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# EFFECT OF MANAGEMENT PRACTICES ON THE YIELD AND QUALITY OF MURTA PLANT (*Schumannianthus dichotomus*) IN JHALAKATI

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## Abstract

The experiment was conducted at farmers' field of Kamdebpur village under Nalchity upazila of Jhalakati district of Bangladesh during 2019-2020 and 2020-2021 to develop suitable management package for increasing the yield and quality of murta. The treatments comprised of five management practices on existing murta plants viz., $T_1$ = Fertilizers (Inorganic + organic, 70-32-40 kg/ha N-P-K, respectively and compost 3 t /ha) + Pesticides application (on rhizome and plant parts) + Pruning (extra tillers and cleaning of dead plant parts), $T_2$ = Fertilizers (inorganic + organic) + Pruning, $T_3$ = Pesticides (insecticide + fungicide) + Pruning, $T_4$ = Pruning and $T_5$ = Farmers' practice (without management). The experiment was set up on 10 years old existing mutra plant. The experiment was laid out in randomized complete block design with three replications. Plant height, doga height, doga diameter, single doga weight, fresh doga yield and rating of doga quality varied significantly due to different management practices. The maximum fresh doga yield (32.37 t/ha) was found in $T_1$ treatment and it was statistically identical to that of $T_2$ treatment (26.66 t/ha). In terms of rating of doga quality (considering length, colour and strength of murta cane), treatment $T_1$ showed the highest quality (2.33) and it was at par to that of $T_2$ and $T_3$ treatments (3.33). The farmers' practice showed the lowest quality doga (4.67), which was similar to that of $T_4$ treatment (4.00). The results further revealed that treatment $T_1$ increased the doga yield of 68.35% over the farmers' practice. However, yield of doga for treatments $T_2$, $T_3$ and $T_4$ treatments were 38.64, 31.38 and 14.97% higher over farmers' practice, respectively. In terms of cost and return, treatment $T_1$ gave the highest gross margin (Tk. 98765/ha), it was slightly reduced in $T_2$ and $T_3$ treatments (Tk. 67663 and 66086/ha, respectively). Improved agronomic practices enhanced the growth and quality of murta stem. Considering the stem (doga) yield, quality and economic return, fertilizers (Inorganic + organic, 70-32-40 kg/ha N-P-K, respectively and compost 3 t /ha) + Pesticides application (on rhizome and plant parts) + Pruning (extra tillers and cleaning of dead plant parts) would recommended for murta cultivation in Jhalakati.

Keywords: Murta, management practices, stem yield, cane quality.

## Introduction

The herbaceous plant from which shitalpati is made is called "murta" plant (*Schumannianthus dichotomus* L.). Murta is a shrub and perennial plant under the

