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Optimization of Macro-propagation of *Schizostachyum dullooa* (Gamble) through Culm Cuttings

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ABSTRACT: *Schizostachyum dullooa* (Gamble) R.B. Majumdar is an important bamboo species, known for its long internodes and having wide applications in kite making, baskets, mats, small boxes, and other handicrafts. Optimization of vegetative propagation is needed for commercial production of quality planting material of the species. An experiment was performed to assess the rooting performance of *S. dullooa* at different levels of IBA concentration during the year 2021. Three different concentrations of IBA (200, 500 and 1000 ppm) mixed with talc powder were tested, along with a control. Analysis of the results reveals that the sprouting and rooting were significantly high, *i.e.*, 92.50% and 86.66%, respectively, when treated with 1000 ppm IBA mixed with talc powder.

Keywords: *Schizostachyum dullooa*, culm cutting, IBA, talc powder.

INTRODUCTION

Schizostachyum dullooa (Gamble) R.B. Majumdar is one of the important bamboo species of Northeast India. It is an evergreen, medium sized, clump forming bamboo species, with a thin wall and long internodes. The species is included among the 38 priority bamboo species listed by the International Network for Bamboo and Rattan (INBAR) and the International Plant Genetic Resources Institute (Rao and Rao 1998). The species is distributed in different north-eastern states of India, *viz.*, Nagaland, Manipur, Mizoram, Tripura and Arunachal Pradesh. In Assam, it is found in the Reserve Forests of Dibrugarh, Tinsukia, Jorhat, Sivsagar and Cachar Forest Divisions (Banik, 2016). Owing to its long internodal length and thin wall, the species is popular for kite-making, and is also used in agarbati sticks and different types of mats and carpets (Banik, 2016). The green culms of this species are used for the preparation of a traditional food during the religious harvest festival in Assam (Nath *et al.*, 2007). People of the Garo Hills in Meghalaya use this species for carrying water and for making umbrellas (Seethalakshmi and Muktesh 1998).

S. dullooa is in high demand, particularly in Gujarat for making kites during the festive season (Pathak *et al.*, 2017) and in Northeast India for making traditional foods during the festive season (Das *et al.*, 2015). The demand of the species for various end uses is primarily met by harvesting the culm from forest areas. For commercial cultivation of the species, standardization of nursery techniques, especially vegetative propagation protocol is required. Pathak *et al.* (2018) previously have standardized the protocol with a combination of IBA (200 ppm) and NAA (500 ppm) and achieved 63.5% rooting in *S. dullooa*. To enhance the rooting efficiency of *S. dullooa* cuttings for large-scale multiplication, further experiments need to be explored. Culm cutting is considered the most effective and simple method for mass multiplication in bamboo, wherein a rooting hormone solution is applied in the cavity of the culm (Banik, 2008; Pattanaik *et al.*, 2004). Among the different rooting hormones, IBA is considered as most effective for bamboo propagation (Fatima *et al.*, 2021). Furthermore, Ilorkar *et al.* (2021) reported that higher concentration of IBA resulted in higher rooting and survival percentage in two-nod culm cuttings of *Dendrocalamus stockssi* and *Bambusa polymorpha*. Reports also indicated that concentration of hormones as well as method of application have a significant impact on rooting percentage of vegetative propagation (Carter and Slee 1993). Othman and Noor (1995) reported that using the contact method of IBA application resulted in higher rooting in *Gigantochloa levis*. Considering the above fact, in the current study, we used different concentrations of IBA mixed with talc powder and applied it directly to the buds on the nodal region of the cutting to enhance rooting percentage.

