sweets (e.g. *kheer, petha, burfi, and halwa*), pickles and rayta. Hard shells of mature fruits are used as water jugs, domestic utensils, floats for fishing nets and making musical instruments, etc. As a vegetable it is easily digestible. It has cooling effect and has diuretic and having cardio-tonic properties. Fruit pulp is used as an antidote against certain poisons and is good for controlling constipation, night blindness and cough. A decoction made out of leaf is taken for curing jaundice.

The effect of organic and inorganic fertilizers is complementary to each other in terms of soil fertility improvement and sustainable agriculture [1,2]. 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 [3]. 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 growth and yield of bottle gourd.

Application of organic manures improves the soil fertility, soil structure and moisture holding capacity. Integrated plant nutrient management is one of the recent methods of supplying nutrients to the plants by organic as well as inorganic means together to fulfill the nutrient requirements. At the same time the main aim of integrated plant nutrient management is to minimize the use of chemical fertilizers without sacrificing the yield. Composts, vermicomposts, poultry manures, Farmyard manure (FYM) etc. are bulky organic manures, although supply low quality of major nutrients, but have potential to supply all essential nutrients for longer periods Rajput and Pandey (2004).

Vermicompost is homogenous with desirable aesthetics, plant growth hormones and high levels of soil enzymes, while enhancing microbial populations and tending to hold more nutrients

over longer periods without adverse impacts on the environment. It can also be used as a bio remedial measure to reclaim problem soils, especially acid soils, because of the near- natural to alkaline pH of vermicompost and the suppression of labile aluminium. Balance dose of NPK to plant give maximum production due to sufficient amount of nutrient absorb by plant .the continuous use of inorganic fertilizers and unbalance to adverse effect on soil physical, chemical and biological properties. Considerable attention in the recent past with hope to meeting the farmer's economic need as well as maintaining favourable ecological condition on long basis. These factors will have marked effect on the growth and yield parameters of bottle gourd.

2. MATERIALS AND METHODS

The experiment was conducted at Experimental Research Field, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj (UP) during 2021 during *Kharif* season in India. The soil of the experiment field was alkaline, sandy loam and pH of 7.2. The experiment was laid out in Randomized Block Design (RBD) with 12 treatments, those were replicated thrice. Sarita variety of bottle gourd was selected for the study. Which was planted during *Kharif* season in 2021. At 3m x 1.5m spacing and different treatment combination were applied at 30, 60 and 90 Days after sowing. The treatment comprises of T₁ 100% RDF (200:100:100kgNPK), T₂ 25%NPK+75%FYM, T₃ 25%NPK+75% Vermicompost, T₄ 25%NPK+75% poultry manure, T₅ 25% NPK+75% goat manure, T₆ 50% NPK+50% FYM, T₇ 50% NPK+50% vermicompost, T₈ 50% NPK+50% poultry manures, T₉ 50% NPK+50% goat manure, T₁₀ 75% NPK+25% FYM, T₁₁ 75% NPK+25% vermicompost, T₁₂ 75% NPK+25% poultry manure. Statistical analysis of variance was performed on the data collected throughout the experiment. The observation were recorded for vine length (m), days to appearance of first male and female flower, total number of male and female flower per vine, fruit diameter (cm), fruit length (cm), fruit weight (g), no of fruits per vine, fruit yield per plant(kg), fruit yield per hectare (t/ha). The significance of the treatments was determined using the 'F' test at a level of significance of 5%.

Table 1.Treatment details

Treatments symbols	Treatment combinations
T ₁	100%RDF (200:100:100kgNPK)
T ₂	25%NPK+75%FYM
T ₃	25%NPK+75% Vermicompost
T ₄	25%NPK+75% poultry manure
T ₅	25% NPK+75% goat manure
T ₆	50% NPK+50% FYM
T ₇	50% NPK+50% vermicompost
T ₈	50% NPK+50% poultry manures
T ₉	50% NPK+50% goat manure
T ₁₀	75% NPK+25% FYM
T ₁₁	75% NPK+25% vermicompost
T ₁₂	75% NPK+25% poultry manures

