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Effect of Different Manures on Growth, Yield and Profitability of Small Scale Brinjal (Egg-Plant) Cultivation in Gunny Bag

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Brinjal, being a long duration vegetable crop, requires appropriate supply of proper nutrition for sustainable and quality yield. Besides, adverse climatic and inadequate cultivable land add a problem for commercial or even subsistence farming with eggplant especially in the ecologically vulnerable southern region of Bangladesh. Therefore, an experiment on small scale brinjal cultivation in gunny bags (60 cm × 50 cm) was undertaken. The study on variation in growth and yield parameters in brinjal (cv. Muktokeshi) under different organic manures, fertilizers and their combinations was carried out during October 2017 to June 2018 at the Germplasm Center of Agrotechnology Discipline, Khulna University, Khulna. The experiment consisted of seven treatments and was laid out in Completely Randomized Design with seven replications. The treatments were T_0 (Control), T_1 (100% Cowdung), T_2 (100% FYM), T_3 (50% Soil+50%

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Recommended Fertilizers), T_4 (50% Soil+ 50% WH), T_5 (50% Soil+50% CD), T_6 (50% Soil+50% FYM), T_7 (50% WH+50% CD), T_8 (50% WH+50% FYM), T_9 (50% FYM+50% CD). Healthy and disease free 30 days old seedlings were transplanted at 15 days after bag preparation. Statistically significant differences among the treatments were noted in respect of all the growth parameters including yield and yield attributing characters. Maximum plant height (60.04 cm) was recorded in treatment T_6 (50% Soil+50% FYM) followed by (50.04 cm) in T_5 (50% Soil + 50% CD) at 90 days after transplanting (DAT). Superiority was also showed by the treatment T_6 (50% Soil+50% FYM) in terms of producing the highest number of branches (15.21 branches/plant) and leaves (40.21 leaves/plant) at 90 DAT. Manures had marked influence on flowering behavior on brinjal. The earliest flowering was occurred in T_6 (50% Soil+50% FYM) treatment (23.49 days) followed by T_5 (50% Soil + 50% CD) treatment (31.07 days). While control plants and plants treated with 50% Soil+50% RD required longer period for flowering (44.0 days and 45.07 days, respectively). Again, significantly maximum number of fruits per plant, the heaviest fruit and the highest fruit yield per bag were registered in plants under T_6 (50% Soil+50% FYM) treatment (42.0, 104.6 g and 4.39 kg, respectively) which was statistically followed by T_5 (50% Soil + 50% CD) treatment. In addition an increase in yield of 164.68 % and 169.02 % over control was also noticed in treatment T_5 and T_6, respectively. Though maximum net return per bag (BDT 89.68 Tk.) was incurred in the treatment T_6, statistically similar but with the highest BCR value was observed in T_5 due to the higher purchase cost of FYM than others (a BCR of 3.18, 3.57 and 3.13 in T_4, T_5 and T_6, respectively). So, Cowdung, Farm yard manure and Water hyacinth can be mixed with soil for small scale and profitable brinjal cultivation in bag.

Keywords: Brinjal; organic manures; bag cultivation; growth; yield; BCR.

1. INTRODUCTION

Brinjal, also known as eggplant belonging to the family Solanaceae, is a vegetable commonly and widely grown by the farmers throughout the world including Bangladesh. Brinjal occupies approximately 13% of the total area and 13.5% of total production under vegetable cultivations in Bangladesh [1]. At present brinjal consumption in Bangladesh is the lowest in the world and per capita consumption is currently 62 g a day against the Food and Agricultural Organisation's (FAO) recommendation of 220 g [2,3]. However, it plays an important vegetables item in every kitchen. Eggplant supplements starchy foods in addition to being good source of protein, minerals and vitamins [4,5]. Again, it is a versatile crop adapted to different agro-climatic regions. Brinjal being a long duration crop requires a good amount of manures and fertilizers for high yield [6]. According to them, 15-20 tons of well-decomposed FYM are incorporated into the soil for a good yield of brinjal. It is well documented that, increased dependence on agro chemicals including fertilizer has led to several ill effects on the human health as well as degrades the soil health [7]. The use of organic manure in such situation is a practically paying proposal. Organic system produced significant improvement in quality of soil mainly bulk density, maximum water holding capacity, infiltration rate, organic carbon, available nitrogen, phosphorus and potassium [8,9]. The demand of *S. melongena* L. cv. 'Muktokeshi local' is increasing as an important vegetable crop in Bangladesh. Moreover, the agro-climatic condition in the coastal region is meager. Again, the urban people can produce brinjal in bags on the roof top of their house. The poor and distressed women can cultivate brinjal by using these alternative cultivation practices with different manures in there homesteads. In addition, this cultivation practices requires less land and also requires less production cost. Hence, the research was undertaken to observe the growth and yield of brinjal cv. Muktokeshi in bags under organic practices.

