INTERNATIONAL JOURNAL OF PLANT, ANIMAL AND ENVIRONMENTAL SCIENCES
IJPAES
Volume-5, Issue-4, Oct-Dec-2015 Coden: IJPAJX-CAS-USA, Copyrights@2015 ISSN-2231-4490
Received: 10th Aug-2015 *Revised: 27th Aug-2015* *Accepted: 28th Aug-2015*
Research article

AVENUE PLANTATION IN EASTERN HIMALAYA: A CASE STUDY OF AVENUE TREES IN NERIST CAMPUS, ARUNACHAL PRADESH.

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ABSTRACT: The avenue trees in NERIST campus are dominated by *Grevillea robusta, Duabanga grandiflora, Mesua ferrea, Delonix regia, Mimusops elengi, Cassia siamea, Anthocephalus chinensis, Polyalthia longifolia*, etc. The database of avenue trees were documented on various parameters like interspacing, crown height, crown width, etc. Of this, the crown height and crown width are important characteristics helpful in proper planning and management of avenue tree.
Key words: Avenue tree, crown height, crown width, etc.

INTRODUCTION

Avenue is a way of access to a country house bordered by trees. Generally, it means a row of trees planted along roads and paths [1]. Avenue plantation is one of the important practices of growing trees along roadside and the canal side to increase aesthetic value and to provide shade to the stray animals and travelers during Emperor Ashoka as well as Akbar's rule [2]. Besides, the National Forest Policy 1988 emphasized in conducting research on social forestry aspects in India [3].

The avenue trees play an important role in maintaining the ecological balance in an urban area. It plays a major role reducing the pollution caused by vehicular movement [4] and also reduces concentration of CO2 in atmosphere in the form of biomass [5]. Some studies were conducted on the effect of vehicular pollution on avenue trees viz., *Azadirachta indica* and *Polyalthia longifolia* [6]. Moreover, the avenue trees have been drastically affected due to modernization and developmental projects in the developing cities [7].

The inventories of avenue trees were done in two cities viz., Chandigarh city [8] and Bangalore [10]. In Bangalore, species richness at various landuse has been done for avenue trees [10]. Proper planning of avenue trees has been recommended for Chandigarh city [9].

This study attempts at developing a database of avenue trees in NERIST campus and suggest important tree characteristic that can be used for efficient planning and management of the avenue trees.

METHODOLOGY

The present study was conducted during the year 2011-12 in the 20 years old avenue plantation done under social forestry program in North Eastern Regional Institute of Science and Technology (NERIST) campus at Nirjuli, situated in Papum Pare district of Arunachal Pradesh, eastern Himalaya.

In the study, various parameters of avenue trees were taken viz., inter spacing between trees, crown width, crown length, crown height, tree height, crown interference, crown damage, etc. Stratified random sampling was adopted to develop the database of the avenue tree. The height of the tree was measured with Ravi altimeter and the diameter (DBH) of the tree was measured at 1.37m height with a measuring tape.

1. **Crown width** = The width of a crown can be measured by projecting the edges of the crown to the ground and measuring the length along one axis from edge to edge through the crown centre = (d1+d2)/2 [11].
2. **Inter space between trees** = Distance between two adjoining trees.
3. **Tree height** = Total height of a standing tree is the straight line distance from the tip of the leading shoot to the ground level [11].
4. **Crown length** = It is the vertical measurement of the crown of a tree from the tip of the point half way between the lowest green branches forming green crown all round and the lowest green branch on the bole [11].
5. **Crown height** = It is the height of the crown as measured vertically from the ground level to the point half way between the lowest green branch and the green branches forming green crown all round [11].
6. **Crown interference** = Crown radius ÷ Distance of the tree from centre of road x 100.

RESULTS AND DISCUSSION

The avenue plantation in NERIST consists of trees viz. *Grevillea robusta, Duabanga grandiflora, Mesua ferrea, Delonix regia, Mimusops elengi, Cassia siamea, Anthocephalus chinensis* and *Polyalthia longifolia*. Most of the trees are evergreen and bear all aesthetic characteristics such as flowers, crown shape, leaf, etc. The crown of the avenue trees is mostly conical and round in shape, which is about 36% and 45% of the total avenue trees, respectively. *Grevillea robusta* is the tallest tree i.e., 26.87m, followed by *Anthocephalus chinensis* (26.8m), *Mesua ferrea* (17.2m), etc. The highest crown length was found in *Anthocephalus chinensis* (21m), followed by *Mesua ferrea* (14.8m), *Grevillea robusta* (14.6m), *Cassia siamea* (14m), etc. (Table no.1)

