

Original Research Article

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

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 T₀ (Control), T₁ (100% Cowdung), T₂ (100% FYM), T₃ (50% Soil+50% Recommended Fertilizers), T₄ (50% Soil+ 50% WH), T₅ (50% Soil+50% CD), T₆ (50% Soil+50% FYM), T₇ (50% WH+50% CD), T₈ (50% WH+50% FYM), T₉ (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 T₆ (50% Soil+50% FYM) followed by (50.04 cm) in T₅ (50% Soil + 50% CD) at 90 days after transplanting (DAT). Superiority was also showed by the treatment T₆ (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 T₆ (50% Soil+50% FYM) treatment (23.49 days) followed by T₅ (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 T₆ (50% Soil+50% FYM) treatment (42.0, 104.6 g and 4.39 kg, respectively) which was statistically followed by T₅ (50% Soil + 50% CD) treatment. In addition an increase in yield of 164.68 % and 169.02 % over control was also noticed in treatment T₅ and T₆, respectively. Though maximum net return per bag (BDT 89.68 Tk.) was incurred in the treatment T₆, statistically similar but with the highest BCR value was observed in T₅ due to the higher purchase cost of FYM than others (a BCR of 3.18, 3.57 and 3.13 in T₄, T₅ and T₆, respectively). So, Cowdung, Farm yard manure and Water hyacinth can be mixed with soil for small scale and profitable brinjal cultivation in bag.

Key words: 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 [6]. 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 [8, 12]. 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 [15, 23]. 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 [18]. 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 [20]. 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 [4, 22]. 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 their 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.

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

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

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

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

Collected data were statistically analyzed by analysis of variance test (ANOVA). The mean differences between the treatments were compared by using Duncan's Multiple Range Test (DMRT) [9]. Cost and return analysis 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).

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.* [5] 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. [Tables not to overlap...](#)

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

**= Significant at 1% level. 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

3.1.3 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 T₆ followed by T₅ (6.00, 21.70 and 33.42, respectively). Whereas, treatment T₃ produced the lowest number of leaves (4.70 and 13.00, respectively) at 30 and 60 DAT but at 90 DAT, T₀ exhibited the lowest number of leaves (18.42). Iyamuremye and Dick [13] 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.* [21] 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

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 T₆ (50% Soil + 50% FYM) followed by T₅ (31.07 days) and T₉ (32.35 days). On the other hand, maximum period (45.07 days) for first flowering in brinjal plant was examined from T₃ (45.07 days) and T₀ (44.00 days). However, days required for flowering were statistically similar in the treatments T₁, T₅ and T₉ (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 [17] 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.* [16] 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 [1] revealed almost similar result in an experiment with integrated nutrient management on growth in brinjal, variety Annamalai.

Table 3. Required days for anthesis and number of flowers per plant 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

**= Significant at 1% level. 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

3.2.1 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 T₆ (48.14) followed by T₅ (41.41) and minimum number of flowers were registered in the treatment T₀ (20.07) followed by treatment T₃ (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 [7]. However, T₄ (50% Soil+ 50% Water Hyacinth) (30.70) and T₈ (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 [11].

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 T₅ (38.00). On the other hand, it was observed that without organic manure (T₀), 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.* [16] and Anburani *et al.* [1] 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.*, [14] 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.* [2] 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.

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 [19]. Similarly, Ullah *et al.* [22] and Anoop and Chauban [3] 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 [14]. Similar results were also reported by Gopinath *et al.* [10].

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	-

**= Significant at 1% level. 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

3.4 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 131.70 Tk/bag to 40.80Tk/bag where maximum return was observed in T₆ followed by T₅ and minimum in control. The cost of soil and water hyacinth were not considered. The total cost of production ranged from BDT 22.90 Tk /bag to BDT 61.14 Tk/bag. The highest cost of production (BDT 61.14 Tk/bag) was found in the treatment T₂ (100% FYM) followed by treatment T₉ (50% FYM+50% CD) and the value was (BDT 51.43 Tk/bag). The cost was found the least in T₀ (BDT 22.9 Tk/bag) and T₄ (BDT 22.9 Tk/bag) followed by T₃ (BDT 23.00 Tk/bag) (Table 5).

Again, in case of net return, the treatment T₆ (50% Soil +50% FYM) provided the highest net return (BDT 89.68 Tk/bag) followed by treatment T₅ (BDT 83.19 Tk/bag) and the lowest net return was held in the treatment T₂ (BDT 5.16 Tk/bag) preceded by T₀ (BDT 17.18 Tk/bag). Thus, maximum BCR was observed in treatment T₅ (3.57) having statistical similarity with T₄ (3.18) and T₆ (3.13) and followed by T₃ (2.41) (Table 5).

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

**= Significant at 1% level. 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 Tk. 3/bag, cost of cow dung @ BDT Tk. 2/kg and cost of farm yard manure @ BDT Tk. 2/kg and sale of brinjal @ BDT Tk.30/kg

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.

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 T₆ (50% Soil + 50% FYM) followed by treatment T₅ (50% Soil + 50% CD).

Maximum level of gross return and net return was observed in the treatment T₆ (50% Soil + 50% FYM) but the benefit cost ratio (BCR) was maximum in treatment T₅ (50% Soil + 50% CD) due to

the higher cost of FYM to that of CD. In a word, the performance of T₆ (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.

[Missing:](#)

[Recommendations](#)

[Declaration of conflict "ofinterest"](#)

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