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Seed management techniques for quality seedling production of *Dendrocalamus strictus* (Roxb) Ness

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ABSTRACT

Study was carried out on enhancing the quality nursery stock production of *Dendrocalamus strictus* by using seed management techniques. The study on seed management techniques revealed that soaking the seed for 72 hours and incubating for 16 hours in dark improved the germination of the seed and the vigour of seedlings both in laboratory as well as nursery up to the evaluation period of four months. The treatment greatly affected the germination percentage, root length, shoot length, dry matter content and vigour index in laboratory conditions. The study showed that the applying the treatment water soaking for 76 h+16 h incubation on seeds of *D strictus* gave highest germination percentage, root length, shoot length, dry matter content and vigour index as compared to all other treatments. This treatment also resulted in maximum nursery establishment, root length, shoot length, dry matter content and vigour index in nursery whereas there was no significant impact of all the treatments on the dry matter content of the seedlings.

Keywords: *Dendrocalamus strictus*; germination; vigour index; nursery; laboratory

INTRODUCTION

Bamboos are the most important items of forest produce used by the rural communities in Asia and the Pacific. It is reported that over 75 genera and 1,250 species of bamboos occur in the world (Anon 1992) with the majority in the tropics. About 300 species are so far reported from China, 130 from India, 55 from the Philippines, 50 from Thailand, 33 from Bangladesh, 31 from Indonesia, 26 from Papua New Guinea and 12 from Malaysia (Sharma 1987). The largest forest area under bamboos is in India with 10.03 million hectares of bamboo forests or 12.8 per cent of the total forest area. The principal bamboos are *Dendrocalamus strictus* and *Bambusa arundinacea* with an overall annual production of 5 million tonnes.

In India bamboo plantation has been raised extensively to meet the increasing demand of the bamboo products

(Tewari 1994). The total growing stock of bamboo in the country is 80.428 million tonnes. Out of this 66 per cent are in the north -eastern states while rest of the country has 34 per cent. According to recent report by INBAR 2005 India is represented by 145 species belonging to 23 genera. In China 3.4 million hectares are under bamboos (3% of total forest area). Two thirds of the area is under *Phyllostachys pubescens*. Apart from this there are many thornless species of bamboos occurring in the world. The important thornless bamboo species are *B vulgaris, B balcooa, B nutans, B tulda* and *D gigantea.*

One of the most important contributions of bamboo to modern-day man is the production of paper. Though once called poor man's timber it is no longer cheap. Its use as a long-fibre raw material in the pulp and paper industry is well known and it is one of the most sought after raw materials in the tropics. In India industrial production of paper was started in 1930s since independence however there has been a rapid expansion of paper factories.

The Planning Commission in the National Mission on Bamboo Technology and Trade Development has suggested raising 2 million ha bamboo plantation in the tenth Five Year Plan and 4 million ha in the eleventh plan period. The estimated demand is 26.69 million tonnes against the supply of 13.47 million tonnes.

D strictus is middle sized, densely tufted bamboo, often gregarious, sub-deciduous, culms attaining 8-16 m height and 2.5-8 cm diameter according to the locality. Young culms are pale blue-green, dull green or yellowish when old, nodes somewhat swollen, basal nodes often rooting, lower nodes often with branches, internodes 30-45 cm long and thick walled. Culms are almost solid in dry areas and hollow with thick walls in moist areas. Bamboo is progagated both by seed and stem cutting. Seed is the basic unit of well defined nursery and plantations. Quality is the characteristic feature of a seed for successful regeneration in wider spell of time. The quality characters of seed have to be brought by proper implication of pre- and post-harvest seed handling techniques.

MATERIAL AND METHODS

Seed management techniques were used for quality seedling production of *Dendrocalamus strictus.* The experiment was laid out in Completely Randomized Design (CRD) as given by Snedecor and Cochran (1967) with seven treatments and four replications at college of Forestry and Environment of Allahabad Agricultural Institute – Deemed University, Allahabad (25º 87' N Latitude, 81º 5' E Longitude, 78m above msl, mean annual rainfall of 1,100 mm).

Seed management techniques

Physiological seed management techniques were applied on seed

characteristics both in laboratory and nursery by subjecting the seeds of *D strictus* to the following treatments:

T_1 Control (seed/caryopsis)
T_2 Hulled seed
T_3 Seeds treated with Bavistin at 2 g kg^{-1} (slurry)
T_4 Hulled seeds treated with Bavistin at 2 g kg^{-1} (slurry)
T_5 Water soaking for 24 hours
T_6 Water soaking for 48 h+16 h incubation
T_7 Water soaking for 76 h+16 h incubation

In the laboratory the treated seeds were observed for the seed quality parameters like germination (%), root length (cm), shoot length (cm), dry matter content per 10 seedlings (g) and vigour index. The treated seeds were observed for the nursery establishment after 21 days and root length, shoot length, dry matter production per 10 seedlings (g) and vigour index in the nursery after three months.

