DIVERSITY OF TREE SPECIES IN URBAN GREEN SPACES OF ULHASNAGAR

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Abstract
Ulhasnagar, a developed municipal town of Thane district, was once a barren land where the migrants were rehabilitated in the aftermath of partition since independence. The town is spread over an area of 13 square kilometers, comprising of five camps. In the present investigation a tree census was conducted from May 2013 to June 2016, to record the number of trees growing in whole of Ulhasnagar. The trees growing in the urban city were recorded (13,667), species richness, diversity indices and species evenness were also analyzed. It was observed that the distribution of tree was not consistent and highest number of trees were found in Camp I (31.10%) followed by Camp III (26.47%), V (20.69%) and IV (14.74%); while least in Camp II (7%). The observation revealed that trees belonged to 33 families, comprising of 76 genus and 90 species. Evergreen trees dominated the deciduous form of trees. Moreover 52.22% of the trees grown in this urban area are native species and 42.7% are of introduced type. The composition of the trees in the study sites appeared to be influenced by the inhabitants and the municipal corporation of the city. Common trees found growing were Polyalthia longifolia, Samanea saman, Terminalia catappa, Alstonia scholaris, Spathodea campunulata, Peltophorum pterocarpum, Cassia simea few of Mangifera indica, Azadirchta indica and varieties of Ficus.

Key words: Ulhasnagar, trees, Polyalthia longifolia, Samanea saman, Terminalia catappa, Alstonia scholaris, Spathodea campunulata and Peltophorum pterocarpum.

I. INTRODUCTION

India ranks 10th in the list of most forested nations in the world with 76.87 million ha of forest and tree cover [7, 8]. The total tree cover of the country has been estimated to be 92,769 km², which constitutes 2.82 per cent of the country’s geographic area. Trees play a significant role in the environment. Trees in the city constitute green spaces managed largely for recreational purposes, and form the largest proportion of publicly available green space for urban dwellers [15]. In developing countries, urban green spaces may provide the only reference to “nature” that they will ever experience, providing important social and psychological functions that substantially improve the quality of city life [12, 4, 2]. They contribute multiple valuable ecosystem services, helping to provide clean air, buffer micro climatic variations and lower noise levels, and regulate water flows [3, 5]. Though urban forest very often is small in area, they tend to be characterized by high levels of diversity and microhabitat heterogeneity, with large proportions of exotic species [9, 11]. Besides ecological status they have medicinal values and they help to a greater extent in controlling pollution. Government has realized the importance of tree cover its protection and extension, therefore has made it compulsory for tree census once in five year [18]. Ulhasnagar with the population of seven lacs has shown rapid urbanization in the last decade. The Ulhasnagar city Municipal Corporation takes up plantation programme to improve the green cover, though no Tree Census Programme were initiated to assess the number of trees of the region. Therefore the present study was undertaken to document the species of trees commonly growing in the study site, also assessing the species richness, species diversity and the species evenness as a preliminary effort towards understanding the green cover.
II. METHODOLOGY

Study Area: Ulhasnagar city in the Thane district, is located on west coast of India approximately 60 kilometers northeast to the city of Mumbai, in the state of Maharashtra. This city is part of Mumbai Metropolitan Region managed by MMRDA. Ulhasnagar is located at 19.22°N 73.15°E. It has an average elevation of 19 meters (62 feet).

Data collection and Analysis: A systematic survey was conducted during the period May 2013 to June 2016. Trees with a trunk diameter of six inch and more were considered, counted physically, the observations were noted down and identified using Flora [6,1]. To understand the population structure and distribution pattern of the vegetation, the data were analyzed for species richness, Shannon’s diversity index (H’), Simpson’s Diversity Indices (D) and Species Evenness (E) [14]. All computation was carried out on XLStat Software package.

III. RESULT AND DISCUSSION

Green cover of a place influences the climatic conditions, temperature and rainfall; it also contributes to a larger extent to the socio-economic and ecological status of the area. Ulhasnagar Township is a fast developing area with a population currently estimated to be approximately seven lacs. This city with its history is not a planned city and this was clearly depicted by the uneven distribution of tree vegetation. Ulhasnagar city comprises of five zones, popularly known as the Camp I, Camp II, Camp III, Camp IV and Camp V. In the present study around 13,667 trees were put on records in the whole of Ulhasnagar city. The distribution of the green was not uniform as seen, both inter and intra camp, especially the count of trees in public places and that in the residential or roadside. In the residential and along the roadsides almost three times more trees were recorded than in the public places. This data clearly indicate the active role of the citizens and their awareness in maintaining the tree cover.