3. RESULTS AND DISCUSSION

3.1 Impact of Organic Manures and Inorganic Fertilizers on Growth Character of Bottle Gourd

The maximum vine length was recorded 25%NPK+75% Vermicompost (7.72m) and it was found to be at par with 50% NPK+50% Vermicompost. The minimum vine length was recorded in 100%RDF (200:100:100kgNPK) (4.29m). This clearly indicated that integrated use of nutrients helpful in cell elongation of rapid cell division and cell elongation in meristematic region of plant due to production of plant growth substance and this may be due to abundant supply of plant nutrients and nitrogen which led in the growth of bottle gourd [4]. Similar findings of Mujahid et al., [5] in lettuce and Bano and Kale [6] in brinjal and radish were earlier reported. The maximum number of branches/ plant was recorded in 25%NPK+75% vermicompost (15.34) and it excelled are other treatments. The treatments T₂, T₄, T₆ and T₇ exerted similar effect. The minimum number of branches/ plant were recorded in 100%RDF (200:100:100kgNPK) (8.76). This might be due to the supply of nutrients through organic sources similar finding has been reported by Mujahid et al., [5] and Vadiraj et al., [7] in brinjal, Bahadur et al., [8], Suresh and Karuppaiah [9]. The minimum days to first male flower appearance was recorded in 25%NPK+75% Vermicompost(66.71) followed by 50% NPK+50% vermicompost and 25%NPK+75%FYM. The maximum days to first male flower appearance was recorded in 100%RDF (200:100:100kgNPK) (84.90). Similar result was also obtained by Bano and Kale [6]. The minimum days to first female flower appearance was recorded in 25%NPK+75% Vermicompost (70.89) followed by 50%

NPK+50% vermicompost and 25%NPK+75%FYM. While the maximum days to first female flower appearance recorded in 100%RDF (200:100:100kgNPK) (89.34). Similar result was also obtained by Bano and Kale [6] in the cucurbits.

3.2 Impact of Organic Manures and Inorganic Fertilizers on Yield and Yield Attributing Characters of Bottle Gourd

- The maximum average fruit length was recorded in 25%NPK+75% vermicompost (43.53cm). This was followed by 50% NPK+50% vermicompost and 25%NPK+75%FYM. The minimum average fruit length was recorded in 100%RDF (200:100:100kgNPK) (27.51cm). The result are in conformity with findings of Abusaleh [10] in okra, Bahadur et al. [8] in Chinese cabbage and Thriveni et al., [11]. The maximum average fruit weight (g) was recorded in 25%NPK+75% vermicompost (1.69kg). However, 50% NPK+50% vermicompost and 25%NPK+75%FYM are found statistically at par with 25%NPK+75% vermicompost. The minimum average fruit weight was recorded in 100%RDF (200:100:100kgNPK) (1.08kg). The maximum fruit diameter was recorded in 25%NPK+75% vermicompost (22.29cm) followed by 50% NPK+50% vermicompost, 25%NPK+75%FYM and 50% NPK+50% FYM. The minimum average fruit weight was recorded in 100%RDF (200:100:100kgNPK) (14.84cm). The maximum fruit diameter per plant was recorded in 25%NPK+75% vermicompost

Table 2. Impact of different nutrient combination on growth, yield and quality character of bottle gourd

Treatments symbols	Treatment combinations	Vine length (m)	No. of branches/plant	Days to first male flower appearance	Days to first female flower appearance	Days to first picking	Avg. fruit length(cm)	Avg. fruit weight(Kg)	Fruit diameter (cm)	No. of fruits per plant	Fruit yield per plant (kg)	Avg. Yield t/ha	TSS (^o Brix)	Vitamin C
T ₁	100%RDF (200:100:100kgNPK)	4.29	8.76	84.90	89.34	89.98	27.51	1.08	14.84	13.26	14.32	18.20	3.25	4.99
T ₂	25%NPK+75%FYM	7.03	14.10	70.25	75.41	75.42	40.44	1.59	19.81	20.71	32.93	41.91	4.32	7.12
T ₃	25%NPK+75% vermicompost	7.72	15.34	66.71	70.89	71.88	43.53	1.69	22.29	23.62	39.92	50.59	4.60	7.34
T ₄	25%NPK+75% poultry manure	6.45	13.50	74.53	78.50	78.40	38.47	1.51	18.94	19.17	28.95	36.84	4.23	6.24
T ₅	25% NPK+75% goat manure	6.03	12.65	77.68	82.18	81.45	36.46	1.44	18.29	17.17	24.72	31.33	4.09	6.34
T ₆	50% NPK+50% FYM	6.83	13.89	73.64	78.14	76.30	39.32	1.54	19.71	19.99	30.37	39.10	4.15	6.72
T ₇	50% NPK+50% vermicompost	7.22	14.26	67.15	71.79	72.37	41.49	1.63	20.97	21.28	34.68	44.04	4.56	7.18
T ₈	50% NPK+50% poultry manures	6.30	12.29	76.43	82.74	80.06	37.66	1.47	18.50	18.73	27.53	35.06	4.16	6.49
T ₉	50% NPK+50% goat manure	5.75	11.85	79.28	85.62	85.51	34.69	1.36	17.53	16.11	21.84	27.75	4.33	5.17
T ₁₀	75% NPK+25% FYM	5.90	11.15	81.40	86.09	85.73	33.52	1.28	17.21	16.45	21.06	26.62	4.45	5.67
T ₁₁	75% NPK+25% vermicompost	5.84	11.87	81.78	85.51	85.50	34.14	1.25	17.16	15.92	19.90	25.35	4.36	5.89
T ₁₂	75% NPK+25% poultry manures	5.48	11.33	82.67	85.58	85.25	34.46	1.31	16.70	15.31	20.06	25.47	3.57	6.06

