

Effect of fertilizer and manures on growth and yield of Tulsi (*Ocimum Sanctum*)

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Abstract: The experiment was carried out at the Field Laboratory, Department of Environmental Science, Bangladesh Agricultural University, Mymensingh during the period of March, 2013 to February, 2014 to evaluate the effect of fertilizer and manure on the growth and yield of Tulsi. There were six treatments consisting of control (No fertilizer and manures), cowdung, poultry manure, cowdung+ NPK fertilizer, poultry manure+ NPK fertilizer and Mixed fertilizer. All the treatment significantly influenced most of the growth and yield components of tulsi. The plant height, no. of branch/plant, leaf length, 1000- fresh leaf weight and fresh yield and yield (t/ha) were highest where Cowdung was applied. All the above parameters were lowest where no manures were applied (control). From these results it was clear that cowdung enhanced the growth and yield of Tulsi one of the important medicinal plant, of the country.

Key words: Tulsi, growth, yield.

Introduction

Bangladesh is a developing country having more than 160 million people and this population is increasing at an alarming rate. Health care is a great concern to the nation (Sattar, 2005). Bangladesh is rich in medicinal plant resources (Ghani, 2002). There are about 5000 species of plants growing in Bangladesh, among them 500 species have medicinal properties. Major medicinal plants are neem, tulsi, mint, vasaka, nayantara, amlaki etc. These plants are natural source of medicine. Tulsi (*Ocimum sanctum*) plant is erect, branched, slightly hairy and aromatic. Tulsi a plant under family Labiatae is a wonderful medicinal plant. It prevents cold, fever and cough etc. Tulsi cultivation is economically profitable. Tulsi leaves contained higher amount of Na, Cu and Zn (Bhowmik *et al.*, 2008). So, in that situation it is necessary to develop organic cultivation of tulsi as it is an important medicinal plant in the country.

Materials and Methods

This chapter gives a brief statement of treatments, experimental design, data collection and analytical methods followed in the experiment. The site belongs to the non-calcareous dark grey floodplain soil under the Agro-ecological Zone (AEZ-9) of Old Brahmaputra Floodplain (FAO and UNDP, 1988). The soil of the experimental field belongs to the Sonatola soil series of non calcareous, dark grey under the Old Brahmaputra alluvial Tract. Vigorous and well-matured seeds of tulsi were selected for sowing. The experiment was laid out in randomized complete block design with three replications. The total number of plots for Tulsi was 18. The size of a unit plot was 2.00 m×1.00 m. The experiment was conducted with six treatments viz. T₀ = No fertilizer and manures, T₁ = Cowdung (5t/ha), T₂ =Mixed fertilizer (NPKS), T₃ = Cowdung + NPK fertilizer, T₄ = Poultry manure(4t/ha), T₅ = Poultry manure + NPK fertilizer. Necessary intercultural operation was done. After 120 days of sowing, data on morphological attributes of tulsi viz. plant height (cm), number of branch/plant, number of leaf/plant, leaf length/leaf, 1000-fresh leaf weight and fresh yield, were collected. The collected data were compiled and tabulated in proper form and were subjected to statistical analysis. The analysis of variance was done following the computer package MSTAT.-C software. The

mean differences among the treatments were tested with Duncan's Multiple Range Test (Gomez and Gomez, 1984).

Results and Discussion

The present study was carried out to investigate the effect of fertilizer and manure on growth, yield of Tulsi. The results obtained from the experiments have been cited and discussed in tables.

