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Rootability of *Dalbergia sissoo* Roxb. cuttings from different clones at two different levels and their primary field growth performance

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Abstract: Rootability of *Dalbergia sissoo* Roxb. cuttings of mature tree originated clonal hedge bed were tested and compared to the same from seedling originated hedge bed. Mature tree originated cuttings were found potential for rooting in low-cost non-mist propagator without any rooting hormone. Steckling growth in nursery and in the field was found promising which is a complete indication for its successful application by tree planters. It will be a new research avenue to get disease free germplasm for the frustrated plantation managers and scientists due to die back of this tree through out the South Asian region.

Additional key words: clone, cutting, hedge bed, rejuvenation

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Introduction

The possibility of vegetative propagation of cuttings using mist propagation chamber and rooting hormones from adult *Dalbergia sissoo* trees was investigted by Puri and Verma (1996). But using rooting hormones and mist propagation chamber is beyond the farmers' imagination especially in the poor country like Bangladesh. Lack of technical advancement and scientific precautions made it more critical for mass propagation and its applicability to the grass root level farmers. So the study was undertaken to determine the possibilities of vegetative propagation without using expensive hormones and mist propagation chamber instead only the cuttings with non-mist simple low-cost propagation chamber that can be easily prepared by a non-technical poor nursery owner. Attempt was also taken to compare the rooting ability of clonal cuttings with seedling originated cuttings.

Materials and methods

Three clonal hedge beds were developed from the rooted cuttings originated from three selected mature *Dalbergia sissoo* plus trees in the field. Side by side hedge bed with cuttings from seedling stock plants was developed as control. One year old hedge beds were cut at two different levels named as level 1 (short cut) and level 2 (long cut) maintaining height of 10 cm and 30 cm accordingly above the ground level. Green shoot cuttings were taken from three clonal hedge beds at two levels and also from the seedling hedge bed. Very new shoot tips with fresh growth (3–5 nodes from the tip) were avoided to get better rooting performance. Cuttings were prepared by maintaining the size 5 to 10 cm. In each cutting two leaves were retained at upper two nodes with two leaflets in each leaf trimmed at 50% surface area. The other leaves were removed by cross cut at the base of

the petiole. The basal ends of the cuttings were cut at 45° angle. All cuttings were dipped fully in the Dithane M-45 solution 2 g dm^{-3} of water for two minutes and rinsed; cuttings were placed in the propagator without IBA treatment. A simple cost effective propagator was designed with wooden frame (1.8 m × 1 m) enclosed with transparent polythene. Coarse sand (popularly known as Sylhet sand) was used as propagation medium. In the experiments cuttings were set in the propagator on perforated plastic trays (depth 12 cm) filled with coarse sand maintaining four blocks, seven treatments and 48 replicates per treatment. The basal ends were placed in the rooting medium so that the basal node and inter-node above it were under the surface and the terminal nodes were exposed to the propagator environment. They were watered once just after placing in the propagator. Humidity was maintained above 95%. The propagator was opened briefly twice a day, in the morning and in the late afternoon to observe the water level and to facilitate gas diffusion. During bright sunny weather it was shaded in mid day. For all the treatments roots initiated within 13–16 days. After 21 days two days were allowed for the hardening process. After 23 days the cuttings were ready for transferring to poly bag. The rooted cuttings were transferred to 10 × 6 poly bag and kept in shade for 5 days and gradually exposed to the sun. The rooted cuttings of the stecklings were watered daily and fertilized with urea dissolved in water (6 g/20 liter of water) at two week intervals. During the growth period mean maximum temperature was 33°C and mean minimum temperature was 25°C. After 90 days of growth the stecklings were measured for shoot length. Than they were transferred to the field maintaining only two treatments as seedling originated (control) and mature tree originated cuttings. After one year the stecklings were measured for survival and height data. Treatment differences were explored by two way analysis of variance and least significant difference test following Freese (1967), Zaman et al. (1982) and Dawkins (1975), finally the results were computed using Microsoft Excel computer program.