2. MATERIALS AND METHODS

2.1 Study Site

The research was conducted at the Germplasm Center of Agrotechnology Discipline, Khulna University, Khulna during October 2017 to June 2018 in jute bags (60 cm in length and 50 cm in width) under open space. According to Khulna Meteorological Center the climate was subtropical in nature locating in the AEZ-13 of Bangladesh. Geographically the study site was at 22°48´01.8´´ N latitude and 89°32´15.2´´ E longitude. The area is one of the warmest regions of Bangladesh with an annual average temperature of 26.3 °C (79.3 °F), with monthly

mean temperatures ranged from 12.4 °C (54.3 °F) in January to 34.3 °C (93.7 °F) in the month of May. In terms of precipitation its average annual rainfall is 1,809.4 mm (71.24 in) and about 87 percent occurring during May to October. According to the Regional Weather Research Centre, Khulna, temperature starts falling in October with January being the coolest month and again starts rising in March being May becomes the warmest month.

2.2 Experimental Layout and Crop Management

The experiment was laid out in Completely Randomized Design with 10 (ten) different treatments and 07 (seven) replications. The treatments include 100% Cow Dung (CD) @ 12.5t/ha (12 kg/bag), 100% Farm Yard Manure (FYM) @ 12.5 t/ha (12 kg/bag), 50% Soil+50% Recommended Fertilizers (NPK) @ 150: 100: 50 (1.23:0.82: 0.41 g/bag), 50% Soil+ 50% Water Hyacinth (WH) (5 g/bag), 50% Soil+50% CD, 50% Soil+50% FYM, 50% WH+50% CD, 50% WH+50% FYM and 50% FYM+50% CD along with control (soil without manures and fertilizers). The treatments were prepared on weight basis. The chemical and physical characteristics of used soil were analyzed at the "Soil Resource Development Institute" (SRDI), Daulatpur, Khulna (Table 1).

Largely cultivated and locally popular brinjal cultivar 'Muktokeshi', crop duration 180 days, was used as planting material. Fungicide treated seeds were sown on the seedbed on 20th October 2017. Upto seedling transplanting the seedbed was covered with 60 mesh white net to prevent seedlings from early insect infestation. At 15 days after treatment preparation (bag filling with manures) healthy seedlings of 30 days old were transplanted in the prepared bags on 18th November 2017. In each bag two seedlings were transplanted but immediately after establishment single seedling was allowed to grow. All the intercultural operations like watering, gap filling, staking, weeding and plant protection measures were executed carefully.

2.3 Measurement of Growth and Yield Characteristics

Immediately after establishment, the plants started growing due to manure application and data on growth parameters like plant height (cm), number of branches/plant and number of leaves/plant at 30, 60 and 90 days after transplanting were recorded. In terms of flowering attributes days to anthesis and number of flowers/plant were counted. Harvesting started from 94 days after transplanting and continued till 172 days after transplanting. Hand picking was practiced. To measure the yield and yield contributing traits number of fruits/plant, individual fruit weight (g) and yield/plant (kg) were recorded.

2.4 Statistical Analysis

The collected data were tabulated and statistically analyzed with appropriate design of experiment (Gomez and Gomez, 1984) adopting statistical program MSTAT-C [10]. The treatment means were separated statistically at 1% and 5 % level of significance. Cost and return analysis (in BDT) and benefit cost ratio were also calculated using standard formula.

3. RESULTS AND DISCUSSION

3.1 Effects of Organic Manures on Growth Characteristics of Brinjal cv. Muktokeshi

There was significant difference in respect of plant height, number of branches/plant and number of leaves/plant among the treatments (Table 2).