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family of Marantaceae. Depending on the growing region, murta plant is also called as *paitra, mustaq, patibet, patipata, muktagach, patigacha, murtha, ratagacha, patijong, shitalpati* plant etc. The murta plants are usually grown in the low-lying and wetland areas of Sylhet, Sunamganj, Moulvibazar, Habiganj, Chattogram, Noakhali, Feni, Lakshmipur, Chandpur, Cumilla, Brahmanbaria, Barishal, Jhalokati, Pirojpur, Jashore, Munshiganj, Narsingdi, Tangail, Mymensingh, Natore, Sirajganj districts of Bangladesh since hundreds years ago. The stripe, collected from culm of the *Murta* plant is used for weaving the bed mat, which is traditionally known as s*hitalpati*. Once planted, good yields are obtained for about forty consecutive years (Chowdhury *et al*., 2007). However, research information on murta cultivation is very scanty in Bangladesh and abroad. It was reported that the average annual revenue of the Bangladesh government from the sale of murta is about five thousand US dollar during the period of 1981-91 (Banik, 2001). Murta can be easily grown on fallow lands around houses, ditches, canal, beels or ponds where the lands remain wet or damp (Alam, 2007). Murta plant can tolerate salinity and waterlogging. Due to its wide adaptability, the plant can be easily cultivated on any land up and down (Ahmed *et al*., 2007). This plant prevents soil erosion and the decaying leaves of the plant mix with the soil add organic matter and increase fertility of the soil. Murta plant flowers in March-April and fruit/seed matures in June-July (Merry *et al*., 1997). Murta plant can grow up to 3-5 meters in length. The main part of this plant for making mat is the long stem without node which tends to get shorter as the plant grows older (Mia *et al*., 2018). Plants are usually harvested twice in a year and the harvesting continues for about 40 years. The farmers of Jhalakati district have been practicing '*shitalpati*' weaving since about 500 years. The mat is used by people all over Bangladesh as a sitting mat, bedspread or prayer mat. Traditional art of *shitalpati* weaving of Sylhet has been included in The United Nations Educational, Scientific and Cultural Organization (UNESCO)'s Representative List of the Intangible Cultural Heritage (ICH) of Humanity in 2017 (*Annon.*, 2017). Moreover, *shitalpati* carries a glorious history for Bangladesh. *Shitalpati* of Sylhet was used to decorate the palace of British Queen Victoria (BSCIC, 2018). Both men and women participate in collecting and processing murta, where women being more involved in the weaving process. Moreover, *murta* has wonderful adaptation capacity to marshy land facilitating production in the waterlogged area and play a significant role in soil erosion control (Ahmed *et al*., 2007). The farmers in Jhalakati region generally do not apply any management practices for murta plant cultivation regarding nutrient management, weeding, pruning of extra tillers and cleaning of dead plant parts, insect-pest and disease management etc. That is why the yield and quality of murta plant products (stem or *doga, beti* etc.) are not satisfactory. Continuous harvesting of murta plants for 10 or more years leads to decrease in culm length. Recurrent harvesting of *murta* leads to nutrient imbalance and consequently the yield is reduced in the aged plantations. Limitations of nitrogen and phosphorus caused culm shortness in murta (Mia *et al*., 2018). It is possible that nutritional imbalance or deficiency, either singly or combined, might be responsible for culm

shortness (Harpole *et al*., 2011). However, research on *murta* cultivation is very scanty in the country. In these circumstances, the experiment was designed to develop suitable management package for increasing the yield and quality of murta stem/doga.

## Materials and Methods

The experiment was conducted at farmers' field of Kamdebpur village under Nalchity upazila of Jhalakati district of Bangladesh during 2019-2020 and 2020-2021 to develop suitable management package for increasing the yield and quality of murta stem. The experimental site is situated in the latitudes and longitudes of $22^{o}33^{/}31.518^{//}$N and $90^{o}15^{/}38.4618^{//}$E. The experimental site is located under the agro-ecological zone Ganges Tidal Floodplain (AEZ 13). The soil type was medium low land with siltly-clay texture in soil. The treatments of the experiment were five management practices on existing murta plants viz., $T_1$ = Plant nutrients (inorganic + organic, @ 70-32-40 kg/ha N-P-K, respectively and compost 3 t /ha) [Mia *et al*., 2018] + Pesticides application (on rhizome and plant parts) + Pruning (extra tillers and cleaning of dead plant parts like branch, leaf etc.), $T_2$ = Plant nutrients (inorganic + organic) + Pruning, $T_3$ = Pesticides (insecticide + fungicide) + Pruning, $T_4$ = Pruning and $T_5$ = Farmers' practice (without management). Pesticides like Autostin 50WDG and Proclaim 5 SG were used as per recommended doses in this experiment. The experiment was set up at farmers on 10 years old existing murta plant. The experiment was laid out in randomized complete block design with three replications. Unit plot size was 4.5 m × 3 m. The experimental plots were fertilized as per the treatment specifications. Before setting up the experiment, the initial soil sample was collected for chemical analysis in the laboratory for determining the available plant nutrients. The collected soil sample was analyzed in the Regional Laboratory of Soil Resource Development Institute (SRDI), Barishal and analytical results were given below:

**Table 1. Analytical results of the soil sample (2019-2020)**

| Soil pH | Salinity (dS/m) | Organic matter (%) | Nitrogen (%) | Potassium (meq /100g soil | Phosphorus (µg/g soil) | Sulphur (µg/g soil) | Boron (ppm) | Zinc (ppm) |
|---|---|---|---|---|---|---|---|---|
| 7.40 | 0.71 | 0.82 | 0.012 | 0.15 | 17.12 | 2.13 | 0.51 | 1.01 |

The samples of murta plant were also collected randomly and sent to the Soil Science Laboratory of Bangladesh Agricultural Research Institute (BARI), Gazipur for determining nutrient status. Analytical results have been presented in Table 2. The murta crop (stem/doga) was harvested in the month of January in 2020 and 2021. Data were collected on different parameters such as plant height, number of stem (doga)/$m^2$, doga height, doga diameter, single doga weight, doga weight/plot and rating of doga quality. The plot wise doga weights were then converted into ton/hectare. The quality of harvested doga (considering length,

colour and strength of murta cane) was rated based on 1-7 scale, where 1 = Excellent quality, 2 = Very good, 3 = Good, 4 = Moderate, 5 = Poor, 6 = Very poor, and 7 = Not useable/worst quality. Besides, the existing local market prices of product and by-product were collected for making economic analysis for murta cultivation. Data were analyzed through Statistix10 computer software and the mean differences were adjudged with Duncan's Multiple Range Test (DMRT) following Gomez and Gomez (1984).

**Table 2. Analytical data of murta sample (2019-2020)**

| Sample name | Ca | Mg | K | P | S | Cu | Fe | Mn | Zn | B |
|---|---|---|---|---|---|---|---|---|---|---|
| | % | | | | | ppm | | | | |
| Peet | 0.43 | 0.23 | 0.60 | 0.17 | 0.39 | 6.88 | 190.86 | 85.59 | 10.52 | 23 |
| Ati | 0.37 | 0.20 | 0.57 | 0.11 | 0.29 | 7.23 | 168.90 | 75.74 | 14.77 | 37 |
| Chota | 0.24 | 0.13 | 0.58 | 0.18 | 0.39 | 7.29 | 245.46 | 100.07 | 15.51 | 17 |
| Buka | 0.74 | 0.39 | 1.33 | 0.64 | 0.69 | 9.30 | 263.40 | 118.12 | 111.63 | 16 |
| Whole plant | 2.07 | 1.09 | 1.12 | 0.28 | 0.48 | 7.72 | 1977.00 | 886.55 | 44.60 | 44 |

Source: Soil Science Laboratory, BARI, Gazipur

Plant samples: Peet = Upper green part of murta stem, Ati = Lower part of peet, Chhota = Lower layer of ati, Buka = Inner soft pith, Whole plant = Peet, ati, chota and buka

## Results and Discussion

### Effect of management practices on yield of murta

The plant height, doga height, doga diameter, single doga weight, fresh doga yield and rating of doga quality varied significantly due to different management practices as imposed on murta plant (Table 2). In 2019-2020 ($Y_1$), treatment $T_1$ gave the tallest plant (385 cm), which was statistically similar to that of $T_3$, $T_2$ and $T_4$ gave statistically similar heights (360, 345 and 320 cm, respectively) but treatment $T_5$ produced the shortest plant (244 cm). Likewise, the longest plant (387 cm) was also obtained from found achieved from $T_1$ treatment in $Y_2$ (2020-2021). Statistically identical results were also found in $T_3$ and $T_2$ (385 and 360 cm, respectively). In average of two years, treatment $T_1$ produced the tallest plant (386 cm), which was statistically similar to that of $T_3$ treatment (373 cm) and $T_2$ treatment (353 cm). The shortest plant (245 cm) was obtained from farmers' practice (without management). The longest doga was found in $T_1$ (234 cm), which was statistically identical to $T_3$, $T_2$ and $T_4$ treatments (212, 208 and 206 cm, respectively) but the shortest doga (179 cm) was obtained from farmers' practice in $Y_2$. Average doga height showed the highest (224 cm) in $T_1$ treatment.