Results

Rooting recorded signifies that vegetative propagation of *Dalbergia sissoo* is promising without any rooting hormone and using a low cost non-mist propagator. No significant difference was found among the clones and between the clones and control for the percentage of cuttings rooted (Fig. 1) and average number of roots per cutting (Fig. 2). But it is evident that cuttings from the lower level cut is comparatively better than those from the upper level. During the nursery phase after transplanting from propagator survival was 100% for all the treatments (Fig. 3). The

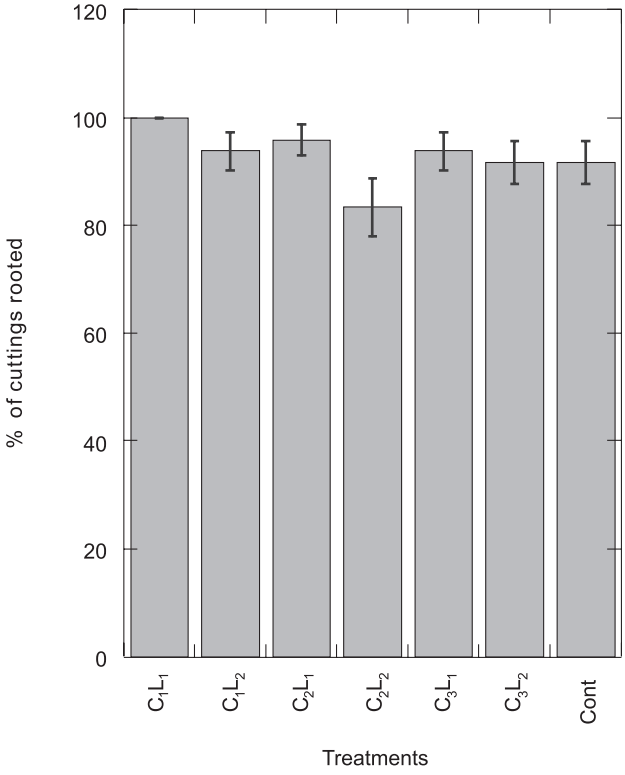

Fig. 1. Percentage of cuttings rooted

Legend for Fig. 1, 2 and 4 – C_1L_1: First Clone cut at low level; C_1L_2: First Clone cut at high level; C_2L_1: Second Clone cut at low level; C_2L_2: Second Clone cut at high level; C_3L_1: Third Clone cut at low level; C_3L_2: Third Clone cut at high level

