International Journal of Basic and Applied Chemical Sciences ISSN: 2277-2073 (Online)
An Online International Journal Available at http://www.cibtech.org/jcs.htm
2012 Vol. 2 (3) July-September pp.14-17/Sinha et al.
Research Article

CYCLIC MACRO-PROLIFERATION OF *BAMBUSA CACHARENSIS* THROUGH SEEDLINGS - A SOCIO-ECONOMICALLY IMPORTANT BAMBOO SPECIES OF NORTH-EAST INDIA

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ABSTRACT
Bambusa cacharensis is an endemic species of North-east India with high potential of commercial values. Flowering and fruiting recorded in this species has necessitated mass proliferation and establishment of bamboo saplings. This paper reports the macro-proliferation method of *B. cacharensis* through seed and rhizome splitting technique. Sampling age of 10 months old were multiplied 2-3 times in number though this techniques. Application of fertilizer supported growth without any significant increase in tiller number. Mass multiplied saplings were successfully transplanted in the field.

Key Words: *B. Cacharensis, Seedling, Macro-Proliferation*

INTRODUCTION
Bamboo has not only great economic importance to the rural people of many developing countries but also play significant role in environmental protection (Byatriakova *et al.*, 2003; Haque and Karmakar, 2004; Rao and *et al.*, 2009). In spite of rich diversity of bamboo species in the north-east India, the resource potential has been decreasing due to increased biotic pressure, shifting cultivation and also increased activities of rubber plantation in many original land areas of bamboo (State bamboo policy, 2001). Moreover, in the last few years' bamboo species like, *Melacanna baccifera, Bambusa cacharensis* are experiencing sporadic to gregarious flowering at different bamboo growing areas. This has been a great concern to the management of bamboo cultivation and production (Banik and Sharma, 2009).

The seed germination and seedling growth pattern followed by seedling division is one of the useful methods for propagation of *Dendrocalamus stictus* (Troup, 1921). Utility of seedling macro-proliferation in *Banbusa tulda* is well documented (Banik, 1987) for bamboo propagation. This seedling macro-proliferation technique could be used along with conventional techniques for mass propagation of most desired species of high economic value. However, useful application of the technique needs viable seed resources and establishment of successful macro-proliferation technique. Raising of bamboo sapling from seed have been very rare and difficult since, most of the species have long cycle of flowering and seed seedling.

In spite of limited seed propagation and fertility, seed sapling establishment and macro-proliferation (splitting of rhizomes) also provide the basis of selection of variable generated in the seedling and the base population for mass multiplication of quality planting stock.

In the present communication, we describe for the first time successful seedling macro-proliferation of *Bambusa cacharensis* for production of field plantable sapling and also to ensure continuous supply of large number of elite planting material.

MATERIALS AND METHODS
Collection of seeds and seedlings from fruiting bamboo cluster of *B. cacharensis* (Figure 1A) was carried out during the year 2009-2012. Only very few seeds were germinated to wilding stage within the two

months of seedling. Seedling size and its transfer to experimental poly-bag were crucial steps for subsequent establishment and growth of saplings. Sapling average size with shoot 34.07±6.04 mm. and root 17.47±5.28 mm were selected for initial transferring to experimental poly-bags for macro-proliferation. Young sapling thus obtained were transferred to two different poly-bags one having sand: soil: manure in the ratio (1:2:1) mixture and called as managed. The other experimental polybag having the managed soil mixture along with fertilizer Growmore (19:19:19, NPK) in addition to manure. All the experimental poly-bags were kept under the 90% shaded Agronet and seedlings were allowed to grow. At least 30 replicates were used for each treatment. Poly-bags size used in the study was 8 X 12cm. (length X breath). Bamboo saplings were maintained by regular watering, weeding and soil working.

Figure 1: Macro-proliferation of *Bambusa cacharensis* through seedling.

A. Fruting capitate cluster, **B.** Seedlings raised in native soil. **C,** Different Sizes of seedlings. **D.** Sapling in poly-bags. **E.** Sprouting of new Rhizomatous shoots. **F.** Proliferating shoot cluster. **G.** Splitting of shoots. **H.** Splitted shoots. **I.** Macro-proliferation of splitted sapling in poly-bags.