The trees recorded from the study area belonged to 33 families and comprised of 76 genus and 90 species (Fig No.1). The members belonging to family Annonaceae was the most abundant (25.7%), followed by the members of Leguminosae (18.37%), while members of families Lythraceae, Moringaceae, Magnoliaceae, Passifloraceae, Casuarinaceae and Boraginaceae were the least and uncommon. There were around 2.2% of the trees represented by only 5 genera belonging to Gymnosperms. It was observed that maximum number of trees was in Camp I (31.10%) and least in Camp II (7.0%). There were a sizeable number of trees in the other zones Camp III (26.47%), Camp IV (14.74%) and Camp V (20.6%) as compared to Camp II The distribution pattern of the trees was not uniform in the entire Camp sites studied. In Camp I, there are 8 public gardens and 8 educational institutions; the tree number was the maximum and showed 77.7% species richness.

At Camp site III, there are 11 gardens and 16 institutions; contributing highest species richness (84.44%). Camp sites IV &V showed moderate vegetation distribution with species richness of 71.1% and 77% respectively, despite the fact that in both the sites number of gardens and institutions were more in number than Camp I & III. This variation in the distribution of trees species may probably be related to the high population density of these areas. In both these Camp regions, the population settled much earlier to that in Camp IV &V; thus the percentage of trees growing along the roads and residential complexes were comparatively larger in number than in other camp regions (Fig No. 2). Majority of the trees encountered in these regions were old with diameter of the trunk more than 36 inches.

While the Camp II being more of business sector have the least number of trees (only 7% of the total) (Table 1).
Figure 1. Number of Plant Genus belonging to Angiosperm Family

Figure No. 2 Distribution of plants in Ulhasnagar

Table 1: Diversity Indices of Different Camps in Study Area

| Camp No | Total Trees | Sp. Richness (S) | Sp. Evenness (E) | Shannon Weiner Index (H) | Simpson’s Index (D) | Simpson’s Index of Diversity (1-D) | Reciprocal of Simpson Index (1/D) |
|---------|-------------|-----------------|-----------------|-------------------------|---------------------|----------------------------------|----------------------------------|
| Camp I  | 4250        | 70              | 0.671           | 2.85465                 | 0.1453              | 0.8547                           | 6.882312                         |
| Camp II | 957         | 47              | 0.78            | 3.00336                 | 0.0694              | 0.9306                           | 14.40922                         |
| Camp III| 3617        | 76              | 0.74            | 3.20158                 | 0.082               | 0.918                            | 12.19512                         |
| Camp IV | 2015        | 64              | 0.78            | 3.24054                 | 0.0721              | 0.9279                           | 13.86963                         |
| Camp V  | 2828        | 70              | 0.79            | 3.37638                 | 0.0595              | 0.9405                           | 16.80672                         |

Among the total number of trees recorded, trees like *Polyalthia longifolia* represented almost 24.89% and were abundant followed by *Terminalia catappa, Samanea saman, Delonix regia, Ficus religiosa* and *Peltophorum*. The highest number of Asupalav (*Polyalthia longifolia*), in all the camp regions can actually be related to the plantation programme conducted annually by the social organizations, NGO and government agencies. This tree occupies less space in terms of crown and canopy is well suited to be planted in gardens, roadsides, complexes and residential buildings, hence most preferred in both public and private places. Similarly, trees like *Terminalia catappa, Roystonia*
regia, Samanea saman, Delonix regia were common in public places, while Mangifera indica was noted to be more in residential complexes.

