

## Effect of fertilizer and manures on growth and yield of Pudina (*Mentha arvensis*)

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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 from March, 2013 to February, 2014 to evaluate the effect of fertilizer and manure on the growth and yield of 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 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, growth and yield of Pudina medicinal plant.

**Key words:** Pudina, 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 and Islam, 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, Amlaki etc. These plants are natural source of medicine. Pudina under the family Labiatae, is a very essential medicinal plant. It plays a great role for making delicious recipe and human digest. Menthol is found from mint. Pudina (*Mentha arvensis*) used against digestive and vomiting. From recent search valuable medicinal plant as tulsi and pudina are found endangered in Bangladesh. So, in this situation it is to develop organic cultivation of pudina medicinal plant for environmental balance. Therefore this study was undertaken to know the effects of fertilizer and manures on growth and yield of 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. Two inches branch cutting of pudina were used as a planting materials. The experiment was laid out in randomized complete block design with three replications. The 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<sub>0</sub>=No fertilizer and manures, T<sub>1</sub>=Cowdung (5t/ha), T<sub>2</sub>=Mixed fertilizer (NPKS), T<sub>3</sub>=Cowdung+ NPK fertilizer, T<sub>4</sub>=Poultry manure (4t/ha), T<sub>5</sub>=Poultry manure+ NPK fertilizer. Necessary intercultural operation was done. After 120 days of planting of pudina data were collected on plant height (cm), number of branch/plant, number of leaf/plant, leaf length/leaf, 1000-fresh leaf weight and fresh yield. 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 Pudina. The results obtained from the experiments have been cited and discussed in tables.

#### Effect of fertilizer and manures on growth and yield of Pudina inkharif season

**Plant height (cm):** Plant height of Pudina was measured at harvested time (120 DAP) and presented in Table 1. 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<sub>1</sub>>T<sub>4</sub>>T<sub>3</sub>>T<sub>5</sub>>T<sub>2</sub>>T<sub>0</sub>. 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.

**No. of branch/plant:** No. of branch/plant was measured at harvested time (120 DAP) and presented in Table 1. 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 no. of branch/plant. On the basis of effect of organic manures and fertilizer on plant of Pudina, the performance of treatments could be placed as the following order T<sub>2</sub>>T<sub>4</sub>>T<sub>3</sub>>T<sub>5</sub>>T<sub>2</sub>>T<sub>0</sub>. 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 1 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)

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

Treatment	Plant height (cm)	No. of branch/plant	No. of leaf/plant	Leaf Length (cm)	1000-Fresh Leaf weight	Fresh yield/plot (gm)	Yield (t/ha)
T <sub>0</sub>	49.00e	9.00e	112.00f	4.00e	74.33d	249.74e	1.24e
T <sub>1</sub>	59.00a	15.33a	150.00a	4.70a	82.00a	368.96a	1.84a
T <sub>2</sub>	51.33d	11.00d	116.00e	4.20d	74.67cd	259.86e	1.29e
T <sub>3</sub>	57.00b	13.00bc	133.33c	4.50bc	76.67c	306.70c	1.53c
T <sub>4</sub>	57.67ab	14.00ab	143.00b	4.60ab	79.00b	338.95b	1.69b
T <sub>5</sub>	54.00c	12.00cd	120.33d	4.40c	76.00cd	274.33d	1.37d
SE±	0.89	0.53	3.44	0.06	0.68	10.53	0.02
C V (%)	1.62	4.29	2.67	1.39	0.88	3.51	3.04
LSD	1.34	1.15	3.57	0.14	1.74	10.80	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):** The length of the leaf blade was significantly influenced by different treatments. Highest length of leaf blade (4.70 cm) was obtained from the T<sub>1</sub> treatment at the 120 DAP. The length of leaf blade (4.00 cm) was lowest in obtained from the control (Table 1). 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 (t/ha):** The maximum yield/plot (368.96 gm /plot) and minimum yield/plot (249.74gm/plot) was recorded from cowdung and control (T<sub>0</sub>) treatment (Table 1).The Maximum yield 1.84 t/ha(cowdung treatment) and minimum yield 1.24 t/ha (control treatment)It was also obvious in table1 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.

**Effect of fertilizer and manures on growth and yield of Pudina in Rabi season**

**Plant height (cm):** Plant height of Pudina was measured at harvested time (120 DAP) and presented in Table 2. It was stated that cowdung treatment gave highest plant height as the value 57.00cm compared to other treatments. In control treatment where no organic manures and fertilizer were used showed lowest plant height (47.00 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<sub>1</sub>>T<sub>4</sub>>T<sub>3</sub>>T<sub>5</sub>>T<sub>2</sub>>T<sub>0</sub>. 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.

**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 13.00 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<sub>2</sub>>T<sub>4</sub>>T<sub>3</sub>>T<sub>5</sub>>T<sub>2</sub>>T<sub>0</sub>.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 (140.00) was appeared in cowdung treatment. Poultry manure also gave near about maximum leaf number (132.00). The minimum leaf number (100.00) 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 (4.6 cm) was obtained from the T<sub>1</sub> treatment at the 120 DAP. The length of leaf blade (3.90 cm) were lowest 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.

**Table 2.** Effect of fertilizer and manure on growth and yield performance of Pudina 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 <sub>0</sub>	47.00e	8.00e	100.00d	3.90d	70.00e	1.05b
T <sub>1</sub>	57.00a	13.00a	140.00a	4.60a	76.00a	1.43a
T <sub>2</sub>	49.00d	9.00de	105.00d	4.00d	72.00d	1.13b
T <sub>3</sub>	55.00b	11.00bc	125.00bc	4.30bc	74.00bc	1.39a
T <sub>4</sub>	56.00ab	12.00ab	132.00b	4.400b	75.00ab	1.48a
T <sub>5</sub>	52.00c	10.00cd	115.00c	4.20c	73.00cd	1.26ab
SE±	0.632	0.516	0.849	0.060	0.623	0.07
C V (%)	2.08	8.52	1.23	2.48	1.47	9.82
Level of sig.	***	**	***	***	**	*

\* = Significant at 5% level of probability, \*\* = 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)

**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 (76.00gm) was found from the treatment of cowdung. The second highest 1000- fresh leaf weight was found at the treatment of poultry manure (75.00gm). Treatment of cowdung+ NPK fertilizer occupied the third (74.00gm) position. The minimum 1000-fresh leaf weight found control (70.00gm). 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 (t/ha):** The maximum yield/plot (1.43 t/ha) and minimum yield/plot (1.05 t/ha) was recorded from control (T<sub>0</sub>) 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, cowdung+ NPK fertilizer and poultry manure + 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.

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 and yield(t/ha) of 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 Pudina medicinal plant.

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