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RESEARCH **P**APER

Micropropagation of *Bambusa vulgaris* var. *striata*

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Bambusa vulgaris var. *striata* is a widely cultivated bamboo species in rural Madhya Pradesh for its versatile uses. The vegetative propagation becomes the only viable alternative for this species because *B. vulgaris* does not set seed after sparse flowering, which makes seedling progenies unavailable. A low-cost propagation trial was conducted to explore the clonal propagation techniques for the species with two types of small branch cuttings, nodal leafy cuttings and tip cuttings. The cuttings, after treating with 1, 2 per cent and 0.1 per cent, solutions of, bavastin and $Hgcl_2$ were kept in non-mist propagator to let them to root for assessing the rooting ability. The cuttings were rooted in three weeks and were allowed to grow in the polybags for 6 months under nursery condition. The study reveals that both types of branch cuttings are able to develop roots, shoots, to survive and to form rhizome under the nursery condition. Rooting ability of the cuttings was significantly enhanced by the application of rooting hormone — IAA. The length of the longest root varied significantly neither with the cutting types nor the concentrations of IAA solution.

Key words : *Bambusa vulgaris,* Leafy branch, Cuttings non-mist propagator, Rooting ability

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INTRODUCTION

Bamboo an important non-wood forestry products is one of the most important agricultural plants worldwide (Liese, 1987). Bamboo is one of the most valuable forest plants nature has given to mankind, but to exploit its full potential, more fundamental research is needed urgently to lay the foundations for the future. It has been realized long back that *in vitro* propagation is essential to meet the ever increasing demand of planting stock of bamboo. In this respect, basic research on bamboo tissue culture for production of quality propagules should be encouraged. For mass propagation of bamboo, micropropagation is the only technique. According to Gielis and Oprins 2002), micropropagation is the best available technique and will become the standard for mass scale propagation of bamboo in the near future.

B. vulgaris has been propagated by different vegetative methods like rhizome cutting, offset planting, culm or stem cutting, branch cutting and pre-rooted branch cutting, ground layering, stump sprout, *etc.*, the most common method is rhizome cutting. However, in large-scale plantation programmes, rhizome cutting method is not practised because of high cost and limited availability of material. Also, the bamboo clump loses its regeneration potential if more rhizomes are excavated. Moreover, the survival percentage of rhizome cutting is not always satisfactory (Hossain *et al*., 2006).

Treatment of cuttings with exogenous rooting hormone is believed to enhance the rooting ability of branch cuttings of different bamboo species (Surendran and Seethalakshmi, 1985; Agnihotri and Ansari, 2000; Singh *et al*., 2002; Pattanaik *et al*., 2004 and Hossain *et al*., 2005). However, there are very few studies which addressed the potential of *B. vulgaris* var. *striata* for

vegetative propagation through branch cuttings. So, a study was designed to examine the clonal propagation potential of the species and the effect of IBA and NAA on rooting ability of branch cuttings and their steckling capacity (*i.e.*, survival percentage and number of shoot produced per cutting).

RESEARCH METHODOLOGY

The study was conducted in the nursery of State Forest Research Institute (SFRI), Madhya Pradesh, India over a period of six months from May to October 2014. The study area enjoys a typically tropical climate, characterized by hot humid summer and cool dry winter. The maximum temperature varies from 24.3 to 41.9°C and the minimum temperature from 15.2 to 25.2°C. Relative humidity is generally lowest in February and highest during July to September.

Preparation of cuttings :

Healthy vigorous clumps were selected for the cuttings based on: i) clump maturity, ii) growth potential of the clumps, *i.e.*, number of culms per clump, height, diameter and internode length of the culms, and iii) resistance to diseases and pests. Branches, not more than two years old, were collected from pre-selected clumps by separating with handsaw and secateur, leaves, auxiliary branches and tips.

Treatment of cuttings :

The different cuttings were treated with extrain, bavastin and $HgCl_2$ two concentrations (1%, 2% and 0.1% w/v). The base of the cutting was dipped into the hormone solution for about one minute. Also, different cuttings each from two cutting types were kept as control by dipping in water for a minute. The cuttings were planted into perforated plastic trays filled with coarse sand mixed with fine gravel.