Statistically similar height was also observed in $T_3$, $T_2$ and $T_4$ treatments (213, 209 and 201 cm, respectively). The shortest height of doga (185 cm) was obtained from $T_5$ treatment. In $Y_1$, treatment $T_1$ showed the highest diameter (22.41 mm) of doga that was statistically at par to that of $T_2$ and $T_3$ treatments (21.10, 20.69 and 17.41 mm, respectively). In $Y_2$, treatment $T_1$ also gave the highest diameter (24.49 mm) of doga, which statistically similar to $T_3$ (21.79 mm). Treatment $T_5$ gave the lowest diameter in both the years (16.74 and 17.84 mm in $Y_1$ and $Y_2$, respectively). Average diameter showed the highest value (23.45 mm) in $T_1$ that was statistically similar to that of $T_3$ (21.24 mm) and $T_2$ (20.63 mm) treatments. The lowest average diameter (17.29 mm) was found in $T_5$ treatment. The highest weight of single doga (423 g) was obtained from $T_1$ treatment in $Y_1$. Statistically identical results were also found in $T_3$ (408 g), $T_2$ (377 g) and $T_4$ (348 g) treatments. In $Y_2$, $T_1$ gave the highest weight of single doga (505 g). In aveage, treatment $T_1$ produced the highest weight of single doga (464 g). Statistically similar weight was also obtained from $T_3$ and $T_2$ treatments (399 and 381 g, respectively). Farmers' practice ($T_5$) produced the lowest weight of single doga (327 g). In $Y_1$, treatment $T_1$ gave the highest fresh yield (30.91 t/ha) of doga that was statistically at par to that of $T_2$, $T_3$ and $T_4$ treatments (25.24, 24.21 and 22.62 t/ha, respectively). Treatment $T_1$ also gave the highest yield of fresh doga (30.91 t/ha) in $Y_1$, which was statistically similar to that of $T_2$ (28.07 t/ha) and $T_3$ (26.31 t/ha) treatments. Treatment $T_5$ gave the lowest yield in both the years (19.82 and 18.63 t/ha in $Y_1$ and $Y_2$, respectively). In average of two years, doga yield showed the highest (32.37 t/ha) in $T_1$ treatment and the results was statistically at par to that of $T_2$ treatment (26.66 t/ha). The lowest yield (19.23 t/ha) was found in farmers' practice ($T_5$). The results further revealed that treatment $T_1$ increased the doga yield of 68.35% over the farmers' practice. However, the increased yield of doga for $T_2$, $T_3$ and $T_4$ treatments were 38.64, 31.38%and 14.97%, respectively over the farmers' practice ($T_5$). Improved management practices like application of balanced fertilizers (inorganic + organic) along with pesticides application on rhizome or plant parts for preventing insect-pest and diseases, pruning of extra tillers and cleaning of dead plant parts produced created favourable environment for vigorous growth of murta plant that produced more number of stem, increased doga height, doga diameter and single doga weight over the farmers' practice. Cumulative effect of these parameters helped in getting higher yield and quality of murta doga. The results are in agreement with the findings of Mia *et al*. (2018) and they noted that a combined limitation of N and P was responsible for culm (stem) shortness and reduced growth in Murta. Combined application of organic and inorganic fertilizers particularly N, P and K increased generation of new plants. It was observed that long and wide diameter of doga is suitable for producing quality cane for shitalpati weaving.