Table 1. Physical and Chemical characteristics of soil sample before manure and fertilizers application

Name of parameters	Value	Critical limit
pH	7.30	-
Electric conductivity (dS/m)	2.01	-
Organic matter (%)	2.70	-
Total Nitrogen (%)	0.37	0.12
Phosphorus (µg/ g soil)	10.20	8.0
Potassium (mg/100g soil)	0.41	0.1
Sulphur (µg/g soil)	60.56	12.0
Zinc (µg/g soil)	1.05	0.6

Source: Soil Research and Development Institute, Regional Lab, Daulatpur, Khulna

Table 2. Vegetative growth of brinjal at different DAT as influenced by manures, fertilizers and their combinations

Treatment	Plant height (cm)			Number of branches/plant			Number of leaves/plant		
	30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT
T_0= Control	17.70cde	24.18d	37.68e	1.00e	2.70d	4.21g	5.28c	13.56e	18.42g
T_1= 100% CD	20.00bc	27.84cd	41.54cd	3.21a	5.70a	9.07cd	5.56cd	16.00d	23.14f
T_2= 100% FYM	20.50b	26.93cd	42.71cd	2.70abc	3.00c	7.49de	5.28c	13.56e	20.00fg
T_3= 50% Soil+50% RD	15.50de	25.56d	39.64cde	2.35cd	4.00b	5.21fg	4.70d	13.00e	19.00g
T_4= 50% Soil+ 50% WH	15.00de	26.06cd	39.25de	2.70abc	4.00b	10.00c	5.42c	16.00d	25.56e
T_5= 50% Soil+50% CD	19.00bcd	32.34b	50.04b	3.28a	5.56a	13.07b	6.00b	21.70b	33.42b
T_6= 50% Soil+50% FYM	25.00a	38.19a	60.04a	3.00ab	4.42b	15.21a	8.28a	25.70a	40.14a
T_7= 50% WH+50% CD	14.00e	25.52d	39.21de	2.00d	3.00c	6.49ef	5.70c	11.70e	19.00g
T_8= 50% WH+50% FYM	19.00b-d	27.75cd	40.79cde	2.21cd	4.00b	10.00c	6.00b	18.42bc	27.42d
T_9= 50% FYM+50% CD	18.00b-e	29.68bc	43.18c	2.49bcd	3.70c	12.07b	6.00b	17.00cd	29.28c
Level of significance	**	**	**	**	**	**	**	**	**
CV%	14.60	9.19	5.96	16.77	15.80	13.19	10.40	12.95	8.54

Means followed by common letter(s) in a column do not differ significantly.

CD= Cow dung, FYM= Farm yard manure, RD= Recommended fertilizer dose, WH= Water hyacinth

3.1.1 Plant height

Maximum plant height (60.04 cm) was recorded in the treatment T_6 (50% Soil + 50% FYM) followed by treatment T_5 (50.04 cm) at 90 days after transplanting (DAT). Plant height was also found the highest at the other DATs in the treatment T_6 which was statistically followed by T_5. While, minimum plant height (24.18 cm and 37.68 cm, respectively) was noticed in the treatment T_0 (control) at all the DATs except at 30 DAT (15.00 cm) in treatments T_7 (14.00 cm), preceded by T_7 (39.21 cm) and T_4 (39.25 cm) at 90 DAT (Table 2). These results of increased height after organic manure application have gained support from the observation of Bationo et al. [11] who stated that addition of different sources of organic manures had a significant effect on vegetative growth of eggplants expressed by their height and fresh weight compared to the controls.

3.1.2 Number of branches per plant

Again, at 90 DAT, the highest number of branches (15.21) was counted in the treatment T_6 (50% Soil + 50% FYM), followed by T_5 (50% Soil + 50% CD) (13.07). Whereas minimum number of branches (4.21) was noted in the T_0 (control) treatment, followed by T_3 (5.21) at 90 DAT. On the other hand, at 30 and 60 DAT, the highest number of branches (3.28 and 5.56, respectively) was observed in T_5 (50% Soil + 50% CD) and those were the lowest (1.00 and 2.70, respectively) in treatment T_0 (Table 2). More branches with the increase of cropping duration and Soil +FYM and FYM + CD combinations might be due to the availability of proper nutrition and good soil health.