RESULTS AND DISCUSSION

Influence of physical and incubation techniques on seed quality characteristics in laboratory

Significant differences were found in various seed and seedling quality characteristics of *D strictus* (Table 1). Highest (98%) germination was recorded with T_7 followed by T_6 (88%) and the lowest (10%) was with T_2. The treatment T_7 also resulted in maximum root length (7.60 cm) closely followed by T_6 (7.00 cm) whereas the minimum root length was recorded in T_3 (2.00 cm) and T_4 (2.02 cm). T_7 also had significant influence on the shoot length resulting in maximum shoot length (7.48 cm) and lowest shoot length was observed in T_4 (5.74 cm) which was at par with T_3 (5.76 cm). Highest dry matter content per 10 seedlings was observed in T_7 (0.070 g) and lowest in case of T_4 (0.039 g). The vigour index was also maximum in the treatment T_7 (1477) and minimum in T_2 (121).

The study showed that the applying the treatment water soaking for 76 h+16 h incubation on seeds of *D strictus* gave highest germination percentage, root length, shoot length, dry matter content and vigour index as compared all other treatments.

Influence of physical and incubation techniques on seedling quality characteristics in nursery

Significant variations were observed in nursery establishment, root length, shoot length and vigour index of seedlings using various treatments of physical and incubation techniques but no significant differences were observed in respect of dry matter content (Table 2).

T_7 resulted in best nursery establishment (84%) after 21 days followed by T_6 (71%) whereas poorest performance was observed in T_4 (8%). Maximum root

Table 1. Influence of physical and incubation techniques on seed and seedling quality characteristics of *D strictus* in laboratory

Treatment	Germination (%)	Root length (cm)	Shoot length (cm)	DMC10 seedling^{-1} (g)	Vigour index
T_1	53	6.40	6.00	0.061	446
T_2	10	6.10	6.00	0.049	121
T_3	60	2.00	5.76	0.056	466
T_4	13	2.02	5.74	0.039	100
T_5	68	6.10	6.04	0.061	826
T_6	88	7.00	6.30	0.064	1170
T_7	98	7.60	7.48	0.070	1477
SEd	1.150	0.120	0.131	0.001	1.053
$CD_{0.05}$	2.354	0.240	0.304	0.002	3.107

DMC: Dry matter content

Table 2. Influence of physical and incubation techniques on seedling quality characteristics of *D strictus* in nursery

Treatment	After 21 days	After three months			
	Nursery establishment (%)	Root length (cm)	Shoot length (cm)	DMC seedling^{-1} (g)	Vigour index
T_1	24	18.47	18.54	3.764	1072
T_2	11	17.41	16.32	3.131	337
T_3	21	16.22	16.52	3.344	982
T_4	08	15.67	16.11	3.019	412
T_5	51	19.46	19.18	3.912	2125
T_6	71	23.56	23.73	4.135	4163
T_7	84	28.11	30.10	4.667	5704
SEd	1.034	0.824	0.801	0.841	1.635
$CD_{0.05}$	2.243	1.784	1.714	1.734	3.350

DMC: Dry matter content

length was recorded in the same treatment of T_7 (28.11 cm) which was significantly higher than T_6 (23.56 cm). The lowest root length was recorded using T_4 (15.67 cm) which was at par with T_3 (16.22 cm). There were no significant differences among the treatments in dry matter content as recorded after 3 months. However the treatment T_7 gave maximum (5704) and T_2 gave the minimum vigour index (337).

The study showed that the treatment of water soaking for 76 h+16 h incubation of seeds resulted in maximum nursery establishment, root length, shoot length dry matter content and vigour index in nursery whereas there was no significant impact of all the treatments on the dry matter content of the seedlings.

Various workers have observed a positive influence between seed germination and cold water treatment in many tree species such as *Acacia mearnsii*, *A melanoxylon*, *A nilotica, Albizia amara, A procera* and *Grevillea robusta* (Pattanath 1982), *Diospyrus melanoxylon* (Athaya 1985, Gopikumar and Kunhamu 1995).

CONCLUSION

It can be concluded from the study that the treatment of water soaking for 76 h+16 h incubation of seeds of *D strictus* results in overall improvement of the seedlings in respect of seed germination, root length, shoot length, dry matter content and vigour index of seedlings in the nursery. This treatment is also useful in nursery for enhancing nursery establishment, root length, shoot length and vigour index of the seedlings.

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