*Environment & Ecology* 27 (1) : 100—103, 2009
 *ISSN 0970-0420*

# Production of Quality Seedlings of *Cryptomeria japonica* using Different Potting Media and Container Type

PARVEZ A. SOFI, JAVEED A. MUGLOO, ASHFAQ A. MIR AND M. A. KHAN

*Faculty of Forestry, S. K. University of Agricultural Sciences & Technology Shalimar, Srinagar 191121, India*

**Abstract**

The containerized seedling production technology is dependent upon suitable growing media for raising quality seedlings in nurseries. The investigation was carried out to assess the suitable growing media and container type for the production of quality nursery stock of *Cryptomeria japonica.* The growth, biomass and plant percent of eight months old seedlings was studied using different potting media and container type. The best response in terms of seedling quality parameters was observed in potting medium of soil : sand : compost in the ratio 2 : 1 : 1 which was closely followed by potting mixture of soil : dalweed : compost in the ratio 1 : 1 : 1 : 1. Root trainer 300 cc resulted into better growth of seedlings in terms of shoot root ratio, biomass and plant percent. However, maximum seedling height and collar diameter was recorded in polybag of size 12.7 cm × 22.9 cm.

**Key words : Potting media, *Cryptomeria japonica,* Growth, Biomass, Plant percent.**

The perspective planning in the forestry sector has laid down that by the end of year 2000 AD, one third of the land in our country should be under forest cover, but unfortunately the same has not been achieved so far. The demands for timber, fuel wood and fodder are on an increase and we are unable to meet the demands of the growing population. Some of the reasons for not achieving the desired results are increased biotic interference, lack of proper management and silvicultural practices for a number of economically important species. Cryptomeria is a genus of conifer in the cypress family Cupressaceae formerly belonging to the family Taxodiaceae. It includes only one species, *Cryptomeria japonica.* The tree is endemic to Japan, where it is known a sugi. It is a large ever green tree with attractive foliage, and introduced into india in 1844. In its native habitat it attains a height of about 45.7 m and a girth of 6—7.6 m. It is widely cultivated in Japan for timber and afforestation purposes. *Cryptomeria japonica* grows in western Himalayas, Shimla, Darjeeling, Assam, Nilgiris and generally in hill stations. It does not thrive so well in western Himalayas and Shimla as it does in regions farther east. In Darjeeling hills, where it has become naturalized, it grows luxurian-tly between 213—1219 m on moist soil (1). The tree is extensively used in forestry plantation in Japan and China and widely cultivated as an ornamental tree in other temperate areas including Jammu and Kashmir. The wood is scented, reddish pink in color, light weight but strong, water proof and resistant to decay. It is used in all types of construction and interior paneling. The tree is firmly wind tolerant and can be used in shelter belt planting.

Propagation of tree species through seeds is the most economical and practical but the problem in conifer seeds is that they have an inherent problem of slow and poor germination both in field and laboratory conditions (2). Presently the seedlings are raised in perforated polythene bags because of their low cost, simple working and convenient handling. On the other hand, root trainer can deal with the problems of root coiling and root distortion (3) as inherient by polybag system. The plants raised in root trainers are capable of surviving in the prolonged drought periods after planting because the root system development is complete in nursery itself. Apart from this, it has several other advantages like easy handling and transportation, less space requirement, repeat usability, require less potting media which ultimately saves cost and labor and makes the nursery management economical. The primary requirement of growing seedlings in root trainers/containers is appropriate potting medium. A good potting mixture is char-

**Table 1.** Mean values of morphological parameters of *Cryptomeria japonica* seedlings raised in different potting mixtures. * Non-significant.

| Potting media | Plant height (cm) | Collar diameter (mm) | Shoot root ratio | Total fresh biomass (g) | Plant percent |
|---|---|---|---|---|---|
| $M_1$ | 13.60 | 2.30 | 2.22 | 3.00 | 66.00 |
| $M_2$ | 15.80 | 2.40 | 2.40 | 3.20 | 68.00 |
| $M_3$ | 16.30 | 2.50 | 2.74 | 3.42 | 70.00 |
| $M_4$ | 16.20 | 2.45 | 3.10 | 3.38 | 68.00 |
| $M_5$ | 20.60 | 2.60 | 3.60 | 4.22 | 82.00 |
| $M_6$ | 17.50 | 2.55 | 3.20 | 3.70 | 72.00 |
| $M_7$ | 19.50 | 2.60 | 3.48 | 4.00 | 78.00 |
| CD 0.05 | 1.20 | NS* | 0.20 | 0.60 | 1.60 |

acterized with light weight, friability, good nutrient and water holding capacity, good porosity (4). In the present investigation, an attempt was made to assess the suitable potting media and container type for raising quality seedlings of *Cryptomeria japonica.*

## Methods

The seeds of *Cryptomeria japonica* were collected in November 2006. The experiment was conducted at nursery of Faculty of Forestry Shalimar at an elevation of 1,584 m a.s.l. For the experiment seven different potting media and three different container types were used. The treatments are as follows.