Table 1: Quantitative parameters of the avenue trees

S.No	Species	Tree height	Crown length	Crown width	Crown height	Inter spacing	Crown overlapping	*Distance from T to R	**Crown inter. (%)
1	*Grevillea robusta*	26.87m	14.6m	3.3m	12.27m	5.4m	No	5.4m	31%
2	*Duabanga grandiflora*	13m	8m	6.35m	5m	4.9m	22.83%	5.4m	59%
3	*Mesua ferrea*	17.2m	14.8m	6m	11.2m	4.7m	21.67%	8m	37%
4	*Delonix regia*	15.71m	11.61m	4.2m	4.1m	6.2m	No	4.2m	37%
5	*Mimusops elengi*	11.2m	8.2m	3.96m	3m	5.2m	No	5.5m	44%
6	*Anthocephalus chinensis*	26.8m	21m	7.58m	5.8m	2.75m	63.72%	3.1m	122%
7	*Polyalthia longifolia*	16.75m	8.6m	4.2m	8.15m	4.44m	No	6m	36%

* Distance from tree to middle of road;
** Crown interference towards the road side

The crown width was greatest in *Anthocephalus chinensis* (7.58m), followed by *Duabanga grandiflora* (6.35m), *Mesua ferrea* (6m), *Cassia siamea* (5.58m), etc. The inter-distance between the avenue trees range from 2.75m to 6.2m. The highest crown overlapping was found in *Anthocephalus chinensis* (63.72%), followed by *Duabanga grandiflora* (22.83%) and *Mesua ferrea* (21.67%) (Table 1).

The distance of the tree to the centre of the road is a matter of concern in avenue plantation. If the crown expansion is more than 50% then it will obstruct or disturb the vehicular movement. Most of the avenue trees were found below 50% except *Anthocephalus chinensis* (122%) and *Daubanga grandiflora* (59%). This is because of the wider crown width in *Anthocephalus chinensis* (7.58m) and *Daubanga grandiflora* (6.35m). However, it did not disturb vehicular movement because of the higher crown height in *Anthocephalus chinensis* and *Daubanga grandiflora*, which is about 5.8m and 5m, respectively. Most of the avenue trees are more than 4m crown height except *Mimusops elengi*, which was merely 3 m in height (Table 1). Moreover, it is recommended that the tree clean bole should be 4 m in height [1].

CONCLUSION AND RECOMMENDATION

The avenue trees planted are *Grevillea robusta, Duabanga grandiflora, Mesua ferrea, Delonix regia, Mimusops elengi, Cassia siamea, Anthocephalus chinensis* and *Polyalthia longifolia*. All these trees were selected to increase the aesthetic value of the campus. The dominant crown in avenue plantation is conical and round in shape crown. The inter-spacing of avenue trees is ranges from 2.75m to 6.2m. Among the avenue trees, *Grevillea robusta* have the highest crown height. Except *Mimusops elengi,* all other avenue trees have a crown height of above 4 m. *Anthocephalus chinensis* has the highest crown length, crown width, crown overlapping and crown interference w.r.t middle of the road among all the avenue trees.

Though the crown interferences w.r.t middle of the road was found highest in *Anthocephalus chinensis* and *Daubanga grandiflora* which is about 122% and 59%, respectively, however, it didn't obstruct the vehicular movement due to their higher crown height, which is more than 5m in height.

Through the study, it has been found that the interspacing of the avenue trees should be based on the crown width of the tree, otherwise overlapping of crown may take place. The crown height should be more than 4m to facilitate easier movement for both pedestrian and vehicles. The crown width and crown height are important parameters in avenue plantation that helps in efficient management of avenue trees. It is recommended that more databases on avenue trees should be developed at the nationwide level for efficient planning and management of avenue trees.

ACKNOWLEDGEMENTS

The authors are thankful to all faculty members, research scholars and students of Forestry department, NERIST for their direct or indirect help in completing the research on avenue trees in NERIST campus. We would like to thank Mr. Raju Barthakur, Assistant professor, NERIST for his cooperation in improving the paper quality.

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INTERNATIONAL JOURNAL OF PLANT, ANIMAL AND ENVIRONMENTAL SCIENCES

ISSN 2231-4490

International Journal of Plant, Animal and Environmental Sciences