3.1.3 Number of leaves per plant

There was a positive relation of number of branches and number of leaves per plant. In general, maximum number of leaves (8.28, 25.70 and 40.14, respectively) at 30, 60 and 90 DAT, respectively was found in treatment T_6 followed by T_5 (6.00, 21.70 and 33.42, respectively). Whereas, treatment T_3 produced the lowest number of leaves (4.70 and 13.00, respectively) at 30 and 60 DAT but at 90 DAT, T_0 exhibited the lowest number of leaves (18.42). Iyamuremye and Dick [12] also studied that the turnover resulting from the decomposition of organic materials improves the nutrient cycling and availability to the plants especially, N and P which improved root development and subsequently vegetative growth. Similar observation was made by Smith et al. [13] who found that addition of organic residues can increase microbial pool sizes and activity, C and N mineralization rates and enzyme activities, all these affect nutrient cycling. This could be attributed to the fact that the nutrients in the organic manure are released gradually through the process of mineralization maintaining optimal soil levels over prolonged periods of time and thus enhanced the growth of brinjal.

3.2 Effects of Organic Manures on Flowering Characteristics of Brinjal cv. Muktokeshi

Significant variations were noticed on flowering characteristics of brinjal due to application of different manures (Table 3).

3.2.1 Days required to anthesis

Days to first flowering also influenced significantly by the application of different manures (Table 3). The shortest duration for floral induction (23.49 days) was required in the treatment T_6 (50% Soil + 50% FYM) followed by T_5 (31.07 days) and T_9 (32.35 days). On the other hand, maximum period (45.07 days) for first flowering in brinjal plant was examined from T_3 (45.07 days) and T_0 (44.00 days). However, days required for flowering were statistically similar in the treatments T_1, T_5 and T_9 (Table 3). The earliness in flowering might be due to the faster enhancement of vegetative growth and storing sufficient reserved food materials for differentiation of buds into flower buds. Naik [14] reported that delayed flowering was recorded in the treatment supplying 100% nitrogen through urea. The phenomenon of early anthesis has found its validity from the findings of Naidu et al. [15] who reported that the flower opening from appearance of bud was generally early in variety with more number of branches, leaves and higher leaf area. Whereas, Anburani and Manivannan [16] revealed almost similar result in an experiment with integrated nutrient management on growth in brinjal, variety Annamalai.

3.2.2 Number of flowers per plant

Again, the total number of flowers in all the treatments was found to be varied from 20.07 to 48.14. Maximum number of flowers was bloomed in treatment T_6 (48.14) followed by T_5 (41.41) and minimum number of flowers were registered

in the treatment T_0 (20.07) followed by treatment T_3 (50% Soil+50% RD). The highest number of flowers might be due to accelerating the respiratory process through cell permeability or by hormone inducing growth action. The supplied manures might have supplied nitrogen, phosphorus and sulphur in available forms to the plants through biological decomposition [17]. However, T_4 (50% Soil+ 50% Water Hyacinth) (30.70) and T_8 (50% WH+50% FYM) (31.21) gave statistically similar number of flowers (Table 3). Using composted water hyacinth material could serve as quality manure for improving soil fertility conditions and thus crop yields on the whole revealed by Gunnarsson and Petersen [18].

3.3 Effects of Organic Manures on Yield Characteristics of Brinjal cv. Muktokeshi

The number of fruits per plant, individual fruit weight (g) and fruit yield per bag (kg) significantly influenced by different combinations of organic manures and fertilizers (Table 4).

3.3.1 Number of fruits per plant

Maximum number of fruits per plant was noticed from the application of 50% Soil + 50% FYM (42.00) which was significantly superior over rest of the treatments followed by T_5 (38.00). On the other hand, it was observed that without organic manure (T_0), resulted in reduction of the total number of fruits (15.07) (Table 4). It can be inferred that treatment combination with 50% Soil + 50% FYM proved significantly better than that of all other treatments, which may be due to organic manures. Further, the increase in the plant height and number of branches per plant as a consequence of improved root environment and increased availability and uptake of nutrients resulted in the increase of total number of fruits per plant. Similar results have been reported by Naidu et al. [15] and Anburani et al. [16] in brinjal.