Potting Media : $M_1$—Forest soil, $M_2$—Soil : sand : FYM in the ratio 1 : 1 : 1, $M_3$—Soil : sand : FYM in the ratio 1 : 1 : 2, $M_4$—Soil : sand : dalweed in the ratio 2 : 1 : 1, $M_5$—Soil : sand : compost in the ratio 2 : 1 : 1, $M_6$—Soil : dalweed : FYM in the ratio 2 : 1 : 1, $M_7$—Soil : sand : dalweed : FYM in the ratio 1 : 1 : 1 : 1. Container Types : $C_1$—Root trainer 275 cc, $C_2$—Root trainer 300 cc, $C_3$—Polybag of size 12.7 cm × 22.9 cm.

The compost consisted of decomposed leaves and twigs of popular, FYM used was fully decomposed, soil was collected from near by forest. All these materials were sieved with ordinary nursery meshes to remove undecomposed twigs, leaves, stones and other foreign matter. Mass was ground in the grinder. All these materials were collected locally. The potting mixtures were thoroughly mixed in the desired proportion before filling the containers. Root trainers were then filled with the potting medium after gentle tapping on the ground. Thereafter, containers were kept on raised platform made of wired mesh to allow self air pruning of roots and encourage fibrous root system in root trainers. Polybags were filled upto 85% of their capacity. Seeds were sown in the containers during February 2007. The seedlings were watered with the help of sprinkle. The experiment was laid in completely randomized design with three replications per treatment. Twenty seedlings per replication were uprooted after completion of one growing season Data on morphological characters viz. plant percent, seedling height, collar diameter, root shoot ratio and fresh biomass per seedling were recorded for eight months old seedlings. The data generated were analyzed and put to statistical analysis following Gomez and Gomez (5).

**Table 2.** Effect of container type on the seedling growth of *Cryptomeria japonica.*

| Container type | Plant height (cm) | Collar diameter (mm) | Shoot root ratio | Total fresh biomass (g) | Plant percent |
|---|---|---|---|---|---|
| $C_1$ | 18.00 | 2.50 | 3.00 | 3.80 | 72.00 |
| $C_2$ | 19.60 | 2.62 | 4.28 | 4.28 | 80.00 |
| $C_3$ | 20.80 | 2.72 | 4.00 | 4.00 | 78.00 |
| CD 0.05 | 0.90 | 0.12 | 0.20 | 0.20 | 1.40 |

## Results and Discussion

The results of the effect of container types and potting media on growth and biomass of *Cryptomeria japonica* are presented in Tables 1 and 2. Mean values of morphological parameters of seedlings raised in different combinations of potting mixtures are presented in Table 1. Results indicated that potting mixture have significant effect on the growth and biomass of the seedlings except collar diameter which did not show any significant difference. The maximum plant height of 20.60 cm was recorded in the potting mixture of soil, sand, compost in the ratio 2 : 1 : 1 ($M_5$) which was statistically at par with 19.50 cm in the potting mixture of soil, sand, dalweed, compost in the ratio 1 : 1 : 1 : 1 ($M_7$). The minimum plant height of 13.60 cm was recorded in soil ($M_1$). The collar diameter of the seedlings did not show any signifi-

cant difference. Maximum shoot root ratio of 3.60 was recorded in the potting mixture of soil, sand, compost in the ratio 2 : 1 : 1 ($M_5$) which was statistically at par with 3.48 in the potting mixture of soil, sand, dalweed compost in the ratio 1 : 1 : 1 : 1 ($M_7$) and the minimum of 2.22 was recorded in soil ($M_1$). The total fresh biomass per seedling and plant percent also showed the similar trend with maximum biomass per seedling of 4.22 g and maximum plant of 82% in the potting mixture of soil, sand, compost in the ratio 2 : 1 : 1 ($M_5$). The minimum values of 3.00 g and 66% were recorded in potting mixture of soil ($M_1$) only.

The better growth and biomass of the seedlings in the potting mixture of soil, sand, compost in the ratio 2 : 1 : 1 ($M_5$) and soil, sand, dalweed, compost in the ratio 1 : 1 : 1 : 1 ($M_7$) may be due to availability of more nutrients to the plant. These results are in agreement with the findings of Bhardwaj et al. (6) in *Pinus roxburghii*, Pyarelal and Karnataka (7) in *Quercus leucotrichophora*, Bahuguna et al. (8) in *Acacia albida*, Shrivastava et al. (9) showed potting mixture of compost, sand, soil in the ratio 2 : 1 : 2 best for raising quality seedlings of Eucalyptus hybrid. Kannur and Devar (10) and Sofi and Bhardwaj (11) showed that the growth and biomass of *Cedrus deodara* was observed best in potting mixture of soil, sand, FYM in the ratio of 1 : 1 : 3 and soil, dalweed, FYM in the ratio of 2 : 1 : 1.