Effect of fertilizer and manures on growth and yield of Tulsi in Kharif season

Plant height (cm): The plant height of Tulsi was significantly influenced by different treatments. The maximum plant height (71.00cm) was observed in T₁ (Cowdung) treatment and lowest plant height (59.00cm) was obtained in control T₀. Plant height of Tulsi was measured at harvesting time (120 DAS) and presented in Table 1. On the basis of effect of organic manures and fertilizer on plant height of Tulsi, the performance of treatments could be placed as the following order T₁>T₄>T₃>T₅>T₂>T₀. Jin *et al.* (1996) reported that the application of cowdung increased plant height of vegetables. More or less similar result was cited by Islam (2004). The second highest plant height was found T₄ (poultry manure) treatment. The tallest plant with poultry manure (67.67cm) might be due to sufficient supply to nitrogen to crop. The third highest (65.67cm) and fourth (64.33 cm) position was found in T₃ (Cowdung+ NPK fertilizer) and T₅ (poultry manure+ NPK fertilizer) treatment. It might be due to higher nitrogen content in cowdung, poultry manure and NPK fertilizers been used in T₃ and T₅ and fertilizer were not applied in the control plot. T₃ and T₅ treatment are statistically similar.

No. of branch/plant: At 120 DAS maximum No. of branch/plant (17.00) was appeared from cowdung treatment and lowest No. of branch/plant (11.00) was obtained from control. No. of branch/plant of Tulsi was significantly influenced by adding fertilizer and manures which were shown in Table 1, the treatment could be placed in T₁>T₄>T₃>T₅>T₂>T₀ in respect of impact on No. of branch/plant.

No. of leaf/plant: The leaf number of Tulsi was significantly influenced by different fertilizer and manure and results presented in Table 1 where the maximum leaf number (163.00) was appeared in cowdung treatment. Poultry manure (160.00) also gave near about maximum

leaf number. The minimum leaf number (118.00) was obtained from control. In the present study, highest significant result was obtained from cowdung treatment, because cowdung and poultry manure is more efficient

than other organic manures (Ansari, 2005). Possible reasons behind this are cowdung and poultry manure add higher phosphorus and potassium content in soil than conventional farming (Jin *et al.* 1996).

Table 1. Effect of fertilizer and manure on growth and yield performance of Tulsi in Kharif season

Treatment	Plant height(cm)	No of branch/Plant	No of leaf/plant	Leaf length (cm)	1000- leaf weight (gm)	Fresh yield(gm)	Yield (t/ha)
T ₀	59.00e	11.00e	118.00f	4.10d	77.00d	272.62f	1.36 f
T ₁	71.00a	17.00a	163.00a	4.90a	91.00a	445.04a	2.22 a
T ₂	62.00d	12.00de	127.67e	4.17d	79.67c	305.10e	1.52 e
T ₃	65.67c	14.00bc	157.33c	4.53b	83.67bc	394.89c	1.97 c
T ₄	67.67b	15.00b	160.00ab	4.80a	87.00b	417.56b	2.08 b
T ₅	64.33c	13.00cd	135.00d	4.37c	81.33c	329.45d	1.64 d
SE±	0.95	0.52	4.26	0.07	1.16	15.24	0.023
C V (%)	1.46	3.79	2.97	1.66	1.38	4.22	2.29
LSD	1.27	1.47	3.44	0.12	3.64	12.20	0.08
Level of sig.	**	**	**	**	**	**	***

** = Significant at 1% level of probability, ***= Significant at 0.01% level of probability, In a column figures with same letter or without letter do not differ significantly whereas figures with dissimilar letter differ significantly (as per DMRT)

Leaf length (cm): Leaf length was significantly influenced by organic manure and fertilizer. The leaf length (4.9 cm) was found in the treatment of cowdung followed by the treatment of poultry manure (4.80 cm). They were statistically similar. Then third and fourth positions were occupied from the treatment of cowdung+ NPK fertilizer (4.53cm) and Poultry manure+ NPK fertilizer (4.37cm), respectively. Leaf length was statistically similar from the treatment of mixed fertilizer (4.17 cm) and control treatment. The lowest leaf length was obtained from the control treatment (4.10). Palit, 2005 reported application of organic manure increasing leaf length. It might be due to higher nitrogen content in cowdung and fertilizers were not applied in the control plot. Nitrogen enhances the protein synthesis, which allows plant to grow faster, and stimulates apical growth as well as increases leaf size.

