

**EFFECTS OF DIFFERENT CHEMICAL TREATMENTS OF MURTA
CANE (*Schumannianthus dichotomus* L.) ON THE QUALITY OF
SHITALPATI (MAT) IN BANGLADESH**

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Abstract

The experiment was conducted during two consecutive seasons of 2019-2020 and 2020-2021 at Farmers' home of Kamdebpur village of Nalchity upazila under Jhalakati district (2019-2020) and Bangladesh Agricultural Research Institute, Regional Agricultural Research Station, Rahmatpur, Barishal (2020-2021) to develop suitable protocol of chemical treatment of murta cane for improving the quality of *shitalpati* (cooling mat) in Bangladesh. There were nine treatments in the experiment viz., T₁ = Boiled with Tamarind leaf + Cowa leaf (50g leaf/liter water), T₂ = Soaking and boiled with fermented rice starch (250ml/liter water), T₃ = Boiled with white vinegar (100ml/liter water), T₄ = Boiled with cowa leaf + Vinegar (25g cowa leaf/liter water and 50ml vinegar/liter water), T₅ = Boiled with Detergent powder (10g/liter water), T₆ = Boiled with Fermented rice starch + Arrowroot (fermented rice starch 250ml/liter water and arrowroot 5g/liter water), T₇ = Boiled with Tamarind leaf + Cowa leaf + Rice starch (50g leaf/liter water and fermented rice starch 250ml/liter water), T₈ = Boiled with Rice starch + Fermented milk (fermented rice starch: milk = 10: 1), and T₉ = Control (no treatment). The experiment was conducted in a Completely Randomized Design (CRD) with three replications. The chemical treatment had significant effect on the quantitative and qualitative traits of murta cane. In terms of qualitative traits, the lowest average value (2.58) was recorded in treatment T₇ that denoted from very good to good quality of *shitalpati* followed by T₄ treatment (rating 2.67). The rating from good to moderate qualities of *shitalpati* were found in T₆ (3.33), closely followed by T₂ (3.42) and T₁ (3.42) treatment. Considering the average value of the qualitative traits (brightness, surface glossiness, surface smoothness and comfort), the treatments T₇, followed by T₄ and T₈ could be applied for the treatment of murta cane towards weaving very good to good qualities of *shitalpati*.

Keywords: *Shitalpati*, murta cane, chemical treatment, quality.

Introduction

Shitalpati (cooling mat) is made from the stripe of the murta plant (*Schumannianthus dichotomus* L.) which is collected from culm of the murta plant (Chowdhury *et al.*, 2007). The cultivation and processing of murta has great potential for the rural economy of the *shitalpati* weaving areas of Bangladesh (Ahmed *et al.*, 2007). The upper shell of the murta cane, locally known as *pit bet*,

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used for weaving cool mat, the next part (called as *buka bet*) is taken out and used to make *buka* mat and the remaining part (called as *chhota bet*) is used for making thin rope. Depending on the growing region, the murta plant is also called as *paitra*, *mustaq*, *patibet*, *patipata*, *muktagach*, *patigacha*, *murtha*, *ratagacha*, *patijong*, *shitalpati* plant etc. The murta plant grows around water bodies in northeastern and southern districts of Bangladesh. *Shitalpati* is very soft, cool and beautiful which is traditionally used in summer and human body feels natural comfort. The mat is used by people all over Bangladesh and some parts of India as sitting mat, bedspread or prayer mat. Mats with decorative designs are also called *nakshipati* (Banu, 2012). *Shitalpati* is also weaved with herbs, animals and surrounding designs and motifs. It has red, blue, green, black and purple colors (Banglapedia, 2014). Both men and women participate in collecting and processing murta but weaving process involved by women. *Shitalpati* is a traditional handicraft product that is about 350 years old. *Shitalpati* is weaved traditionally in the districts of Sylhet, Moulvibazar, Habiganj, Jhalokati, Barishal, Pirojpur, Jashore, Faridpur, Sunamganj, Netrokona, Nilphamari, Kurigram, Tangail, Mymensingh, Narsingdi, Munshiganj, Sirajganj, Cumilla, Chandpur, Feni, Lakshmipur and Noakhali. However, Rajnagar, Balaganj, Baralekha and Molla Bazar of Sylhet region, Sonagazi and Raipur of Noakhali, Swarupkathi and Nilgati of Barishal and Satche of Faridpur produced high quality of *shitalpati* (Banglapedia, 2014). The Forestry Master Plan (1992) claimed that about eight thousand people in the country are involved in making *shitalpati* (GoB, 1992) and the annual value of the murta and hogla plants used for making *shitalpati* in 1992 was about USD 0.11 million (Basit, 1995). The traditional art of *shitalpati* weaving of Sylhet has been included in the United Nations Educational, Scientific and Cultural Organization (UNESCO)'s as Intangible Cultural Heritage (ICH) of Humanity (Anonymous, 2017a).