Some trees like Tamarindus indica, Vitex negundo and Plumeria alba were less than 100 in number; while Ceiba pentandra, Citrus maxima, Erythrina indica, Ficus elastica, Holarrhena antidysenterica, Ipomea caracalla, Murraya paniculata, Millingtonia hortensis, Putranjiva roxburghii, Sterculia villosa, Tectona grandis, Cycas revoluta, Mimosops elengi, Araucaria spp were represented by very few individual trees (> ten in numbers). The irregular distribution of genera’s clearly illustrates that it is related to the choice of the planter rather than to the natural phenomenon of occurrence in nature. Many tree plantation projects adopted by the Municipal Corporation along the road sides have helped the city to improve its green cover. Trees like Alstonia scholaris, Spathodea campanulata, Terminalia catappa, Anthocephalus indicus, Peltophorum pterocarpum, etc. are planted by the Ulhasnagar Municipal Corporation. The data also portrays the role of common man, in the care and maintenance of the tree which are mostly of ornamental values, evergreen, fast growing of some economical value as fruit tree or of medicinal trees.

A total of 13667 trees were sampled from the five Camp regions of Ulhasnagar that comprised of 90 species. Of these 90 species, 52.22% are native and rest is introduced species. Urban vegetation is known to be a mix of exotic and natives trees [13]. Moreover, out of 90 species observed 63 species are evergreen and others majorly deciduous few are semi- deciduous. Shannon-Weiner index for the present study area ranged from 2.85 to 3.37. The highest H’ index of 3.37 was observed at Camp V area and lowest H’ index at Camp I. There was very small difference in the species diversity among the five camp areas. The reciprocal of Simpson’s Index (1/D) ranged from 6.9 to 16.8, the highest value of 16.8 for Camp V and lowest for Camp I (6.89). According to this computation, when D increases diversity decreases and vice versa (lower D means higher diversity). Simpson’s Index of diversity can be expressed as 1-D or 1/D. Higher the value indicate monoculturing. In the urban city areas, the composition of the green space and the distribution of the tree species have direct relation to the human population. Shannon’s evenness index E ranged from 0.67 to 0.79. These values also indicate that the urban area under study shows very moderate species diversity and species evenness (Table 1). Similar observations are reported earlier by few workers [10]. The rise in number of introduced trees is a matter of concern as they have negative impact on the distribution of other organisms like birds and butterflies [11]. Urban trees distribution is also strongly influenced by the developmental history of the region. In addition, there is a complete shift in the choice from huge-large canopy trees that supported many insects and birds to the small – narrow sized trees that occupy less space and still perform its function.

In general the ratio of number of trees to man was around 1: 51, as against the ratio for the city of Mumbai 1: 19 (2008) and 1:6 (1998). This ratio is a real cause of concern when compared with the data available for the Mumbai division. The data on the record of various wards in Mumbai city indicates a fairly good tree to man ratio. In Colaba, the ratio is 1 tree to 5 man, in Mulund, Borivali and Bandra it is 1:4, places like Marine lines and Dongri shows the ratio as poor as 1:51 and 1:20 respectively [17]. During the 1998 Tree Census [16], a tree having height of 4 ft and trunk diameter of 6 inches were considered, whereas this parameter was relaxed in 2008 to 4 inches trunk diameter. Dead trees were not taken into account in the 1998 tree census, but in 2008 dead trees have been included to know the status of dead trees throughout Mumbai. The mortality rate of trees could be due to diseases, burning or illegal damages to the trees. Some environmentalists are of the opinion that dead trees are also ecologically important as they are the host for a variety of insects. Though, in the present investigation no dead trees were considered.

IV. CONCLUSION

Ulhasnagar being a commercial hub has witnessed high level of greenhouse gases been released into the atmosphere. These gases have taken toll on the health of average citizen of Ulhasnagar leading to number of ailments. The moderate values of quantitative characters like the
diversity and the distribution of trees could explain the anthropogenic activities of man, that affects the vegetation. The tree to man ratio 1: 51 appear to be alarming and present a grave picture of severe oxygen debt. The city population is at a greater risk to health problems related especially to oxygen deficient air they breathe. Moreover, the distribution of green cover is also irregular with greater deficiency at certain spots like the Camp II as compared to the rest of the city. The congestion in Camp II is severe and the scope for improvement in green cover seems to be next to impossible, unless stringent actions are enforced. The condition can be improved in other parts of the city with implementation of programmes supported by the government. In the recent years, many such activities are conducted annually like “Harit Kranti” (NGO), Tree Plantation Programmes by School, Colleges, Rotract and Rotary Clubs of the city in co-ordination with the Ulhasnagar Municipal Corporation planting more than 5000 trees every monsoon. These activities can in future improve the tree cover of the city. More over the present study can be helpful in understanding the efficiency of the urban garden and ways to improve the city green cover.

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