1000-fresh leaf weight (gm): Organic manures and fertilizers significantly influenced 1000-fresh leaf weight. The highest 1000-fresh leaf weight (91.00 gm) was found from the treatment of cowdung. The second highest 1000-fresh leaf weight (87.00 gm) was found at the treatment of poultry manure. Treatment of cowdung+ NPK fertilizer occupied the third (83.67 gm) position. The fourth (81.33 gm) positions occupied from the treatment of poultry manure+ NPK fertilizer which was statistically similar of mixed fertilizer (79.67gm). The lowest 1000-fresh leaf weight was found control treatment (77.00gm).

Yield (t/ha): Fresh leaf yield was significantly influenced by organic manure and fertilizer (Fig. 1). The maximum fresh leaf yield (445.04 gm/plot) was recorded from the treatment of cowdung followed by the treatment of poultry manure (417.56 gm/plot). The third and fourth fresh leaf yield (394.89 gm/plot and 305.10 gm/plot) were found from the treatment of cowdung+ NPK fertilizer and poultry manure+ NPK fertilizer. The lowest yield (272.62 g/plot) was recorded from the treatment of control. The Maximum yield 2.22 t/ha was recorded Cowdung treatment and Minimum yield 1.36 t/ha was recorded in Control treatment. Shamsunnahar (2006) obtained maximum result from organic manure which was less than the result of

present study because organic manure are more efficient than mixed of organic and inorganic fertilizer.

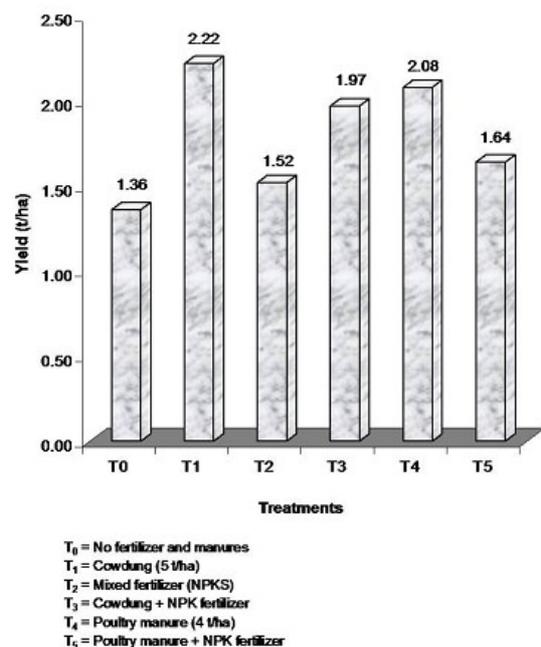


Fig. 1. Yield of tulsi of different treatment in kharif season

Effect of fertilizer and manures on growth and yield of tulsi in Rabi season

Plant height (cm): The plant height of Tulsi was significantly influenced by different treatments. The maximum plant height (65.00cm) was observed in T₁ (Cowdung) treatment and lowest plant height (55.00cm) was obtained in control T₀. Plant height of Tulsi was measured at harvesting time (120 DAS) and presented in Table 2. On the basis of effect of organic manures and fertilizer on plant height of Tulsi, the performance of treatments could be placed as the following order T₁>T₄>T₃>T₅>T₂>T₀. Jin *et al.* (1996) reported that the application of cowdung increased plant height of

vegetables. More or less similar result was cited by Islam (2004). The second highest plant height was found T₄ (poultry manure) treatment. The tallest plant with poultry manure (62.00cm) might be due to sufficient supply to nitrogen to crop. The third highest (60.00cm) and fourth (57.00 cm) position was found in T₃ (Cowdung+ NPK fertilizer) and T₅ (poultry manure+ NPK fertilizer) treatment. It might be due to higher nitrogen content in cowdung, poultry manure and NPK fertilizers been used in T₃ and T₅ and fertilizer were not applied in the control plot.

