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Mass propagation of *Dendrocalamus asper* through tissue culture and comparison of selected morphological, physical and anatomical features with seed raised plants

by

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DECLARATION BY THE CANDIDATE

The work described in this thesis was carried out by me under the supervision of Prof. (Mrs.) W.T.P.S.K. Senarath (Department of Botany, University of Sri Jayewardenepura) and Prof. Hiran Amarasekara (Department of Forestry and Environmental Sciences, University of Sri Jayewardenepura) and a report on this has not been submitted in whole or in part to any university for any other degree/Diploma.

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09.05.2016

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CERTIFICATION OF SUPERVISORS

We certify that the candidate has incorporated all corrections, additions and amendments recommended by the examiners.

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TO

Sasan putha,

Harithashi duwa,

&

Amma

Who sacrifice more than me

Towards this effort.

Together we made it...

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BAP; BA	6-benzylaminopurine
DBH	Diameter at breast height
FYM	Farm Yard Manure
GA_3	Gibberellic acid
IBA	Indole-3-butyric acid
IAA	Indole-3-acetic acid
Kin	Kinetin
OSB	Oriented Strand Board
OSL	Oriented Strand Lumber
MS	Murashige and Skoog`s (1962) medium
MSL	Mean Sea Level
NAA	α-naphthaleneacetic acid
TDZ	Thidiazuron
2,4-D	2,4-dichlorophenoxyacetic acid

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ABSTRACT

Dendrocalamus asper is an introduced bamboo species adapted well into intermediate climatic conditions in Sri Lanka which has many uses of high economic and environmental importance. The objective of the present study was to develop a protocol for *in vitro* mass propagation, selecting suitable areas to grow the plant in the country and to investigate some of the macroscopic and microscopic properties of the micropropagated plants grown in the field to recommend suitability of the species as an alternative for growing demand of wood and wood based products.

Suitability of nodal segments from secondary branches of nursery maintained plants as explants were experimented as it is the most commonly available material, however higher level of microbial contaminations were observed. Therefore nodal segments from in vitro germinated seedlings were used. Maximum seed germination percentage achieved was 23.7%. MS with 1.0 mg/L BA was the best medium for shoot induction with high number of shoots (16.87±0.52), higher shoot length (4.12±0.27 cm) and with a mean of 4.80±0.33 leaves after 6 weeks of incubation. MS medium supplemented with 2.0 mg/L BA produced a mean number of 11.73±1.59 of shoots with 9.21±0.55 cm mean shoot length and 12.2±1.21 of mean leaf number after 6 weeks of incubation. It was observed that the shoot multiplication varies with the number of shoots in a cluster and three shoots per cluster produced higher number of elongated shoots with higher

number of leaves. Liquid medium was found to be more suitable than solidified medium for multiplication. It was observed that 100% rooting could be obtained in the ½MS medium supplemented with 2.0 mg/L IBA after 6 weeks of incubation. Acclimatization could be achieved by transferring tissue cultured plantlets to 50 mm^3 coir pellets and maintaining them in the humid chamber for one month and gradually exposing to 70% shade in the following month. Then, plantlets were transferred to potting mixture consisted of sand:compost:coir dust (1:1:1) and obtained 100% survival rate.

The growth pattern of tissue cultured plants in the field was compared with seed raised plants after one year of establishment in the field. Tissue cultured plants showed better growth in the field with significantly higher mean number of shoots, mean shoot length and the mean leaf number than seed raised plants. The increase in chlorophyll contents of both plant types was observed with time and slightly higher values observed in tissue cultured plants. In order to find suitable climatic area for the establishment of large scale plantations of *D. asper* in Sri Lanka, tissue cultured plants were established in twelve sites in different Geo-climatic zones. After one year of growth, they established well and showed healthy growth in all tested sites, however, significant differences in growth were observed at different sites. Gannoruwa area was found as the best for the growth of *D. asper*. Drier areas such as Jaffna and Hambantota also indicated that, plants could be well established, but showed low performances compare to the other sites. Some of the macroscopic and microscopic characteristics of four and half years old matured tissue cultured plants were compared with similar aged seed raised plants and indicated tissue cultured plants have similar or better qualities which proves the suitability of the end product for its wide array of commercially valuable uses. The protocol developed was able to reduce the cost of a plant to LKR 4.50.