

Original Research Paper

COMPARISION OF GROWTH PERFORMANCE IN TIMBER TREE SPECIES CULTIVATED UNDER DRIP IRRIGATION ON FARM LANDS

ABSTRACT

A field experiment was conducted at Forest College and Research Institute, Mettupalayam, Tamil Nadu, India to study the growth performance of *Neolamarckia cadamba*, *Acrocarpus fraxinifolius* and *Dalbergia sissoo* under drip irrigation. The biometric attributes viz., height, basal diameter and diameter at breast height (DBH) were studied during 3 MAP, 6 MAP, 9 MAP and 12 MAP. Among the three fast growing tree species, *Neolamarckia cadamba* exhibited a maximum height of 4.40 m, basal diameter of 5.31 cm and DBH of 5.03 cm followed by *Acrocarpus fraxinifolius* (Height of 3.99 m, basal diameter of 4.52 cm and DBH of 4.26 cm) and minimum in *Dalbergia sissoo* (Height of 3.37 m, basal diameter of 3.45 cm and DBH of 3.96 cm). The drip technology can boost the productivity and overall production of tree crops in addition to improvement of soil and tree health especially in problem soils. *Neolamarckia cadamba* was responded well to the drip irrigation system and it also plays a major role in weed management.

Keywords: Basal Diameter, Cadamba, Drip Irrigation, Height, Farm lands

1. INTRODUCTION

Wood from forest is the world's major renewable commodity and the demand for wood and other forest products are increasing in a trend, which resulted in serious depletion of forest cover due to demand for fuel wood, fodder and timber. The gap between demand and supply of forest produce is so wide that most intensive management practices in the existing forests cannot bridge it. The ever increasing human population would likely to keep the demand for forest produce at a higher order. In order to bridge the widening gap, forest productivity has to be maximized to meet the increasing demand by adopting new ways and technologies. The demand for Indian industrial rose from 58 million cubic meters in 2000 to 123 million cu.m in 2013 and expected to cross 150 million cu.m by 2018 (1).

Water management experts have assessed that water is going to be the major constraint for economic development in most parts of the world, since the demand of water has been increasing at an alarming rate. Therefore, water is a precious commodity and its judicious utilization is very much essential for maximizing crop yield. In recent times, the mean annual rainfall is decreasing, the length and severity of dry season has become a limiting factor for the crop growth and productivity. The moisture requirements of crops are met with drip irrigation system in many parts of the world. Since in forest, natural vegetation and rainfed plantations have low annual increments that cannot meet the increasing needs of the local communities and industries for wood, building materials, industrial inputs and other products.

Drip method of irrigation helps to reduce the over-exploitation of groundwater that partly occurs because of inefficient use of water under surface method of irrigation. Environmental problems associated with the surface method of irrigation like water logging and salinity are also completely absent under drip method of irrigation (2). Drip method helps in achieving saving in irrigation water, increased water-use efficiency, decreased tillage requirement, higher quality products, increased crop yields and higher fertilizer-use efficiency (3,4,5). Similarly, in drip irrigated plantation the weed problem was very minimum and it also helpful in reducing the labour usage (4).

The country is likely to be water stressed in the coming years. Therefore hand in hand with technologies for water harvesting and storage, technologies for precision water application methods need to be adopted. To adopt the latest technologies for precision irrigation, the study was carried out at Forest College and Research Institute, Mettupalayam to study the growth performance of timber tree species under drip irrigation.

Comment [WK1]: In this section, the species should be introduced especially their water requirements. In addition, there is no report about literature knowledge for drop system usage on the other tree

2. MATERIAL AND METHODS

The experiment was conducted in Forest College and Research Institute, Mettupalayam at 11° 19' N longitude and 77° 56' E latitude with an altitude of 300 m above mean sea level and mean annual rainfall of 920.5 mm. The normal weather conditions of the experimental site prevailed during the study period was maximum and minimum temperature with 38.8°C and 17.7°C respectively. The soil of the experimental field was Illupanatham soil series and slightly alkaline (pH-7.87) in nature. The soil was loamy sand, well drained and non saline (EC-0.20 dSm⁻¹).