The *shitalpati* is made through different indigenous chemical treatments or processes of murta cane in the country. It was reported that cane is picked up from the culm of murta plant. Then rice starch and water are mixed and boiled the murta cane for making it smooth and white (Anonymous, 2017b). Cane is made where one bunch is tied in the form of a *bira* followed by boiled by mixing rice starch and hog plum (*Spondias mombin*), jarul (*Lagerstroemia speciosa*) and geowa (*Excoecaria agallocha*) leaves with water. This results in soft, smooth and shiny cane (Anonymous, 2019). The indigenous ingredients like tamarind leaf (*Tamarindus indica*), cowa leaf (*Garcinia cowa*) etc. are also used for murta cane processing. Quality of *shitalpati* is judged by its glossiness, smoothness and fineness of texture. Most of the *shitalpati* available are of poor quality and sold at low price in the local market. However, formal research has yet to be conducted for the improvement of *shitalpati* handicraft in Bangladesh. Development of suitable chemical treatment would improve the quality of *shitalpati* as well as its market demand, which ultimately will increase the net income of the respective stakeholders. In these circumstances, the experiment was designed to develop suitable protocol of chemical treatment of murta cane in Bangladesh.

Materials and Methods

The experiment was conducted during 2019-2020 and 2020-2021 seasons at Farmers' home of Kamdebpur village under Nalchity upazila of Jhalakati district (2019-2020) and Regional Agricultural Research Station, Bangladesh Agricultural Research Institute (BARI), Rahmatpur, Barishal (2020-2021) to develop suitable protocol of chemical treatment/process of murta cane for improving the quality of *shitalpati* in Bangladesh. There were nine treatments in the experiment viz., T₁ = Boiled with Tamarind leaf + Cowa leaf (50g leaf/liter water), T₂ = Soaking and boiled with fermented rice starch (250ml/liter water), T₃ = Boiled with white vinegar (100ml/liter water), T₄ = Boiled with cowa leaf + Vinegar (25g cowa leaf/liter water and 50ml vinegar/liter water), T₅ = Boiled with Detergent powder (10g/liter water), T₆ = Boiled with Fermented rice starch + Arrowroot (fermented rice starch 250ml/liter water and arrowroot 5g/liter water), T₇ = Boiled with Tamarind leaf + Cowa leaf + Rice starch (50g leaf/liter water and fermented rice starch 250ml/liter water), T₈ = Boiled with Rice starch + Fermented milk (fermented rice starch: milk = 10: 1), and T₉ = Control (no treatment). The design of the experiment was Completely Randomized Design (CRD) with three replications. The stem (*doga*) of murta plant was harvested and then the green top layer was separated from the stem for making cane (locally known as *Aibeti*). The murta cane was treated or processed following the chemical treatment specifications as designed under this experiment. At first, murta cane was kept in the treatment solution for 7 days towards fermentation and then it was boiled with the same solution for about 15 minutes until appearing the desired yellowish colour of the cane. The boiled cane was dried in the sun for 2-3 days until getting ready for making *shitalpati*.

