Volume : 3 | Issue : 11 | November 2014 • ISSN No 2277 - 8179

Research Paper

Growth Performance of Sal in Mahamaya Central Forest Nursery (Ambikapur), Chhattisgarh

Forestry

KEYWORDS : Growth performance, root shoot ratio, sal seedling.

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ABSTRACT

In the present study an attempt has been made to investigate the growth performance of Sal (Shorea robusta Gaertn. f.) in Sarguja Forest Division at Mahamaya central forest nursery during the year 2013-14. It is evident from the study that there are prominent variations in the seedlings height during the 6 months period and one year aged seedlings. The root shoot ratio at 6 months stage of sal seedling ranged between 0.67 to 0.82. The percent of average leaf infected was 49.50 per individual seedlings. During one year stage the mean total height and root length of the individual seedling was 42.40 cm and 17.93 cm, respectively. The total height of the seedlings ranged from 19.10 to 106.00 cm. Among the total leaf in a seedling the mean infected leaf percent was 37.73% at one year aged stage. The root shoot ratio at 1 year old sal seedling ranged between 0.31 to 0.74. The growth performance of the sal seedling is slower as compared to other tropical species in the nursery stage. Proper management practices should also be opted so that the good growth performance can be achieved.

Introduction

Tropical hardwood trees are renewable sources for food and economically important raw material like fodder, fuel wood, timber and other valuable non-timber products. All trees play an important role in the ecosystem (Pijut et al., 2011). According to FSI (2013), from the total RFA area 49.69% falls under miscellaneous (mixed) forests, followed by Sal (5.78%), lowland hardwood (5.69%), Teak (4.68%) and Teak with mixed species (4.23%), respectively. In present time, the scale of new forest planting has increased considerably (Kumar et al., 2013; Kumar et al., 2014, Bhagat et al., 2014). This is primarily due to the commitment in many countries to extend the forest area or to rehabilitate degraded forest ecosystems and to reclaim disturbed sites for forestry, also with the aims to maintain and increase biodiversity, to mitigate global climate changes. In addition, the market of the forest nursery stock has changed, nurserymen are requested to produce planting stock of high quality standards, of a wide variety of species.

Shorea robusta is a tree commonly known as sal, belonging to the family Dipterocarpaceae. Sal is a large, deciduous tree up to 50 m tall and girths of 1.5–2 m; the bole is clean, straight and cylindrical, the crown is spreading and spherical. The bark is dark brown and thick, with longitudinal fissures deep in poles, becoming shallow in mature trees; it provides effective protection against fire (Orwa et al., 2009). The tree develops a long taproot at a very young age. Leaves simple, shiny, glabrous, about 10-25 cm long and broadly oval at the base, with the apex tapering into a long point; new leaves reddish, soon becoming delicate green. Flowers yellowish-white, arranged in large terminal or auxiliary racemose panicles. Fruit at full size about 1.3-1.5 cm long and 1 cm in diameter; it is surrounded by segments of the calyx enlarged into 5 rather unequal wings about 5-7.5 cm long (Khare, 2007; Joshi and Sharma, 2013). Sal is one of the most important timber yielding plants and also good source of aromatic gum and non- timber forest product (Deka et al., 2012).

The district Sarguja has a sizeable tribal population using enormous range of plants for their basic needs substance and livelihood. The district has very rich plant diversity, including medicinal plants. Now a days Shorea robusta is facing much pressure due to various factors and due to over exploitation and destruction for basic needs of forest villagers for their livelihood. No systematic attempts were made to understand dynamism of its natural regeneration and to suggest management inputs to encourage its regeneration (Chaubey and Sharma, 2013) and after care in plantation sites. It is also essential to produce good nursery stock for the plantation purpose to ensure the proper stocking in and around the forests area. Therefore, the present study aims to know about the growth performance pattern of sal species at nursery.

Materials & Methods

The present study was carried out at Mahamaya central forest nursery, Ambikapur in Sarguja forest division during the year 2013-2014. District Sarguja in the state of Chhattisgarh is very rich in natural vegetation and biological wealth. It lies between 22^0 58' to 23^0 49' North latitude and 81^0 33' to 82^0 45' East longitude. The average height of the area varies from 60^0 meter and above. Geologically, the area is dominated by upper Gondwana rocks which are rich in coal deposits. The highest mountain ranges of the region occupies the northern part of the district. The climate of the study area is dry tropical. The mean monthly temperature ranges between 15.34^0 C (January) to 31.54^0 C (May) and the mean annual temperature averages 23.31^0 C. The average annual rainfall is 1161.42 mm. The soil of the Sarguja District can be broadly classified in four major classes: Red and yellow soils, Alluvial soils, Laterite soils and Medium blue soils.

Different parameters of sal seedlings viz., height, root length, total number of leaf, number of fresh leaf, number of defected leaf, leaf length and width at nursery were observed after six months and one year of sowing at nursery. The collected data were subjected to suitable analysis followed by Kumar et al. (2013) and Bhagat et al. (2014).