~~The drip irrigation system is a method of irrigation used in arid region that helps in the water wastage and reducing the cost of cultivation. In drip irrigation, water drains slowly towards the roots of the trees either while running on the surface of the ground or by directly irrigating the rhizosphere. Kumar (7) identified that transition from flood irrigation method to drip irrigation increases the biometric growth in trees, which is an important marketing criterion for tree growers.~~

Drip irrigation system was installed and the irrigation was given once in every three days during summer/non rainy days for first six months and in later stages it was irrigated for twice/week. The discharge rate of drippers was 4.0 liters/hour for one hour/day. The timber tree species planted under drip irrigation was *Neolamarckia cadamba*, *Acrocarpus fraxinifolius* and *Dalbergia sissoo*. The following biometric characteristics were measured at Initial, 3 months after planting (MAP), 6 MAP, 9 MAP and 12 MAP in tree seedlings as given below.

2.1 Height

The height of the trees was measured from the ground level to the leading terminal tip using the standard scale and is expressed in metre.

2.2 Basal diameter

Basal diameter is measured with the help of digital vernier caliper at the ground level and expressed in cm.

2.3 Diameter at Breast Height (DBH)

Diameter is measured at 1.37 m from ground level using the tree calliper and expressed in cm.

2.4 Statistical analysis

The data obtained were subjected for statistical analysis to evaluate the possible relationship between the different parameters and to employ analysis of variance employing statistical methods (6).

3. RESULTS AND DISCUSSION

~~The drip irrigation system is a method of irrigation used in arid region that helps in the water wastage and reducing the cost of cultivation. In drip irrigation, water drains slowly towards the roots of the trees either while running on the surface of the ground or by directly irrigating the rhizosphere. Kumar (7) identified that transition from flood irrigation method to drip irrigation increases the biometric growth in trees, which is an important marketing criterion for tree growers. The biometric parameters viz., Height and basal diameter was recorded during Initial, 3 MAP, 6 MAP, 9 MAP and 12 MAP respectively. Among the three timber species studied, *Neolamarckia cadamba* was exhibited with the maximum mean height of 4.40 m followed by *Acrocarpus fraxinifolius* (3.99 m) and the minimum height of 3.37 m in *Dalbergia sissoo* (Table 1). Wood et al. (8) and Bheemaiah et al. (9) reported that maximum height increment in Casuarina may be attributed by micro irrigation with regular interval. On supporting the present result, Kandell et al. (10) and Igbal (11) reported that the tree growth was the highest in drip irrigated plants as compare to furrow irrigation. The basal diameter of plants in different treatments showed a significant variation and was significantly higher in drip irrigation.~~

Table 1. Effect of drip irrigation on height (m) in timber tree species under drip irrigation

| Tree Species | Initial | 3 MAP | 6 MAP | 9 MAP | 12 MAP | Mean |
|--------------|---------|-------|-------|-------|--------|------|
|--------------|---------|-------|-------|-------|--------|------|

Formatted: Indent: First line: 0.5"

| | | | | | | |
|---------------------------------|------|------|------|------|------|------|
| <i>Neolamarckia cadamba</i> | 1.31 | 3.23 | 4.46 | 5.87 | 7.12 | 4.40 |
| <i>Acrocarpus fraxinifolius</i> | 1.21 | 3.05 | 4.11 | 5.21 | 6.36 | 3.99 |
| <i>Dalbergia sissoo</i> | 1.28 | 2.69 | 3.22 | 4.35 | 5.29 | 3.37 |
| SEd | 0.07 | 0.10 | 0.15 | 0.20 | 0.14 | |
| CD (0.05) | 0.17 | 0.24 | 0.39 | 0.51 | 0.32 | |

In the present study, The basal diameter of plants in different treatments showed a significant variation and was significantly higher in drip irrigation (Table 2). The mean basal diameter was ranked in the order of 5.31 cm (*Neolamarckia cadamba*) > 4.52 cm (*Acrocarpus fraxinifolius*) > 3.45 cm (*Dalbergia sissoo*) in Table 2. Similarly, In the mean diameter the maximum was observed in *Neolamarckia cadamba* with the diameter of 5.03 cm followed by *Acrocarpus fraxinifolius* (4.26 cm) and minimum was exhibited in *Dalbergia sissoo* (3.96 cm) in Table 3. This result was in line with the findings of Narayanamoorthy (2) concluded that the increase in rate of micro irrigation will have a significant increase in tree collar diameter and vigour.