No. of branch/plant: At 120 DAS maximum No. of branch/plant (15.00) was appeared from cowdung treatment and lowest No. of branch/plant (9.00) was obtained from control. No. of branch/plant of Tulsi was significantly influenced by adding fertilizer and manures

which were shown in Table1, the treatment could be placed in T₁>T₄>T₃>T₅>T₂>T₀ in respect of impact on No. of branch/plant.

No. of leaf/ plant : The leaf number of Tulsi was significantly influenced by different fertilizer and manure and results presented in Table 2 where the maximum leaf number (140.00) was appeared in cowdung treatment. Poultry manure (130.00) also gave near about maximum leaf number. The minimum leaf number (100.00) was obtained from control. In the present study, highest significant result was obtained from cowdung treatment, because cowdung and poultry manure is more efficient than other organic manures (Ansari, 2005). Possible reasons behind this are cowdung and poultry manure add higher phosphorus and potassium content in soil than conventional farming (Jin *et al.*, 1996).

Table 2. Effect of fertilizer and manure on growth and yield performance of Tulsi in Rabi season

Treatment	Plant height (cm)	No of branch/Plant	No of leaf/plant	Leaf length (cm)	1000 leaf weight (gm)	Yield (t/ha)
T ₀	55.00e	9.00d	100.00f	4.00c	70.00d	1.05f
T ₁	65.00a	15.00a	140.00a	4.60a	78.00a	1.63a
T ₂	57.00d	10.00d	110.00e	4.10bc	72.00c	1.18e
T ₃	60.00c	13.00bc	125.00c	4.30b	74.00b	1.39c
T ₄	62.00b	14.00ab	130.00b	4.53a	72.00a	1.50b
T ₅	58.00d	12.00c	120.00d	4.20bc	73.00bc	1.31d
SE±	0.60	0.62	0.56	0.064	0.605	0.014
C V (%)	1.76	8.88	0.81	2.61	1.42	1.81
Level of sig.	***	**	***	**	***	**

** = Significant at 1% level of probability, *** = Significant at 0.1% level of probability. In a column figures with same letter or without letter do not differ significantly whereas figures with dissimilar letter differ significantly (as per DMRT).

Leaf length (cm): Leaf length was significantly influenced by organic manure and fertilizer. The leaf length (4.6 cm) was found in the treatment of cowdung followed by the treatment of poultry manure (4.533 cm). They were statistically similar. Then third and fourth positions were occupied from the treatment of cowdung+ NPK fertilizer (4.30cm) and Poultry manure + NPK fertilizer (4.20cm), respectively. Leaf length was statistically similar from the treatment of poultry manure + NPK fertilizer (4.20cm) and mixed fertilizer (4.10 cm). The lowest leaf length was obtained from the control treatment (4.00). Palit, 2005 reported application of organic manure increasing leaf length. It might be due to higher nitrogen content in cowdung and fertilizers were not applied in the control plot. Nitrogen enhances the protein synthesis, which allows plant to grow faster, and stimulates apical growth as well as increases leaf size.

1000-fresh leaf weight (gm): Organic manures and fertilizers significantly influenced 1000-fresh leaf weight. The highest 1000-fresh leaf weight (78.00 gm) was found from the treatment of cowdung. The second highest 1000-fresh leaf weight (77.00 gm) was found at the treatment of poultry manure. Treatment of cowdung+ NPK fertilizer occupied the third (74.00 gm) position. The fourth (73.00 gm) positions occupied from the treatment of poultry manure+ NPK fertilizer. The lowest 1000-fresh leaf weight was found control treatment (70.00gm).