Data were recorded on different quantitative traits viz., pH (before and after boiling of murta cane with treatment solution) and temperatures (before and after dipping of cane in hot treatment solution). However, data on surface temperature and four qualitative traits (surface glossy, bright, smooth and comfortable) were taken after weaving of *shitalpati* using the respective murta cane treated as per treatment specifications. The pH value of hot treatment solution was measured using water pH meter. Temperatures of hot treatment solution were measured with the help of mercury based water thermometer before and after boiling of murta cane. *Shitalpati* was weaved with the treated murta cane under different treatment specifications. Efficient *patikar* (craftsman) of the locality were engaged to weave the *shitalpati*. The unit size of *shitalpati* was 2.3 meter long and 1.38 meter wide. Each of the four qualitative characteristics of *shitalpati* (surface glossy, bright, smooth and comfortable) were evaluated just after weaving the *shitalpati* based on 1 to 7 rating scale, where 1 = Excellent quality, 2 = Very good, 3 = Good, 4 = Moderate, 5 = Poor, 6 = Very poor, and 7 = Worst quality. It can be noted that the excellent quality indicates the highest value of surface glossy, bright, smooth and comfortable of *shitalpati*. Data were analyzed through Statistix10 computer software and the mean differences were adjudged with Duncan's Multiple Range Test (DMRT).

Results and Discussion

All the quantitative traits viz. p^H (before and after boiling of murta cane), temperature (before dipping of murta cane), temperature (after dipping of cane), surface temperature and qualitative traits of *shitalpati* varied significantly due to different chemical treatments of murta cane (Table 1). Before boiling of cane, the maximum p^H value (6.83) was recorded in normal water that was at par to that of T_6 treatment solution (5.62). The lowest p^H value (3.18) was recorded in treatment T_3 . The treatment solutions of T_4 followed by T_2 , T_7 , T_2 , T_8 and T_5 also showed the lower p^H values (3.51, 3.88, 4.09, 4.21, 4.38 and 5.43, respectively) before boiling of cane. During boiling of cane, the highest p^H value (8.73) was shown by T_5 treatment solution due to adding detergent powder in water. The p^H value for normal water was 7.05. Somewhat lower p^H values were also recorded in the solutions of T_6 (5.73) followed by T_1 (5.16), T_8 (4.56), T_7 (4.11) and T_2 (4.04), respectively. The lowest p^H value was found in the treatment T_4 and it was statistically similar to that of T_3 (3.78). Before dipping of cane, the temperatures of the treatment solutions were found ranged from 98.10 to 98.70 °C. After dipping of cane, the temperatures of the treatment solutions were found ranged from 97.83 to 98.73 °C. The highest surface temperature of *shitalpati* (31.43°C) was recorded in T_3 treatment and the lowest temperature (30.13°C) in T_7 treatment at 4:30 PM on 23 May, 2021. It is believed that human body comparatively feels cool and pleasant on *shitalpati* during hot weather condition and therefore, surface temperature of *shitalpati* was recorded for supporting the study.

In terms of surface qualitative traits (glossy, bright, smooth and comfortable) of *shitalpati*, the average lowest value (2.58) was recorded in treatment T_7 that denotes from very good to good quality of *shitalpati* which was followed by T_4 treatment (rating 2.67) and T_8 treatment (rating 3.00). The rating from good to moderate qualities of *shitalpati* were found in T_6 (3.33) followed by T_2 (3.42) and T_1 (3.42). On the other hand, treatments T_5 and T_9 produced from poor to very poor qualities of *shitalpati* (average rating 5.50 and 5.25, respectively).

The fermented rice starch and other sour materials like tamarind leaf, cowa leaf, white vinegar and fermented milk functioned as cleaning agents of the spots and dirty portion on the surface of murta cane because they are also slightly acidic in nature. Therefore, cane that treated with boiled water by incorporating these materials becomes glossy and bright. The results are in agreement with the findings of Fukushima *et al.* (2004). Palmer and Gallagher (2022) reported that lactic acid helps to remove old, dull cells on the skin's surface by dissolving the bonds that hold them together. As a result, it gives a brighter complexion, as well as smoother and softer skin. Therefore, murta cane soaked and boiled with fermented rice starch or the cane soaked and boiled with fermented milk made the *shitalpati* glossy, bright and smooth. On the other hand, cane treated with detergent powder make roughness on the cane surface. Roopa and Kasiviswanatham (2015) claimed that tamarind comprises organic acids like high content of tartaric acid 12-18%, malic acid and citric acid. So, boiling of cane with slightly acidic materials (fermented rice starch,

tamarind leaf, cowa leaf, white vinegar and fermented milk) make the cane surface glossy, bright and smooth. As a results mankind feel comfort on the *shitalpati* as made from these type of murta cane.

