Print : ISSN 0970-7662

Journal of Tree Sciences
online available at www.ists.in

Volume 31 No.1&2 June & December, 2012

Seedling Growth Improvement in *Nothapodytes nimmoniana* Graham using different sizes of Container

Nanda R. Kurde, Rajesh P. Gunaga*, S.S. Narkhede, A.D. Rane, ; A.P. Rewale and S.G. Bhave
College of Forestry, BS Konkan Krishi Vidyapeeth, Dapoli-415 712, Maharashtra
**E-mail: rpgunaga@gmail.com*

ABSTRACT

*Nothapodytes nimmoniana*is one of medicinal tree species of India that yield a potent anti-tumour alkaloid called *Camptothecin.* It is used in the treatment of various cancers such as lung, breast, uterine and cervical cancer. Presently, raw materials required for pharmaceutical industries are procured from the natural habitat. There is a scope for this species to undertake commercial plantation. Nursery growth of this species is slow and it needs growth improvement at nursery stage. Therefore, a study was undertaken in the College of Forestry, Dapoli, Maharashtra to improve the seedling growth of this species using different sizes of polybags *viz.*, 4x6" (T1), 6x8" (T2) and 10x14" (T3). These polybags were filled with potting mixture consisting of soil, sand and FYM in the ratio of 2:1:1. Result showed that seedlings of *N. nimmoniana* grown in bigger sized container (T3) recorded significantly higher seeding height (18.48 cm), basal diameter (5.39 mm), number of leaves (11.95) and root length (24.18 cm) than those of medium (T2) and smaller (T1) sized containers. Growth increment in terms of height and diameter was also more in bigger sized container. Biomass of seedling such as dry weight of shoot, root and leaves was also higher in bigger container. Hence, it is suggested to use bigger sized container for this species to achieve more growth and biomass at nursery condition.

Keywords:

Container size, *Nothapodytes nimmoniana,* seedling growth

INTRODUCTION

Nothapodytes nimmoniana Graham (Family: Icacinaceae) is one of the commercial important medicinal tree species distributed in the semi-evergreen to moist deciduous forests of Indian sub-continent, Indo-malaysian and Indo-china regions. This species is gaining international importance due to newly identified pharmacological and curative properties. *Camptothecin* and its derivatives *viz.* 9-Nitro-Camptothecin, 9-Amino-Camptothecin and 9-Methoxy-Camptothecin are procured from various parts of plant (Govindachari and Viswanathan 1972a). *Camptothecin* (CPT) is a potent anti-tumour isoquinoline alkaloid used extensively in the treatment of several cancers such as lung, breast, uterine and cervical cancer (Govindachari and Viswanathan 1972b).

It is quantified that Camptothecin (CPT) content in different parts of plants, where bark of root and stem recorded maximum CPT content, followed by wood part. However, leaf and fruit of

this plant also contained little quantity of CPT (Padmanabha et al. 2006). Suhas et al. (2007) quantified the status of CPT content among different populations of *N.nimmoniana*in theWestern Ghats, India. It is also recorded that the seedlings grown in the nursery also containssome traces of CPT. Being a slow growing species, plants may be harvested economically at the rotation period of 10 years under intensive plantation condition (Vasudeva et al. 2004). Production of tall seedling is one of the silvicultural approaches to attain good growth and establishment at field condition. However, seedling growth can be manipulated by using different sizes of containers at nursery stage (Venkateshet al.2002 and Rathore et al. 2004). In the present study, three different container sizes were used to enhance seedling growth and vigour in *N. nimmoniana* under nursery conditions.

MATERIALS AND METHODS

The present investigation was undertaken in the forest nursery of College of Forestry, DBS Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India (Lat. 17^{o}45' N, Long. 13^{o}12' E and Alt. 250 m MSL) during 2010. The climate of the study area is tropical warm and humid condition having lateritic soil belt with annual rainfall of 3000 mm; minimum and maximum temperature of study area was 12^{o} C and 34^{o} C, respectively. The relative humidity (RH) of the study site ranged from 64.5 to 98.5 per cent.

Seeds were procured from trees located at Amboli natural forest of Maharashtra. Depulped seeds were soaked in water for 48 hrs and then sown on raised bed. Seedlings having 2 paired leaves were transplanted to different sizes of containers. Three different sizes of polybags *viz.*, 4"x6" (T1), 6"x8" (T2) and 10"x14" (T3) were used. Each treatment consisting of five replications of 25 seedlings each arranged in randomized block design. These polybags were filled with potting mixture consisting of soil, sand and FYM in the ratio of 2:1:1. Observations on seedling growth and biomass were recorded at monthly intervals from June to December. The data recorded was analyzed statistically using Mstatc statistical package and ANOVA (Analysis of Variance) table was constructed for all the parameters for data interpretation.