3.3.2 Individual fruit weight (g)

The data depicted that treatment T_0 (control) produced the least number of fruits with the least individual fruit weight (90.13 g) over the recommended dose of fertilizers (91.24 g) (Table 4). The treatment T_6 (50% Soil + 50% FYM) resulted in maximum individual fruit weight (104.6 g) followed by treatment T_5 (101.30 g). This result may be due to increased uptake of N and P which resulted in increased fruit weight due to increased number of leaves and branches. The improved plant growth led to better carbohydrate build up which increased the fruit weight. In this concern, Kannan et al. [19] reported that among the different organic sources, substitution of 100% N as FYM recorded plant height, number of branches per plant and yield comparable to that of 100% nitrogen as urea. Anburani et al. [20] reported that application of 25 t ha^{-1} FYM + 100:50:50 kg NPK ha^{-1} + biofertilizers resulted in highest fruit weight and yield of brinjal cv. Annamalai.

Table 3. Required days for anthesis and number of flowers per plant as influenced by fertilizers, manures and their combinations

Treatment	Days required to anthesis	Number of flowers/plant
T_0= Control	44.00a	20.07g
T_1= 100% CD	33.28de	27.07e
T_2= 100% FYM	39.21b	24.49ef
T_3= 50% Soil+50% RD	45.07a	22.07fg
T_4= 50% Soil+ 50% WH	35.70cd	30.70d
T_5= 50% Soil+50% CD	31.07e	41.21b
T_6= 50% Soil+50% FYM	23.49f	48.14a
T_7= 50% WH+50% CD	39.21b	26.28e
T_8= 50% WH+50% FYM	37.28bc	31.21d
T_9= 50% FYM+50% CD	32.35e	35.00c
Level of significance	**	**
CV%	6.00	7.05

Means followed by common letter(s) in a column do not differ significantly.
CD= Cow dung, FYM= Farm yard manure, RD= Recommended fertilizer dose, WH= Water hyacinth

Table 4. Effect of fertilizers, manures and their combinations on yield and yield contributing parameters

Treatment	Number of fruits plant^{-1}	Individual fruit weight (g)	Fruit yield bag^{-1} (kg)	Yield increased over control (%)
T_0= Control	15.07h	90.13g	1.36h	-
T_1= 100% CD	24.14ef	95.07de	2.29ef	140.61
T_2= 100% FYM	23.49f	94.29def	2.21fg	138.46
T_3= 50% Soil+50% RD	20.28g	91.24fg	1.85g	126.49
T_4= 50% Soil+ 50% WH	26.70de	91.14fg	2.43de	144.03
T_5= 50% Soil+50% CD	38.00b	101.3ab	3.85b	164.68
T_6= 50% Soil+50% FYM	42.00a	104.6a	4.39a	169.02
T_7= 50% WH+50% CD	22.14fg	92.29efg	2.04fg	133.33
T_8= 50% WH+50% FYM	29.35cd	97.25cd	2.85cd	152.28
T_9= 50% FYM+50% CD	31.07c	99.22bc	3.08c	155.84
Level of significance	**	**	**	-
CV%	7.94	2.43	9.97	-

Means followed by common letter(s) in a column do not differ significantly.
CD= Cow dung, FYM= Farm yard manure, RD= Recommended fertilizer dose, WH= Water hyacinth

3.3.3 Fruit yield bag^{-1} (kg)

The range of fruit yield bag^{-1} was 1.36 kg to 4.39 kg (Table 4). Among the treatments the highest fruit yield (4.39 kg/bag) was estimated in treatment T_6 (50% Soil + 50% FYM) followed by T_5 (3.85 kg/bag) and T_9 (3.08 kg/bag). Fruit yield was the lowest (1.36 kg/bag) in treatment T_0 which was followed by T_3 (1.85 kg/bag). Here, in treatment T_6 and T_5 about 169.02% and 164.68% yield was increased over control, respectively. Higher the number of leaves might increase the photosynthetic surface and higher photosynthetic accumulations and hence, resulting in higher yield and the higher yield is attributed to the higher number of fruits per plant and fruit weight. The results are in accordance with Shashidhara [21]. Similarly, Ullah et al. [9] and Anoop and Chauban [22] reported that organic manure showed a significant increase in yield than inorganic manure in eggplant production. Among the different organic sources, substitution of 100% N as FYM recorded plant height, number of branches per plant and yield comparable to that of 100% nitrogen as urea [19]. Similar results were also reported by Gopinath et al. [23].