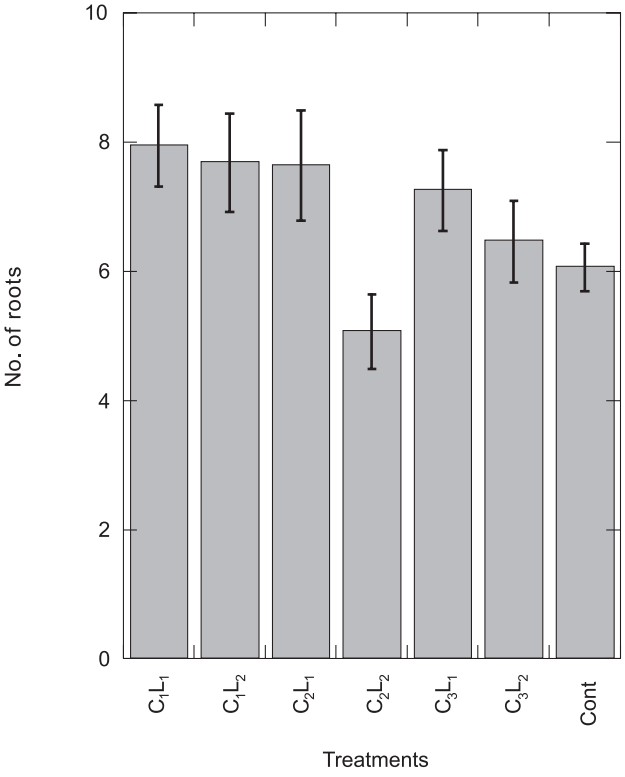

Fig. 2. Average number of roots

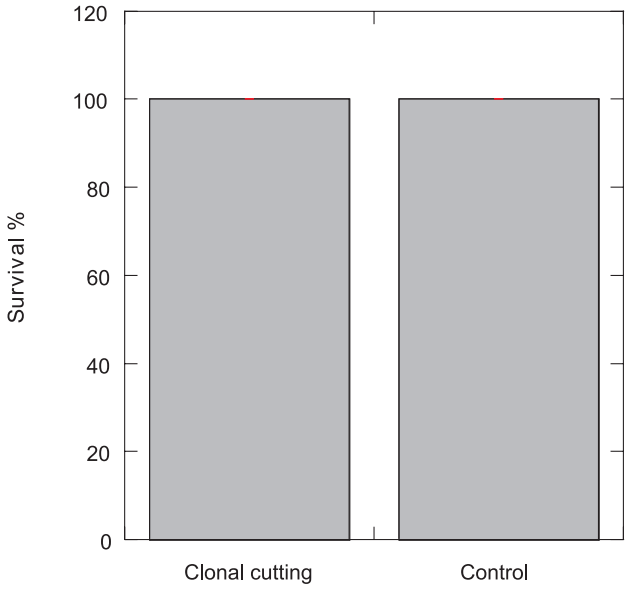

Fig. 3. Survival percentage of different stecklings after 90 days

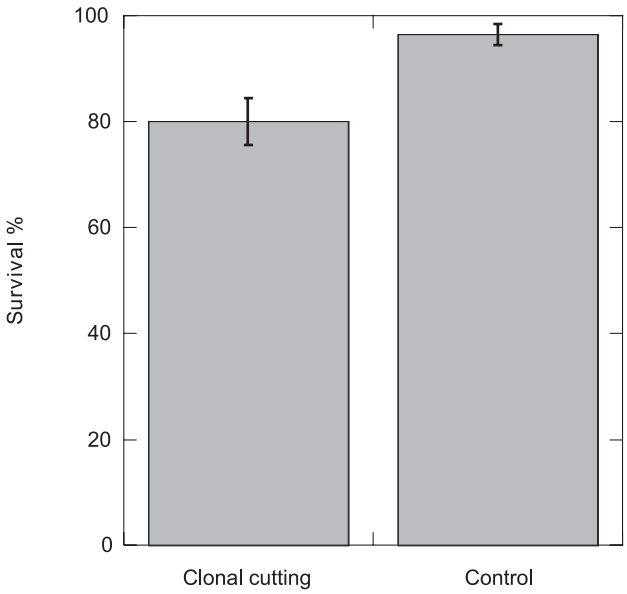

Fig. 5. Survival percentage of different stecklings after one year

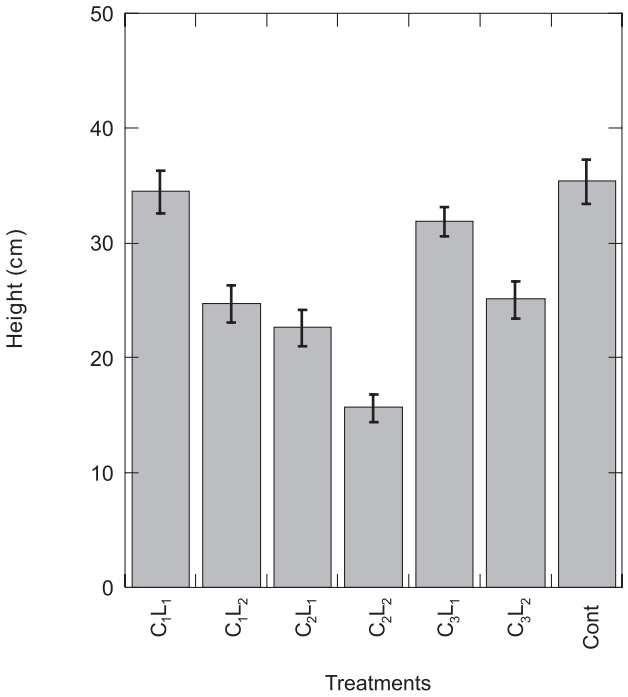

Fig. 4. Steckling height after 90 days in the nursery

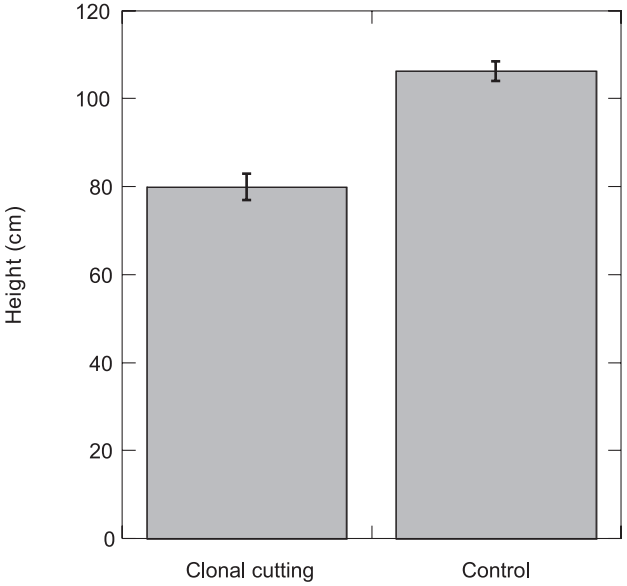

Fig. 6. Steckling height after one year

cuttings also grew well in the field but the growth rate of the stecklings from the level 2 have shown a little bit slower growth than those of level 1 and control (Fig. 4). While comparing the one year growth data, stecklings from seedling originated hedge bed showed significantly better performance than those from mature tree originated clonal hedge bed (Fig. 5 and Fig. 6). However, the growth data gives a clear indication of potential future avenue for the research in Sissoo tree improvement program.

Discussion

Though there is no significant difference among the clones for rooting but some variations are noticed. Variation of rootings among clones is reported by Ahmed (2003) for the *Chickrassia velutina*. Differences in rooting ability were reported by Haissig and Riemenschneider (1988). Rooting abilities of cuttings can be influenced by donor genetics (Kleinschmit 1983; Russell and Ferguson 1990). Variations in rooting ability can be attributed to biochemical and physiological processes effected by genetic differences within a given species, the propagation envi-