RESULTS AND DISCUSSION

Results showed that there was a significant variation among three container sizes for seedling growth and biomass parameters such as height, basal diameter, number of leaves, leaf area, root length, fresh and dry weight of leaves, shoot and total fresh and dry weight at the age of six months from the date of transplanting (Table 1 and 2). Bigger size container (T3) recorded maximum seeding height (18.48 cm), basal diameter (5.39 mm), number of leaves (11.95) and root length (24.18 cm) as compared to medium and small size containers (T1 and T2. Growth increment in terms of height and diameter was also showed similar trend where maximum increment was recorded in bigger sized container followed by small and medium containers (Fig. 1). Periodic growth observation recorded in different size containers is depicted in Fig. 2. At the age six months after transplanting, fresh and dry biomass of seedling was recorded. The data showed that T3 (size of 10"x14") recorded significantly higher fresh and dry biomass (Table 2). The total plant dry biomass in T3 was found to be approximately 2.5 times more than T1. Dry biomass of leaves (four times), shoot (2 times) and root (two times) was more in bigger containers as compared to smaller ones (Table 1). Moisture content also showed significant difference among three container size, where plants grown in bigger container has got maximum moisture of 60.5% as compared to other treatments such as T1 (48.7%) and T2 (52.7%). Significantly more leaf area was recorded in medium and bigger containers as compared to smaller container. Relative growth rate (RGR) and Net assimilation rate (NAR) was calculated for four months intervals. However, RGR showed significant variation among three treatments, where NAR did not exhibit significant differences among treatments. Plants grown in bigger containers (T3) showed maximum RGR value (0.163 g g^{-1}day^{-1}), followed by T2 (0.068 g g^{-1}day^{-1}) and T1 (0.060 g g^{-1}day^{-1}). The overall NAR ranged from 0.0028 (T2) to 0.0064g (T3) dry matter production per dm^{2} of leaf area in a day.

The overall result showed that seedling

Table 1: Influence of container size on seedling growth in *N. nimmoniana* (data recorded at the age of 6 months)

Treatments	Seedling height (cm)	Basal diameter (mm)	Root length (cm)	Number of leaves	Leaf area (cm^2)
T1 (4" x 6")	12.75	4.10	16.10	4.46	28.3
T2 (6" x 8")	15.53	5.23	25.00	6.81	77.6
T3 (10" x 14")	18.48	5.39	24.18	11.95	66.8
SEm (±)	0.37	0.08	1.65	0.30	11.6
$CD_{0.05}$	1.09	0.22	4.91	0.89	33.6

Table 2: Influence of container size on moisture content and seedling biomass in *N. nimmoniana* (data recorded at the age of 6 months)

Treatments	Moisture content (%)	Fresh biomass (g)				Dry biomass (g)			
		Leaf	Shoot	Root	Total	Leaf	Shoot	Root	Total
T1: 4" x 6"	48.77 (44.3)	0.38	0.67	1.11	2.12	0.17	0.32	0.61	1.08
T2: 6" x 8"	52.76 (46.6)	1.47	1.52	2.80	5.79	0.61	0.72	1.49	2.83
T3: 10" x 14"	60.55 (51.3)	2.27	1.63	3.44	7.33	0.68	0.71	1.32	2.70
SEm (±)	(1.65)	0.42	0.19	0.57	1.04	0.12	0.10	0.27	0.43
$CD_{0.05}$	4.90	1.25	0.55	1.69	3.10	0.36	0.29	NS	1.29

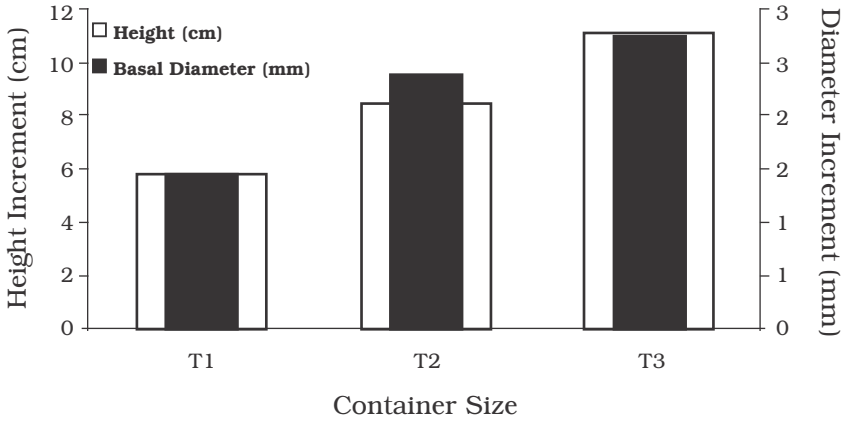

Fig. 1. Influence of size of containers on seedling growth increment in *N. nimmoniana*