3.4 Cost and Return Analysis

The expenses incurred and income generated in brinjal cultivation is an important consideration with respect to the inputs applied for gross returns, net returns and benefit cost ratio. For this material, non-material and overhead cost were recorded for all treatments on bag basis and calculated as per bag (Table 5).

Gross return ranged from BDT 131.70/bag to BDT 40.80/bag where maximum return was obsered in T_6 followed by T_5 and minimum in control. The cost of soil and water hyacinth were not considered. The total cost of production ranged from BDT 22.90/bag to BDT 61.14/bag. The highest cost of production (BDT 61.14/bag) was found in the treatment T_2 (100% FYM) followed by treatment T_9 (50% FYM + 50% CD) and the value was BDT 51.43/bag. The cost was found the least in T_0 (BDT 22.90/bag) and T_4 (BDT 22.90/bag) followed by T_3 (BDT 23.00/bag) (Table 5).

Again, in case of net return, the treatment T_6 (50% Soil + 50% FYM) provided the highest net return (BDT 89.68/bag) followed by treatment T_5 (BDT 83.19/bag) and the lowest net return was held in the treatment T_2 (BDT 5.16/bag) preceded by T_0 (BDT 17.18/bag). Thus, maximum BCR was observed in treatment T_5 (3.57) having statistical similarity with T_4 (3.18) and T_6 (3.13) and followed by T_3 (2.41) (Table 5).

Although, FYM gave good result in production but its price was high and that affect the total outcome. On the other hand, brinjal grow well in field condition for mass production. But present study was conducted in bag for small scale production. As a result, production decreased and the cost of production for brinjal increased.

Table 5. Cost and return analysis of brinjal cv. Muktokeshi production

Treatments	Gross return (BDT Tk/bag)	Production cost (BDT Tk/bag)	Net return (BDT Tk/bag)	Benefit cost ratio (BCR)
T_0= Control	40. 80i	22.90	17.90g	1.78c
T_1= 100% CD	68.70f	41.72	26.98f	1.65c
T_2= 100% FYM	66.30f	61.14	5.16h	1.08d
T_3= 50% Soil+50% RD	55.50h	23.00	32.50e	2.41b
T_4= 50% Soil+ 50% WH	72.90e	22.90	50.00c	3.18a
T_5= 50% Soil+50% CD	115.50b	32.31	83.19b	3.57a
T_6=50% Soil+50% FYM	131.70a	42.02	89.68a	3.13a
T_7=50% WH+50% CD	61.20g	32.31	28.89f	1.89bc
T_8=50% WH+50% FYM	85.50d	42.02	43.48d	2.03bc
T_9=50% FYM+50% CD	92.40c	51.43	40.97d	1.80c
Level of significance	**		**	**
CV%	2.74		5.17	17.86

Means followed by common letter(s) in a column do not differ significantly.
CD= Cow dung, FYM= Farm yard manure, RD= Recommended fertilizer dose, WH= Water hyacinth
Here, Cost of bag @ BDT 3/bag, cost of cow dung @ BDT 2/kg and cost of farm yard manure @ BDT 2/kg and sale of brinjal @ BDT 30/kg

4. CONCLUSION

Based on the results of the experiment, it may be inferred that all the organic manures used significantly enhanced growth, yield and fruit quality of brinjal and the most superior result was obtained from treatment T_6 (50% Soil + 50% FYM) followed by treatment T_5 (50% Soil + 50% CD).

Maximum level of gross return and net return was observed in the treatment T_6 (50% Soil + 50% FYM) but the benefit cost ratio (BCR) was maximum in treatment T_5 (50% Soil + 50% CD) due to the higher cost of FYM to that of CD. In a word, the performance of T_6 (50% Soil + 50% FYM) was found to be best in this local variety of brinjal cultivated in bags. If the farmers can produce FYM then it will be cost effective.

5. RECOMMENDATION

Organically produced vegetables have high consumer preferences because of its health benefits. Again, natural adversities sometimes pose challenges to large scale safe food production. Therefore, it is recommended that almost all the vegetables can be cultivated in small scale organically by using manures in easily decomposable gunny bags. Hence, researches can be conducted on vegetables other than brinjal on different bags and pots with varied organic media.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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