ronment, season, exogenous application of auxin(s), to the physiological condition and the age of stock plants (Leakey 1985). Gera et al. (1998) reported variations on rooting ability of *Azadirachta indica* due to provenance differences. Variation of rooting abilities of cuttings may occur due to the stump height following decapitation of stock plants (Wongmanee et al. 1989). In the present study such variation is found between two levels.

Conclusion

Dalbergia sissoo is one of the most useful multipurpose trees of South Asia. It has got so much acceptance to the farmers that no timber species except teak was so extensively planted as sissoo (Baksha and Basak 2003). Unfortunately, in the last few years a novel disease, die-back has spread among *D. sissoo* trees, leads to the death of this tree species within a few months. In Bangladesh 43% of the standing trees have already been affected (Basak et al. 2003), in some plantations even 100% mortality was observed (Mridha et al. 2003), as a result of which vast areas will have to be cleared. In the neighboring countries India, Nepal, Pakistan and Afghanistan the same devastating scale of mortality in *D. sissoo* is apparent. In such a situation using seed for further plantation program may lead in failure of plantation but using clonal materials from selective disease resistant (apparently disease free in severely attacked plantation site) trees offers a greater prospect in production of large and continuous supply of healthy planting stock. The present study will create new avenue to rejuvenate the Sissoo popularity for large scale plantations in the South Asian region.

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