MATERIALS AND METHODS

The experiment was carried out in a randomized completely block design (RCBD) with three replications at the Bamboo nursery, ICFRE-Rain Forest Research Institute, Jorhat, India, during the year 2022. Experiment was started in the month of April and continued up to September. During the experimental periods rainfall and humidity ranges from 278mm-489mm and 78% to 85% respectively. One-year-old culm cuttings of *S. dullooa* which were disease free were collected from the Bambusetum of ICFRE-RFRI,

Jorhat. Double-node culm cuttings from mid to lower culm were selected and treated with different concentrations of IBA, i.e., 200, 500 and 1000ppm and control. IBA was mixed with talc powder and the slurry was directly applied to the buds on the nodal region. To prepare the IBA-talc mixture, first IBA was dissolved in 30% ethanol then mixed with talc powder to make a slurry mixture. Concentration of talc-IBA mixture was calculated as 1 mg of IBA was added to 1 gram of talc to make 1000 ppm (Sarponga *et al.,* 2021). No treatment was given in the control. The culm cuttings segments were placed horizontally in a row, 1-2 cm below the surface of nursery bed containing mixture of sand, soil and cow-dung in a 3:1:1 ratio. All cutting were placed under 70% shade and watered twice a day. The sprouting percentage was recorded after one month, two months and three months after planting. Rooting percentage and survival percent were recorded at 90 days and at one month after transplantation respectively. The recorded data was statistically analyzed using Microsoft Excel.

RESULTS AND DISCUSSION

After recording the performance of the experiment at four different levels of treatment, the highest percentages of sprouting (96.67%), rooting (92.50%) and survival (86.66%) were found with the 1000 ppm IBA-talc mixture. The second highest performance in terms of sprouting (68.33%), rooting (60.83%) and survival (62.22%) was recorded with 500 ppm IBA-talc mixture. The control group had the lowest percentages of sprouting, rooting, and survival. The result revealed a significant difference in both sprouting and rooting in relation to different concentration of IBA treatment (Table 1).

Reports have indicated that rooting hormone concentration and application methods have a tremendous effect on rooting percentage of cuttings. Many bamboo species respond differently to hormone treatment in terms of their rooting ability; some species root with ease while others are difficult to root (Sahoo *et al.,* 2020). Banik (2016) reported that rooting hormones are useful in the rooting of cuttings of thin-walled bamboo species such as *S. dullooa*, which is otherwise difficult to root. Among the different rooting hormones, the effect of IBA on rooting have been found to be the best choice in many species (Palanisamy and Kumar 1997; Palanisamy *et al*., 1998; Reddy *et al.*, 1998; Fatima *et al*., 2021). In the present study, different concentrations of IBA mixed with talc powder were tested as a contact method for rooting in *S. dullooa*. The results revealed that slurry of 1000 ppm of IBA mixed with talc powder applied directly to the buds in the nodal region resulted in maximum rooting (92.50%) and survival percentage (86.66%). Similar results of higher rooting percentage have been reported by Othman and Noor (1995), who used the contact method of the IBA application in *Gigantochloa levis.* Similarly, Shahab *et al.* (2013) also obtained better rooting in Alstonia cutting when treated with mixture of IBA and talc powder. In the current study the longer retention period of IBA at the application site, efficient absorption may have contributed to the increased rooting percentage. Eugene *et al.* (2007) also revealed that extended retention time of the IBA mixed with talc powder have resulted in effective uptake of the IBA and improved rooting percentage.

Table 1: Effect of different concentration of IBA-talc mixture on rooting and survival.

Treatment	Sprouting (%)	Rooting (%)	Survival %
Control	49.17	20.00	15.55
200ppm IBA	60.00	57.50	55.55
500ppm IBA	68.33	60.83	62.22
1000ppm IBA	96.67	92.50	86.66
CD ($p \leq 0.05\%$)	2.61	2.28	2.31

CONCLUSIONS

The perusal of the study revealed that vegetative propagation of *S. dullooa* through culm cutting shows very good performance in terms of rooting and survival when treated with 1000 ppm of IBA mixed with talc powder and applied directly on the buds of the nodal region. The optimized method can be used for large-scale *S. dullooa* multiplication.

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Conflict of Interest. None.

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