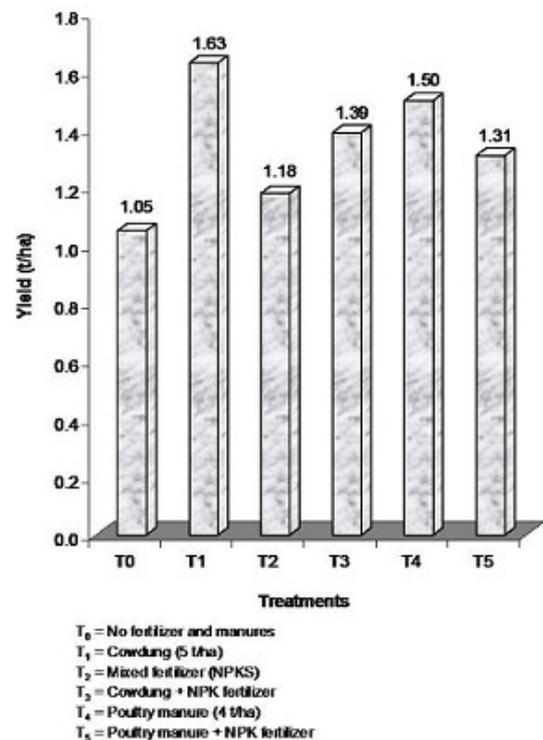


Fig. 2. Yield of tulsi of different treatment in rabi season

Yield (t/ha): Fresh yield was significantly influenced by organic manure and fertilizer. The maximum fresh yield (1.63 t/ha) was recorded from the treatment of cowdung

followed by the treatment of poultry manure (1.50 t/ha). The third and fourth fresh leaf yield (1.39 t/ha) and 1.31 t/ha) were found from the treatment of cowdung+ NPK fertilizer and poultry manure+ NPK fertilizer. The lowest yield (1.05 t/ha) was recorded from the treatment of control (Fig. 2). Shamsunnahar (2006) obtained maximum result from organic manure which was less than the result of present study because organic manure are more efficient than mixed of organic and inorganic fertilizers.

Considering the above discussion, it is clear that cowdung and poultry manure showed its superiority on plant height, leaf length, 1000-fresh leaf yield and fresh yield of tulsi medicinal plant compare to that of control in kharif season. In order to maintain good soil health and keep the environment sound, it would be the best to advise farmers for the application of cowdung or poultry manure for cultivation of tulsi medicinal plant.

References

- Ansari, A. 2005. Effect of organic farming on soil nutrients and quality of carrot. M.S. Thesis. Dept. of Environ. Sci. Bangladesh Agril Univ., Mymensingh.
- Bhowmik, S., Chowdhury, S.D., Kabir, M.H. and Ali, M.A. 2008. Chemical composition of some medicinal plant products of indigenous origin. Bangladesh Animal Health Society, BAU, Mymensingh, Bangladesh.
- Ghani, A. 2002. Medicinal plants of Bangladesh: Chemical Constituents and Uses Asiatic Society of Bangladesh, Dhaka, Bangladesh.
- FAO and UNDP, 1988. Land resources Appraisal of Bangladesh for Agricultural Development, Report. 2. Agro-Ecological Regions of Bangladesh. BARC/UNDP, New Airport road, Farmgate, Dhaka, 1207. pp.212-221.
- Gomez, K.A. and Gomez, A.K 1984. Statistical procedures for Agricultural Research. Second (Edn). John Wiley and Sons. New York. pp. 207-215.
- Islam, M. S. 2004. Effect of organic farming material on soil Micro - environment and quality of spinach, M.S. thesis, dept. Environ. Sci., Bangladesh Agril. Univ., Mymensingh.
- Jin, H.J.; Kim, J.G.; Cho, Y.M.; Kway, J.H.; Shin, J. S And Lee, H. H. 1996. Growth, yields and quality of rice cultivated on paddy soils as after crop fodder area under heavy application of animal manures. J. Korean. soc. Grassland sci. 16(4):338-342.
- Palit 2005. Effect of organic manure on morphological feature, growth and abscission of reproductive structure and yield in soybean. M.S. Thesis, Dept. of Crop Botany. Bangladesh agric. univ., Mymensingh.
- Sattar, M.A and Islam, M.T .2005. Pocket Encyclopedia of medicinal plants of Bangladesh.
- Samsunnahar, 2006. Effect of organic farming on properties of soil and growth and quality of red amaranth.. M.S Thesis. Dept. of Envir. BAU, Mymensingh.