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Effect of Fertilizer and Manures on Growth and Yield of Tulsi and Pudina Medicinal Plant

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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, 2012 to July, 2012 to evaluate the effect of fertilizer and manure on the growth and yield of Tulsi and Pudina. 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 and Pudina. The plant height, No. of branch/plant, No. of leaf/plant, Leaf length, 1000- fresh leaf weight and fresh yield 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 was the best for soil quality and growth and yield of Tulsi and Pudina medicinal plant.

Key words: Growth, Pudina, Tulsi, Yield

Introduction

Bangladesh is 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 plants (Ghani, 2002). There are about 5000 species of plants growing in Bangladesh; among them 500 species are having medicinal properties. Major medicinal plants are Neem, Tulsi, Mint, Vasaka, Nayantara, Amloki etc. These plants are natural source of medicine. The Tulsi (*Ocimum sanctum*) plant is erect, branced, slightly hairy and aromatic. Tulsi and Pudina under family Labiatae. Tulsi is a wonderful medicinal plant. It prevents cold and fever, cough etc. Tulsi cultivation is economically profitable. Pudina (Mint) is a very essential medicinal plant. It plays a great role for making delicious recepy and human digest. Menthol is found from mint. Pudina (*Mentha arvensis*) used against digestive and vomiting. Tulsi leaves contained higher amount of Na, Cu and Zn (Bhowmik *et al.*, 2008). From recent search valuable medicinal plant as Tulsi and Pudina are found endangered in Bangladesh. So, in that situation it is emergence organic cultivation, development and research of Tulsi and Pudina medicinal plant for environmental balance. Therefore, this study was undertaken to find out to study the effects of fertilizer and manures on growth and yield of Tulsi and Pudina.

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**.** Test crop used for the experiment: The medicinal plant under the study was Tulsi and Pudina. For Tulsi healthy, vigorous and well-matured seeds were selected for sowing. For Pudina, 2 inches branch cutting used as a planting materials.

Layout and design of the experiment

The experiment was laid out in randomized complete block design with three replications. The total number of plots for Tulsi was 18 and total number of plots for Pudina was 18. The size of a unit plot was 2.00 m×1.00m. Treatments of the experiment: The experiment was conducted with six treatments viz.T_0= No fertilizer and manures, T_1= Cowdung (5t/ha), T_2= Mixed fertilizer (NPKS), T_3= Cowdung+ NPK fertilizer, T_4= Poultry manure (4t/ha), T_5= Poultry manure+ NPK fertilizer. Nessesary intercultural operation was done.

Data collection

The following parameters were recorded and their mean values were calculated from the sample plants during the course of experiment. After 120 days of sowing (Tulsi) data were collected. Morphological attributes of Tulsi and Pudina: Plant height (cm), Number of branch/plant, Number of leaf/plant, Leaf length/leaf, 1000-fresh leaf weight and fresh yield.

Statistical analysis

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 and Pudina. The results obtained from the experiments have been cited and discussed in tables.

a) Effect of fertilizer and manures on growth and yield of Tulsi

Plant height (cm)

The plant height of Tulsi was significantly influenced by different treatments. The maximum plant height (71.00cm) was observed inT_1 (Cowdung) treatment and lowest plant height (59.00cm) was obtained in control T_0. Plant height of Tulsi was measured at harvesting time (120 DAS) and presented inTable1. 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 $T_1>T_4>T_3>T_5>T_2>T_0$. 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 T_4 (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 T_3 (Cowdung+ NPK fertilizer) and T_5 (poultry manure+ NPK fertilizer) treatment. It might be due to higher nitrogen content in cowdung, poultry manure and NPK fertilizers been used in T_3 and T_5 and fertilizer were not applied in the control plot. T_3 and T_5 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 Table1, the treatment could be placed in$T_1>T_4>T_3>T_5>T_2>T_0$ in respect of impact on No. of branch/plant.

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

Treatment	Plant height(cm)	No of branch/Plant	No of leaf/plant	Leaf length (cm)	1000- leaf weight (gm)	Fresh yield(gm)
T_0	59.00e	11.00e	118.00f	4.10d	77.00d	272.62f
T_1	71.00a	17.00a	163.00a	4.90a	91.00a	445.04a
T_2	62.00d	12.00de	127.67e	4.17d	79.67c	305.10e
T_3	65.67c	14.00bc	157.33c	4.53b	83.67bc	394.89c
T_4	67.67b	15.00b	160.00ab	4.80a	87.00b	417.56b
T_5	64.33c	13.00cd	135.00d	4.37c	81.33c	329.45d
SE±	0.95	0.52	4.26	0.07	1.16	15.24
C V (%)	1.46	3.79	2.97	1.66	1.38	4.22
LSD	1.27	1.47	3.44	0.12	3.64	12.20
Level of sig.	**	**	**	**	**	**

** = Significant at 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)

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).