The effect of container type on the growth and biomass of *Cryptomeria japonica* seedlings is presented in Table 2. Significant differences were observed in growth parameters of the seedlings raised in different containers. The data revealed that maximum seedling height of 20.80 cm was recorded in polybags of size 17.7 cm × 22.9 cm which was closely followed by 19.60 cm in root trainer 300 cc. The maximum collar diameter of 2.72 mm was recorded in polybags of size 17.7 cm × 22.9 cm which was statistically at par with 2.62 mm in seedlings raised in root trainer 300 cc. However, maximum shoot root ratio of 3.68 was recorded in seedlings raised in root trainer 300 cc. Total fresh biomass per seedling of 4.28 g was recorded to be high in root trainer 275 cc which was closely followed by 4.00 g in seedlings raised in polybags. Similarly maximum plant of 80.00% was recorded in root trainer 300 cc raised seedlings followed by 78.00% in polybags. The minimum values in all the growth attributes were recorded in seedlings raised in root trainer 275 cc.

Size of container has significant role in carrying capacity of potting mixture, which support the growth and development of seedlings at nursery stage. Larger the size of the container, more the availability of nutrient for longer period and more the surface area to hold water and root development resulting in better growth of seedlings. The better height was observed in polybags while as rest of the seedling growth parameters were recorded best in root trainer 300 cc. This is because of development of fibrous root system which enabled the seedlings to absorb water and nutrients more efficiently thereby resulting in better shoot root ratio and biomass of the seedlings. These results get support from the findings of Gonzalez et al. (12) in *Pinus caribaea*, Midnawati and Rostawati (13) in *Agathis loranthifolia* seedlings. The results also get support from the work of Ginwal et al. (14) who found that *Acacia nilotica* seedlings in 300 cc Hiko pots performed the best in nursery and in the field in terms of seedling quality parameters. The results are also in line with the findings of Sofi and Bhardwaj (11) who found that root trainer 275 cc resulted into better growth of *Cedrus deodara* seedlings as compared to smaller sized containers.

## References


1. Anonymous. 1992. Wealth of India, a dictionary of Indian raw material and industrial raw materials, volume 3. Publ. and Inform. Direct. CSIR, New Delhi, India.
2. Shopmeyer C. S. 1974. Seeds of woody plants in the United States. US Dep. Agri. Handbook 450. Washington DC, USA.
3. Gera M., S. Sharma, A. S. Bhandari and R. L. Srivastava. 1996. A trail on improved polybag seedling production system Ind. For. 122 : 992—998.
4. Chakravarti K., A. Zaidi and S. Bhandri. 1998. Compost for container nursery—A West Bengal experience. Ind. For. 124 : 17—30.
5. Gomez K. A. and A. A. Gomez. 1984. Statistical procedures for agricultural research, 2nd edition. John Willey and Sons, Inc., New York, USA.
6. Bhardwaj S. D., G. S. Shamet, P. S. Chauhan and V. K. Mishra. 1996. Nursery and plantation technology of chir (*Pinus roxburghii* Sargent) under Solan conditions of Himachal Pradesh. Himachal J. Agri. Res. 12 : 15—21.
7. Pyarelal and D. C. Karnataka. 1993. Effect of orientation and seed sowing and soil mixture on germina-

tion behavior of *Quercus leucotrichophora.* Ind. For. 119 : 122—125.

8. Bahuguna V. K., G. P. Maithani, U. D. Dhaundiyal and K. P. Unnikrishna. 1987. Standardization of nursery techniques of *Acacia albida* Del. under north Indian moist climatic conditions. Ind. For. 13 : 95—100.
9. Shrivastava R., R. Nanhorya and J. K. Upadhyaya. 1998. Selection of proper potting mixture for root trainer of *Eucalyptus* hybrid. Ind. For. 124 : 502—510.
10. Kannur S. and K. V. Devar. 2003. Influence of growing media on the seedling growth of teak. My For. 39 : 323—327.
11. Sofi P. A. and S. D. Bhardwaj. 2007. Standardization of potting media and root trainer size for production of quality seedlings of *Cedrus deodara.* Roxb. G. Don. (D. Don). SKUAST J. Res. 9 : 24—28.
12. Gonzalez Roque A., M. Perez Santana, J. J. Blanco and J. J. Vera. 1988. Performance of *Pinus caribaea* var. Caribaea grown in polythene containers of twelve different sizes. Revista Forestal Baracoa. 18 : 39—51.
13. Midnawati T. N. and Rostawati. 1989. The influence of container size on growth of *Agathis loranthifolia* seedlings. Bul. Penelitian Hutan. 505 : 9—20.
14. Ginwal H. S., D. S. Rawat, S. Sharma, A. S. Bhandari, C. Krishnan and P. K. Shukla, 2001. Standardization of proper volume/size and type of root trainer for raising *Acacia nilotica* seedlings. Nursery evaluation and field trail. Ind. For. 127 : 920—928.