RESULTS AND DISSUSION

Seedling of *B. cacharensis* was established in natural soil (unmanaged) condition adjacent to the flowering mother clump (Figure 1B). Seedlings measuring an average size of 34.07±6.04mm shoot and 17.47±5.28mm root were finally transplanted in experimental poly-bags, (Figure 1C-D)). Two types of

poly-bags like managed soil with fertilizer and without fertilizer were also used for proliferation of seedling (Table 2). Seedlings were allowed to grow under 90% Agronet shaded condition for proliferation during different ages of growth. Young rhizomatous shoot formation (Figure 1E) from the juvenile sapling was recorded early in the 8th months old seedlings in poly-bags. Seedling produced a number of tillers till the rhizome is fully developed to form distinguishable culms (Figure 1F). Number of tillers varied according to different ages of saplings (Table 1) in unmanaged condition. Seedlings with moderate number (2-4) of tiller and growth were observed in 10 months old saplings (Figure 1H). Morphometric measurement of the growing shoots and roots revealed size variation with the increase in the growth period of *B. cacharensis*. Optimum shoot growth was obtained in 10 month old sapling with proportionate root formation. Maximum tiller number was recorded in 14 months old seedling stage (Table 2). This characteristic tiller property of the sapling was utilized to produce a number of propagules from one viable seeds and seedling of the *B. cacharensis* (Figure 1I). The sapling of *B. cacharensis* produced as many as 2-7 distinguishable culm during their 10 months of age in managed soil of poly-bag with fertilizer.

Table 1: Morphometric characters of seed saplings of *Bambusa Cacharensis* at different ages of their growth in unmanaged condition

Seed Sapling age (Months)	No. of Shoots/Polybags Mean* ±SD	Shoot Height(cm) Mean** ±SD	Range of Shoot size(cm)	No. of Roots /Shoots Mean ±SD	Root Length(cm) Mean ±SD
08	3.06±0.57 (2 – 4)	25.16±4.89	16 - 37	3.17±1.51 (1 – 7)	10.67±4.85
10	3.00±0.63 (2 – 4)	31.47±9.45	16 - 56	4.33±1.66 (1 – 6)	19.63±8.24
12	3.90±1.04 (2 – 6)	26.15±9.39	12 - 45	3.36±1.55 (1 – 7)	13.30±9.71
14	3.10±0.79 (2 – 5)	34.93±6.90	21 - 48	3.87±1.12 (2 – 6)	20.63±7.06
18	4.90±1.15 (3 – 8)	33.61±10.04	18 - 52	5.55±2.54 (2 – 11)	11.64±2.88

**N=10; **Mean of 30 observation; in parenthesis ( ) range of shoot/root number.*

Table 2: Macroproliferation of splitted sapling of *B. Cacharensis* in managed condition without and with fertilizer.

Age of Sapling	Managed	Without Fertilizer	Managed	With Fertilizer
(Months)	**No. of Shoots Mean ±SD**	**Growth of Shoot Height(cm) Mean ±SD**	**No. of Shoots Mean ±SD**	**Growth of Shoot Height(cm) Mean ±SD**
10	3.60±0.88 (2 – 4)	64.83±20.74 (32 – 100)	4.73±1.21 (2 – 7)	95.50±35.20 (48 – 146)
14	3.53±1.02 (2 - 6) BS –23.33%	66.63±22.17 (32 – 127)	4.37±1.28 (3 – 8) BS –80.00%	103.93±21.11 (66 – 137)

In parenthesis ( ) range of shoot number/shoot height; Number of sapling N=30; BS= Sapling with branch shoot.

The practice of seedling division is one of the efficient methods of propagation (Troup, 1921) and since then it is successfully applied to many other species of bamboo (Banik, 1987). The sapling of each poly-bag (Figure 1G) were separated into two to three cluster units and used for cyclic macro-proliferation. Each sapling cluster gets multiplied into two to three times through splitting young rhizomatous shoot cluster of initial stock.

This splitting produced to at least three separate shoots with young rhizome and new buds (Figure 1H). Shoots were re-transferred to manage soil with or without fertilizer for their optimum growth and proliferation. No significant difference in tiller number was recorded between the two types of soil condition (Table 2). However, there is a significant difference in growth of vegetative shoots in poly-bags having managed soil with fertilizer. Thus the practice of repeated splitting of shoot cluster could be achieved successfully for every 10 months interval. This cyclic macro-proliferation of seedlings resulted in the production of high number of selected elite sapling of *B. cacharensis* for mass propagation.
The need of fertilizer in the present experiment is to support only vegetative growth for better survival and transplantation of the bamboo sapling. Present study also describes the macro-proliferation method and the role of incubation period of fertilizer on the production of tiller number per seedling of *B. cacharensis*. Macro proliferated saplings thus obtained were successfully established in field condition.

ACKNOWLEDGEMENTS
Authors are highly grateful to DBT, Govt. of India for providing financial support to carry out present investigation.

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