RESEARCH FINDINGS AND ANALYSIS

The present study was carried out with following sterilization process of the explants, which comprised of two different treatments *i.e.*, treatment A and treatment

Table 1: Treatment for reducing contamination

Treatments	Time	%	Percentage of contamination
A			
Running tap water	--	--	--
Extrain	10min	1%	9% contamination was
Bavastin	10min	2%	found in explant
$HgCl_2$	5min	0.1%	
B			
Running tap water	--	--	--
Extrain	10min	2%	Contamination in
Bavastin	15min	2%	explants was reduced
$HgCl_2$	5min	0.2%	to 6.5%

Table 2: Effect of different PGRs showing morphological response in inoculated explants of *Bambusa vulgaris* on MS media

Composition of media	No. of vessel with replica of 3	No. of weeks						No. of responded culture after 3 weeks
		1st week		2nd week		3rd week		
		No.of shoots (avg)	Length in cm (avg)	No.of shoots (avg)	Length in cm (avg)	No.of shoots (avg)	Length in cm (avg)	
T_0 No PGR	10	Bud	Break	1	0.5cm	1	1.5cm	
IAA+kinetin								
T_1 0.5+1	10	Bud	Break	1	1cm	1	2cm	
T_2 1+1	10	1	-	-	-	1	1cm	
T_3 1+2	10	1	0.5cm	1	1.5cm	2	2cm	
T_4 1+3	10	3	2cm	2.25	3.75cm	2.5	5cm	
T_5 2+3	10	1	1cm	1	2cm	2	2cm	

B. After the sterilization it was found that the contamination was less in treatment B as compared to the treatment A *i.e.,* the contamination was reduced by 2.5 per cent.

Rooting ability of branch cuttings :

Rooting percentage in base cuttings ranged from 1cm to 5cm among the treatments. Castillo (1990) reported the best rooting, shoot production and survival of base cuttings of *B. vulgaris* var. *striata* treated with 0.1 per cent IBA. Nagarajaiah *et al*. (1994) reported the potent of IBA in increasing survival, rooting and sprouting of stem cuttings of *B. vulgaris.* Somashekar *et al*. (2004) reported the number of roots of base cuttings and secondary cuttings under different treatments with IBA and NAA. Root length of base cuttings and secondary cuttings under different treatments of IBA and NAA maximum rooting percentage (85% in leafy branch cuttings with tip and 80% in nodal cuttings) in cuttings treated with 0.25 per cent IBA. Again, Hossain *et al*. (2005) reported highest rooting ability in *B. vulgaris* branch cuttings (84%) treated with 0.2 per cent IBA solution.

Treatment for reducing contamination :

Roots were induced on shoots within 7 to 21 days (Table 2) of explanting period either on auxin or on a combination of both auxin and cytokinin enriched medium. For successful root induction, apart from the optimum concentration of growth regulators, selection of appropriate size of shoot propagule was also more important factor. A propagule of two to three shoots should be selected from profusely growing healthy multiple shoots having1.0 to 2.0 cm in length. Longer shoots (> 2.0 cm) with folded leaf lamina showed a lower rooting percentage. Placing of single shoot in rooting media, failed to induce root formation. Similar to our case, Arya *et al*. (2002) reported that a propagule of three shoots (1 to 2 cm long) was the best for root induction of *D. asper.*

From the findings it was observed that when the MS culture media was supplemented with 3.0mg/l of kinetin along with 1.0mg/l of IAA showed induction of new, green, healthy shoots from the nodal parts of explants (Fig.1). This study was confined for 1 month duration. The other combination and concentration of PGR showed poor (Fig. 2) to moderate morphogenetic response. The established cultures are maintained in tissue culture repository.

Fig. 1 : Induction of new green healthy shoots from the nodal parts of explant.

Fig. 2 : Combination and concentration of PGR

Rooting percentage :

All the treatments with plant growth regulators promoted rooting; however, variations were observed among the treatments for per cent rooting of microcuttings. Hundred per cent root induction was not observed in most of the bamboo species.

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