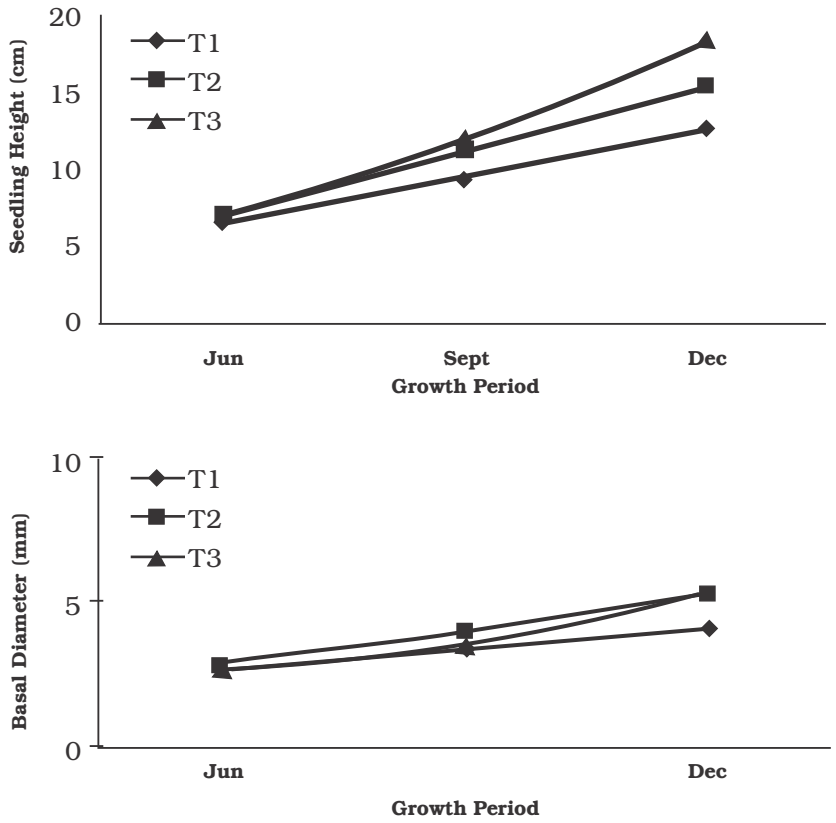

Fig. 2. Pattern of periodic seedling growth in *N.nimmoniana*

growth and biomass of *N. nimmoniana* can be improved by manipulating size of container. Among three container sizes, bigger container (size of 10"x14") resulted better growth and biomass as compare to other containers (4"x6" or 6"x8"). Bigger size container generally holds more growing media and essential nutrients that help the plants to grow vigoursly. Secondly, bigger container provides relatively larger space for root growth and holds more moisture content as compared to smaller ones. Therefore, maximum growth and seedling vigour of *N. nimmoniana* was achieved in bigger container. This kind of trend is already achieved in different forest species at nursery stage, where Rathore et al.(2004) showed highest growth of *Casuarina equisetifolia* seedlings in bigger containers. It is also reported that seedlings grown in container size of 15 x 20 cm performed best in terms of growth and vigour in *Acacia nilotica* (Venkateshet al. 2002). Raidh et al. (1995) also recorded similar trend in *Acacia auriculiformis* and *Chukrasia tabularis* at nursery stage.

REFERENCES

Govindachari TR and Viswanathan N 1972a 9-Methoxycamptothecin: A new alkaloid from *Mappiafoetida*. *Ind Jour Chem* **10**: 453-454.

Govindachari TR and Viswanathan N 1972b Alkaloids of *Mappiafoetida*. *Phytochemistry* **11**: 3529-3531.

Padmanabha BV, Chandrashekar M, Ramesha BT, HombeGowda HC, Gunaga RP, Suhas S, Vasudeva R, Ganeshaiah KN and Uma Shaanker R 2006 Patterns of accumulation of camptothecin, an anti-cancer alkaloid in *Nothapodytesnimmoniana* Graham in the Western Ghats, India: Implications for identifying high-yielding sources of the alkaloid. *Cur Sci* **90**(1): 95-100.

Rathore TS, Annapurna D, Joshi G and Srivastava A 2004 Studies on potting mixture and size of containers on the quality of seedling production in *Casuarinaequisetifolia*Forst. *IndFor* **130**(3): 323-332.

Riadh SM, Hossain MK and Akther S 1995 Effect of polybag size on initial growth of *Acacia auriculiformis* and *Chikrassiatabularis* seedlings in the nursery. *Pak Jour For* **45**(1): 1-8.

Suhas S, Ramesha BT, Ravikanth G, Gunaga RP, Vasudeva R, Ganeshaiah KN and Uma ShaankerR 2007 Chemical profiling of *Nothapodytesnimmoniana*populations in theWestern Ghats, India for anti-cancercompound, Camptothecin. *Cur Sci* **92**(8): 1142-1147.

Vasudeva R, Hombe Gowda HC and Raghu HB 2004 Suitability of *Nothapodytesnimmoniana* as a profitable medicinal tree component for agroforestry systems of hill and transition zones of Karnataka. *My For* **40**(1): 39-43.

Venkatesh A, Vanangamudi K and Umarani R 2002 Effect of container size on seedling growth of *Acacia nilotica* spp. *indica*. *IndFor* **128**(7): 795- 799.