**Table 2. Effects of management practices on yield and quality of murta plant at farmers' field of Kamdebpur village, Nalchity, Jhalakati during 2019-2020 and 2020-2021**

| Treatment | Plant height (cm) | | | Stem (doga)/ $m^2$ (no.) | | | Doga height (cm) | | |
|---|---|---|---|---|---|---|---|---|---|
| | $Y_1$ | $Y_2$ | Average | $Y_1$ | $Y_2$ | Average | $Y_1$ | $Y_2$ | Average |
| $T_1$ | 385a | 387a | 386a | 7.21 | 6.65 | 6.92 | 215 | 234a | 224a |
| $T_2$ | 345a | 360ab | 353ab | 6.64 | 7.31 | 6.98 | 210 | 208ab | 209ab |
| $T_3$ | 360a | 385a | 373a | 5.99 | 6.71 | 6.35 | 215 | 212a | 213a |
| $T_4$ | 320a | 309bc | 314b | 6.56 | 6.22 | 6.39 | 197 | 206ab | 201ab |
| $T_5$ | 244b | 246c | 245c | 6.05 | 5.72 | 5.89 | 191 | 179b | 185b |
| CV (%) | 11.05 | 9.85 | 11.60 | 10.81 | 14.63 | 9.02 | 7.99 | 7.73 | 10.66 |
| F-test | ** | * | * | NS | NS | NS | NS | ** | * |

***Table 2. Contd.***

| Treatment | Doga diameter (mm) | | | Single doga weight (g) | | | Stem (doga) fresh yield (t/ha) | | | Doga yield increase over control (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| | $Y_1$ | $Y_2$ | Average | $Y_1$ | $Y_2$ | Average | $Y_1$ | $Y_2$ | Average | |
| $T_1$ | 22.41a | 24.49a | 23.45a | 423a | 505a | 464a | 30.91a | 33.82a | 32.37a | 68.35 |
| $T_2$ | 21.10a | 20.17bc | 20.63ab | 377ab | 385b | 381ab | 25.24ab | 28.07ab | 26.66ab | 38.64 |
| $T_3$ | 20.69a | 21.79ab | 21.24a | 408ab | 391b | 399ab | 24.21ab | 26.31ab | 25.26bc | 31.38 |
| $T_4$ | 17.41b | 18.72bc | 18.06bc | 348ab | 344b | 346b | 22.62ab | 21.59b | 22.10bc | 14.97 |
| $T_5$ | 16.74b | 17.84c | 17.29c | 330b | 325b | 327b | 19.82b | 18.63b | 19.23c | - |
| CV (%) | 7.12 | 10.13 | 8.22 | 12.27 | 14.59 | 11.65 | 21.19 | 23.44 | 14.25 | - |
| F-test | ** | ** | * | * | ** | * | * | ** | * | - |

Note: $Y_1$ = Year 2019-2020 and $Y_2$ = Year 2020-2021

* and ** Significant at 5% and 1% level of probability, respectively; NS = Not significant

Management practices: $T_1$ = Fertilizer + Pesticide + Pruning; $T_2$ = Fertilizer + Pruning; $T_3$ = Pesticide + Pruning; $T_4$ = Pruning and $T_5$ = Farmers' practice

## Effect of management practices on the quality of murta

Stem or doga quality (based on length, colour and strength of murta cane) varied significantly because of different management practices (Table 3). Treatment $T_1$ showed the highest quality (2.33) and it was at par to that of $T_2$ and $T_3$ treatments (3.33). The farmers' practice showed the lowest quality doga (4.67), which was similar to that of $T_4$ treatment (4.00). Application of improve management

practices, enhanced the growth of murta plant that produced higher yield and improved quality of murta stem. It can be noted that longer and wide diameter of doga is more suitable for making good quality murta cane. Attractive natural colour and good strength of murta cane are also considered for weaving quality shitalpati. Long cane of murta stem is used for weaving big size of shitalpati without making any joint of the cane with one another. Demand and price of the unjointed shotalpati is comparatively high to the end user as well as in the local market.