Results and Discussion

Performance of Sal species in nursery at different time period

The growth performance of the Sal after six months of sowing in Mahamaya central forest nursery is given in table 1. It is evident that there are prominent variation in the seedlings height. The height of the sal seedlings ranged between 8.50 to 28.00 cm. The average root length and average total height of Sal seedlings was 13.43 cm and 31.50 cm, respectively. Total number of leaf in individual seedling ranged between 3.00 and 12.00. The average number of defected leaf per seedling was 3.80 and the average number of healthy leaf per seedling was 3.90, respectively. The

Volume : 3 | Issue : 11 | November 2014 • ISSN No 2277 - 8179

percent of average leaf infected was 49.50 per individual seedling. The average leaf width of large leaf was 5.41 cm whereas 2.95 cm for the small leaf. The average leaf length of large and small leaf was 11.03 cm and 5.26 cm, respectively. The root shoot ratio at 6 months stage sal seedling ranged between 0.67 to 0.82.

The performance of Sal after 1 year in nursery is given in table 2. The mean total heigh and root length of the individual seedling was 42.40 cm and 17.93 cm, respectively. The total height of the seedlings ranged from 19.10 to 106.00 cm. The total of number of leaf in each seedling ranged from 7 to 20.00 in which defected leaf varied from 1.00-11.00 and healthy leaf ranged from 2.00-19.00. Among the total leaf in a seedling the mean infected leaf percent was 37.73%. The average leaf width of large leaf was 7.74 cm whereas 2.61 cm for the small leaf. The average leaf length of large and small leaf was 16.66 cm and 6.21 cm, respectively. The root shoot ratio at 1 year old sal seedling ranged between 0.31 to 0.74.

The climatic condition, edaphic condition and managerial aspects are the driving factors for the better performance of the species in a area in particular time. The performance of the sal seedling in the present study is found slower as comparison to other species grown in tropics (Kumar et al., 2013; Bhagat et al., 2014). Substrate plays a significant role in seedling emergence, because seeds have characteristic requirements for moisture and oxygen for their germination. A substrate needs to be non-toxic, free of moulds with adequate aeration and moisture for germinating seeds (Justice, 1972). In a similar investigation, germination of Albizia lebbek Benth. was found better in FYM followed by sand, sand + soil and sand + soil + FYM (Thakur et al., 2000). In order to maximize survival and growth, it is essential to raise seedlings in nurseries with proper care. Watering, weeding around the out planted seedling etc. enhance the growth of seedling (Bognounou et al., 2010). The texture or particle size distribution of nursery soils and potting medium for containerized planting stock is an important soil physical property influencing root and shoot growth. In Picea smithiana maximum seed germination was recorded in humus medium (Lavania et al., 2007). Nandeshwar and Patra (2004) also suggested that soil, sand and compost in the ratio of 1:1:2 is the best for growth and survival of Acacia catechu seedlings. It is also reported that inoculation of ectomycorrhizal fungus in sal species help to rise good establishment as well as growth and for producing quality stock (Pyasi et al., 2013).

Conclusion

Shorea robusta is a major species in the Sarguja region. Sal species is a good source of livelihood for tribal population or people residing in the forest villages. Due to various anthropogenic disturbances like fire, grazing, illicit felling, mining, encroachment etc. natural forest of these area under force to alteration in their regeneration potential and vegetation dynamics. Decreasing sal forest cover is one of the top ranked problems. The primary reason for decreasing it so rapidly is poor regeneration. The seed of sal is recalcitrant, and start to germinate just before it detaches from the tree. It immediately needs appropriate moisture, nutrient and mycorrhiza for its establishment. The growth performance of the sal seedling is slower as comparison to other tropical species during the nursery stage. Proper management option should be opted in the nursery so that the good growth performance can be achieved. Artificial application of ectomycorrhizal fungus synthesise mycorrhiza in feeder roots at non sal growing area and supporting during the initial growth and establishment of sal seedlings in nurseries and also in plantation areas. The present study may be helpful in producing quality planting stock of sal species for afforestation programmes.

Table 1. Performance of Sal species in nursery after 6 months

Observation after 6 months			
Parameters	Max.	Min.	Avg.
Height (cm)	28.00	8.50	18.07±1.47
Root Length (cm)	21.50	7.00	13.43±1.21
Total Height (cm)	49.50	15.50	31.50±1.90
No. of Leaf	12.00	3.00	7.70±0.98
DF Leaf	7.00	2.00	3.80±0.91
Healthy Leaf	7.00	1.00	3.90±0.86
IF Leaf %	70.00	33.33	49.50±1.94
Leaf Width (cm)			
Large (cm)	7.20	3.50	5.41±0.55
Small (cm)	4.80	1.50	2.95±0.56
Leaf Length (cm)			
Large (cm)	16.00	5.00	11.03±1.05
Small (cm)	8.50	3.30	5.26±0.67
Root/Shoot Ratio	0.82	0.67	0.75±0.07

Table 2. Performance of sal species in nursery after 1 year

Observation after 1 year			
Parameters	Max.	Min.	Avg.
Height (cm)	81.00	11.00	42.40±3.40
Root Length (cm)	25.00	8.10	17.93±1.28
Total Height (cm)	106.00	19.10	60.33±3.52
No. of Leaf	20.00	7.00	15.40±1.05
DF Leaf	11.00	1.00	5.40±1.07
Healthy Leaf	19.00	2.00	10.00±1.42
IF Leaf %	71.43	5.00	37.73±2.95
Leaf Width (cm)			
Large (cm)	12.60	1.60	7.74±1.12
Small (cm)	5.50	0.50	2.61±1.08
Leaf Length (cm)			
Large (cm)	23.05	8.00	16.66±1.06
Small (cm)	11.09	3.50	6.21±1.25
Root/Shoot Ratio	0.74	0.31	0.49±0.20

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