Table 2. Effect of drip irrigation on basal diameter (cm) in timber tree species under drip irrigation

| Tree Species | Initial | 3 MAP | 6 MAP | 9 MAP | 12 MAP | Mean |
|---------------------------------|---------|-------|-------|-------|--------|------|
| <i>Neolamarckia cadamba</i> | 1.25 | 3.13 | 5.28 | 7.75 | 9.12 | 5.31 |
| <i>Acrocarpus fraxinifolius</i> | 1.18 | 2.89 | 4.77 | 6.07 | 7.71 | 4.52 |
| <i>Dalbergia sissoo</i> | 1.21 | 2.18 | 2.89 | 4.51 | 6.45 | 3.45 |
| SEd | 0.04 | 0.21 | 0.56 | 0.47 | 0.59 | |
| CD (0.05) | 0.13 | 0.58 | 1.28 | 1.10 | 1.53 | |

Table 3. Effect of drip irrigation on diameter (cm) in timber tree species under drip irrigation

| Tree Species | 3 MAP | 6 MAP | 9 MAP | 12 MAP | Mean |
|---------------------------------|-------|-------|-------|--------|------|
| <i>Neolamarckia cadamba</i> | 2.56 | 4.22 | 5.94 | 7.41 | 5.03 |
| <i>Acrocarpus fraxinifolius</i> | 2.07 | 3.68 | 5.08 | 6.21 | 4.26 |
| <i>Dalbergia sissoo</i> | 1.95 | 3.34 | 4.54 | 6.02 | 3.96 |
| SEd | 0.12 | 0.23 | 0.38 | 0.52 | |
| CD (0.05) | 0.27 | 0.65 | 0.99 | 1.17 | |

4. CONCLUSION

Neolamarckia cadamba and *Acrocarpus fraxinifolius* were responded well to the drip irrigation system and it also plays a major role in water as well as weed management.

REFERENCES

- Wood news. The statistical details of wood production in and around world (Since 1991). <http://www.woodnews.in/index.php>. 2014.
- Narayanamoorthy A. Averting water crisis by drip method of irrigation: A study of two water intensive crops. Indian Journal of Agricultural Economics. 2003; 58(3): 427-437.
- Qureshi ME, Wegener MK, Harrison SR, Bristow KL. Economic evaluation of alternate irrigation systems for sugarcane in the Burdekin delta in North Queensland, Australia, In: *Water Resource Management*, Eds: C.A. Brebbia, K. Anagnostopoulos, K. Katsifarakis and A.H.D. Cheng, WIT Press, Boston. 2001; 47-57.
- Sivanappan RK. Strengths and weaknesses of growth of drip irrigation in India, In: Proc. of Micro Irrigation for Sustainable Agriculture. GOI Short-term training 19-21 June, WTC, Tamil Nadu Agricultural University, Coimbatore. 2002; 1037.

- 112 5. Namara, Regassa E, Upadhyay, Bhawana, Nagar RK. Adoption and Impacts of Microirrigation
113 Technologies: Empirical Results from Selected Localities of Maharashtra and Gujarat States of
114 India, Research Report 93, International Water Management Institute, Colombo, Sri Lanka. 2005;
115 176-195.
- 116 6. Panse VG, Sukhatme PV. Statistical methods for agricultural workers (Ref. Edn.). ICAR, New
117 Delhi. 1985; 9-15.
- 118 7. Kumar, Suresh. Promoting Drip Irrigation: Where and Why? Managing Water in the Face of
119 Growing Scarcity, Inequity and Declining Returns: Exploring Fresh Approaches, IWMI TATA 7th
120 Annual Partner Meet. 2008; 1:108-120.
- 121 8. Wood PJ, Willens AF, Willens GF. An irrigated plantation project in Abu Dhabi. Commonwealth
122 Forestry Reviews. 1975; 54 (2): 139-146.
- 123 9. Bheemaiah G, Subrahmanyam MVR, Syed Ismail. Performance of teak under different irrigated
124 and fertilizer management practices. Indian Forester. 1997; 123(12): 1171-1175.
- 125 10. Kandell SAE., Isebrands J, Ali MH. Evaluation of short rotation *P.deltoides* and *Eucalyptus* for
126 pulp production under drip irrigation. Forest Products Research Society abstracts. 1980; 34: 24.
- 127 11. Igbal B. Evaluation of water requirement and growth characteristics of casuarina (*Casuarina*
128 *equisetifolia* Forst.) under drip irrigation. M.Sc. Thesis, TNAU, Coimbatore, India. 2005.

129