**Table 3. Effect of management practices on the quality of murta (2020-2021)**

| Treatment | Rating of murta (cane quality) | | | |
|---|---|---|---|---|
| | Length | Colour | Strength | Average |
| $T_1$ | 2.00 | 2.00 | 3.00 | 2.33c |
| $T_2$ | 3.00 | 3.00 | 4.00 | 3.33bc |
| $T_3$ | 3.00 | 3.00 | 4.00 | 3.33bc |
| $T_4$ | 4.00 | 5.00 | 3.00 | 4.00ab |
| $T_5$ | 6.00 | 5.00 | 3.00 | 4.67a |
| CV (%) | - | - | - | 12.33 |
| F-test | - | - | - | * |

Note: * Significant at 5% level of probability

Rating of doga quality: 1 = Excellent, 2 = Very good, 3 = Good, 4 = Moderate, 5 = Poor, 6 = Very poor, and 7 = Not useable/worst quality

## Economic return from different management practices of murta

The economic analysis was done based on the local market price of the product and by-product of murta plant. Economic analysis results revealed that gross return obtained from treatment $T_1$ was the highest (Tk. 173465/ha), while $T_2$ gave the return of Tk. 124863/ha (Table 3). Treatment $T_3$ and $T_4$ showed the gross returns of Tk. 118586 and 74647/ha, respectively. The lowest gross return (Tk. 61057/ha) was found in $T_5$ (farmers' practice). Similar trend was also observed in case of gross margin. Treatment $T_1$ showed the highest gross margin (Tk. 98765/ha). However, comparatively reduced gross margins were achieved from $T_2$ and $T_3$ treatments (Tk. 67663 and 66086/ha, respectively). On the other hand, the lowest gross margin (Tk. 31057/ha) was computed in $T_5$ treatment. The highest value of BCR (2.32) was computed in $T_1$, while the values in $T_3$, $T_2$ and $T_4$ were 2.26, 2.18 and 2.13, respectively. The farmers' practice showed the lowest value of BCR (2.04). Considering the stem (doga) yield, quality and economic return, treatment $T_{1=}$ Fertilizers (Inorganic + organic, 70-32-40 kg/ha N-P-K, respectively and compost 3 t /ha) + Pesticides application (on rhizome and plant parts) + Pruning (extra tillers and cleaning of dead plant parts) can be applied for murta cultivation in Jhalakati.

**Table 3. Economic return from different management practices of murta (average of 2 years)**

| Treatment | Stem (doga) yield (t/ha) | By-product yield (t/ha) | Gross return (Tk/ha) | Total variable cost (Tk/ha) | Gross margin (Tk/ha) | Benefit cost ratio (BCR) |
|---|---|---|---|---|---|---|
| $T_1$ | 32.37 | 10.32 | 173465 | 74700 | 98765 | 2.32 |
| $T_2$ | 26.66 | 9.83 | 124863 | 57200 | 67663 | 2.18 |
| $T_3$ | 25.26 | 9.84 | 118586 | 52500 | 66086 | 2.26 |
| $T_4$ | 22.10 | 7.83 | 74647 | 35000 | 39647 | 2.13 |
| $T_5$ | 19.23 | 6.76 | 61057 | 30000 | 31057 | 2.04 |

Local market price of murta product: Stem (doga) for $T_1$ Tk. 5200, $T_2$ Tk. 4500, $T_3$ Tk. 4500, $T_4$ Tk. 3200 and $T_5$ Tk. 3000/t; By-product (dried stem as cooking fuel) price: Tk. 500/t

## Conclusion

From two years study it might be concluded that application of inorganic and organic fertilizers @ 70-32-40 kg/ha N-P-K, respectively and compost 3 t /ha along with pesticide application on rhizome and plant parts and pruning (extra tillers and cleaning of dead plant parts like branch, leaf etc.) would be recommended in cultivating murta for achieving higher yield, quality and economic return of murta stem or doga.

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