Treatments symbols	Treatment combinations	Vine length (m)	No. of branches/plant	Days to first male flower appearance	Days to first female flower appearance	Days to first picking	Avg. fruit length(cm)	Avg. fruit weight(Kg)	Fruit diameter (cm)	No. of fruits per plant	Fruit yield per plant (kg)	Avg. Yield t/ha	TSS (^o Brix)	Vitamin C
	F-Test	S	S	S	S	S	S	S	S	S	S	S	S	S
	S.Ed (±)	0.219	0.424	1.078	0.966	0.700	0.872	0.038	0.464	0.660	0.994	1.262	0.212	0.342
	C.D at 5%	0.454	0.880	2.237	2.004	1.453	1.809	0.078	0.962	1.368	2.061	2.617	0.440	0.710
	CV	4.304	4.129	1.730	1.462	1.064	2.902	3.125	3.071	4.452	4.611	4.611	6.229	6.689

(23.62) followed by 50% NPK+50%, 25%NPK+75%FYM and 50% NPK+50% FYM. The minimum number of fruits per plant was recorded in 100%RDF (200:100:100kgNPK) (13.26) Similar result has been recorded in Subbian et al., (1985). The maximum fruit yield per plant was recorded in 25%NPK+75% vermicompost(39.94kg) followed by 50% NPK+50% vermicompost, 25%NPK+75%FYM and 50% NPK+50% FYM. The minimum fruit yield per plant was recorded in 100%RDF (200:100:100kgNPK) (14.33kg). The maximum fruit yield was recorded in 25%NPK+75% vermicompost (50.59t/ha), followed by 50% NPK+50% vermicompost and 25%NPK+75%FYM. The minimum fruit yield was recorded in 100%RDF (200:100:100kgNPK) (18.20kg/ha).

3.3 Impact of Organic and Inorganic Fertilizers Treatments on Quality Characters of Bottle Gourd

The analysis data of Total soluble solid showed the significant results. The maximum Total soluble solid was recorded in 25%NPK+75% vermicompost(4.60) However, 50% NPK+50% Vermicompost, 75% NPK+25% FYM and 75% NPK+25% vermicompost are found statistically at par with 25%NPK+75% vermicompost. The minimum Total soluble solid recorded in 100%RDF (200:100:100kgNPK) (3.25). The maximum Vitamin C was recorded in 25%NPK+75% vermicompost (7.34), 50% NPK+50% vermicompost, 25%NPK+75% FYM, and 50% NPK+50% FYM are found statistically at par with 25%NPK+75% Vermicompost. The minimum Vitamin C recorded in 100%RDF (200:100:100kgNPK) (4.99).

4. CONCLUSION

Organic manures and inorganic fertilizers treatments rendered their significant effect on almost all the growth, flowering and yield characters as well as fruit yield of bottle gourd. Treatment consists of 25%NPK+75% Vermicompost was recorded maximum performances with respect to almost all the characters viz., growth, flowering and yield. It is concluded from the investigation application of 25%NPK+75% Vermicompost was found suitable for kharif season bottle gourd cultivation for better yield (50.59 t ha⁻¹).

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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