Table 1. Effects of chemical treatment of murta cane on quantitative and qualitative traits of *shitalpati* (Pooled of 2 years)

Treatment	p ^H of hot solution		Temperature (°C) of hot solution		Surface temperature of <i>shitalpati</i> (°C)
	Before boiling of murta cane	After boiling of murta cane	Before dipping of murta cane	After dipping of murta cane	
T ₁	4.21cd	5.16c	98.43b	98.43ab	30.37b-d
T ₂	3.88d	4.04de	98.20c	98.30ab	30.47bc
T ₃	3.18d	3.78e	98.70a	98.60a	31.43a
T ₄	3.51d	3.73e	98.53ab	98.73a	30.37b-d
T ₅	5.43bc	8.73a	98.57ab	97.83b	30.53bc
T ₆	5.62ab	5.73c	98.17c	98.63a	30.30cd
T ₇	4.09d	4.11de	98.50ab	98.63a	30.13d
T ₈	4.38cd	4.56d	98.10c	98.50a	30.40b-d
T ₉	6.83a	7.03b	98.20c	98.47a	30.63b
CV (%)	15.76	6.63	0.12	0.36	0.53

Table 1. Contd.

Treatment	Qualitative rating of <i>shitalpati</i> (1-7 scale)				
	Glossy	Bright	Smooth	Comfortable	Pooled
T ₁	3.67bc	3.00de	3.67bc	3.33bc	3.42c
T ₂	3.33cd	3.33cd	3.33c	3.67bc	3.42c
T ₃	4.33b	4.33bc	4.33b	4.33ab	4.33b
T ₄	3.00cd	2.00e	3.00cd	2.67c	2.67d
T ₅	5.67a	5.67a	5.67a	5.00a	5.50a
T ₆	3.33cd	3.33cd	3.33c	3.33bc	3.33c
T ₇	2.67d	2.67de	2.33d	2.67c	2.58d
T ₈	3.33cd	2.67de	3.00cd	3.00c	3.00cd
T ₉	5.33a	5.33ab	5.33a	5.00a	5.25a
CV (%)	14.13	16.94	13.48	18.18	6.72

Means followed by the same letters within each column do not differ significantly by Duncan's Multiple Range Test (DMRT).

T₁ = Boiled with tamarind leaf + Cowa leaf, T₂ = Boiled with fermented rice starch, T₃ = Boiled with white vinegar, T₄ = Boiled with cowa leaf + Vinegar, T₅ = Boiled with detergent powder, T₆ = Boiled with fermented rice starch + Arrowroot, T₇ = Boiled with Tamarind leaf + Cowa leaf + Rice starch, T₈ = Boiled with rice starch + Fermented milk, and T₉ = Control (no treatment).

Qualitative (surface glossy, bright, smooth and comfortable) rating (1-7 Scale): 1 = Excellent quality, 2 = Very good, 3 = Good, 4 = Moderate, 5 = Poor, 6 = Very poor, and 7 = Worst quality.

Conclusion

Although the traditional art of shitalpati weaving of Bangladesh has been recognized by the United Nations Educational, Scientific and Cultural Organization (UNESCO) as important intangible cultural heritage of the world but the quality of shitalpati should be improved for sustaining the glorious tradition of this handicraft in Bangladesh. Considering the average value of the qualitative traits (brightness, surface glossiness, surface smoothness and comfort), the treatments T₇ (Boiled with Tamarind leaf + Cowa leaf + Rice starch) followed by T₄ (Boiled with Cowa leaf + Vinegar) and T₈ (Boiled with Rice starch + Fermented milk) could be applied for the treatment of murta cane towards weaving very good to good qualities of *shitalpati*.

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