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/plot

Fresh leaf yield was significantly influenced by organic manure and fertilizer. 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 cowdund+ NPK fertilizer and poutry manure+ NPK fertilizer. The lowest yield (272.62 g/plot) was recorded from the treatment of control. 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.

b) Effect of fertilizer and manures on growth and yield of Pudina

Plant height (cm)

Plant height of Pudina was measured at harvested time (120 DAP) and presented in Table2. It was stated that Cowdung treatment gave highest plant height as the value 59.00cm compared to other treatments. In control treatment where no organic manures and fertilizer were used showed lowest plant height (49.00 cm). On the basis of effect of organic manures on plant height of Pudina, the performance of treatments could be placed as the following order $T_1>T_4>T_3>T_5>T_2>T_0$. Jin *et al.* (1996) reported that the application cattle manures increased plant height of vegetables. More or less similar result was cited by Islam (2004). Maximum amount of cowdung application might have reduced more nutrients which enhanced the plant height.

Table 2. Effect of fertilizer and manure on growth and yield performance of Pudina

Treatment	Plant height(cm)	No. of branch/plant	No .of leaf/plant	Leaf. Length (cm)	1000-Freash Leaf weight	Fresh yield(gm)
T_0	49.00e	9.00e	112.00f	4.00e	74.33d	249.74e
T_1	59.00a	15.33a	150.00a	4.70a	82.00a	368.96a
T_2	51.33d	11.00d	116.00e	4.20d	74.67cd	259.86e
T_3	57.00b	13.00bc	133.33c	4.50bc	76.67c	306.70c
T_4	57.67ab	14.00ab	143.00b	4.60ab	79.00b	338.95b
T_5	54.00c	12.00cd	120.33d	4.40c	76.00cd	274.33d
SE±	0.89	0.53	3.44	0.06	0.68	10.53
C V (%)	1.62	4.29	2.67	1.39	0.88	3.51
LSD	1.34	1.15	3.57	0.14	1.74	10.80
Level of sig.	**	**	**	**	**	**

** = Significant at 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)

No. of branch/plant

No. of branch/plant was measured at harvested time (120 DAP) and presented in Table 2. It was stated that Cowdung treatment gave highest No. of branch/plant as the value 15.33 no. of branch/plant compared to other treatments. In control treatment where no organic manures and fertilizer were used showed lowest plant height. On the basis of effect of organic manures on plant of Pudina, the performance of treatments could be placed as the following order $T_2>T_4>T_3>T_5>T_2>T_0$.It might be due to higher nitrogen content in cowdung and poultry manure 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 branch and leaf.

No. of leaf/plant

The leaf number of Pudina was significantly influenced by different fertilizer and manure and the results presented in Table 2 where the maximum leaf number (150.00) was appeared in Cowdung treatment. Poultry manure also gave near about maximum leaf number (143.00). The minimum leaf number (112.00) was obtained from control. In the present study, highest significant result was obtained from Cowdung treatment, because cowdung is more efficient than other organic manures (Ansari, 2005). Possible reasons behind this are organic manures add higher phosphorus and potassium content in soil than conventional farming (Jin *et al.*1996)

Leaf length (cm)

The length of the leaf blade was significantly influenced by different treatments. Highest length of leaf blade (4.70 cm) was obtained from theT_1 treatment at the 120 DAP. The lowest length of leaf blade (4.00 cm) were obtained from the control (Table 2). It might be due to higher nitrogen content in cowdung was 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 i.e. increases leaf length and leaf breadth. Talukder *et al.* (2007) studied the effect of different organic and inorganic fertilizers on growth and yield of Mukhi kachu cv. Sali kachu. The result revealed that plant height, length and breadth of leaf blade were highest in organic manure treated plant.

1000-fresh leaf weight (gm)

There was significant variation in 1000-fresh leaf yield. At 120 DAP, cowdung treatment gave organic manure and fertilizer significantly influenced 1000-fresh leaf weight. The highest 1000-fresh leaf weight (82.00gm) was found from the treatment of cowdung. The second highest 1000- fresh leaf weight was found at the treatment of poultry manure (79.00gm). Treatment of cowdung+ NPK fertilizer occupied the third (76.67gm) position. The minimum 1000-fresh leaf weight found control (74.33gm). Samsunnahar (2006) evaluated the effect of organic farming on properties of soil and growth of red amaranth. She reported that cowdung and poultry manure treated plots conserved maximum Vitamin -C, Na, Ca and Fe content.

Yield/plot

The maximum yield/plot (368.96 gm /plot) and minimum yield/plot (249. 74gm/plot) was recorded from control (T_0) treatment (Table 2). It was also obvious in table 2 that yield was significantly influenced with applying manure and fertilizer. In case of production of Pudina, cowdung, poultry manure and cowdung+ NPK fertilizer produced statistically identical yield although numerically different. Cowdung is the key house of nutrient availability and maintenance of better physical condition of the soil. It is an essential factor for crop productivity. Moreover, use of cowdung not only acts as a source of N and other nutrients but also increase efficiency of applied nitrogen. Similarly poultry manure was more economical at high target yields of medicinal plant.

Conclusions

Considering the above discussion, It is a clear that cowdung and poultry manure showed its superiority on plant height, Leaf length,1000-fresh leaf yield and fresh yield of Tulsi and Pudina (Mint) medicinal plant to the control. In order to maintain good soil and keep the environment sound, it would be the best to advise farmers for the application of cowdung or poultry manure for cultivation herbal medicinal plant.

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