**DOCUMENTATION URBAN TREES IN SHIVAMOGGA, KARNATAKA**

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**Abstracts**

Many of the world’s major cities have implemented tree planting programs based on assumed environmental and social benefits of urban forests. Urban trees serve many useful functions such as climate change mitigation by carbon sequestration, air quality improvement by air pollution abatement, biodiversity conservation and source of ecosystem goods to urban inhabitants. They also have aesthetic, socio-religious and recreational value in urban contexts. In spite of the importance, they have not received much scientific attention. In this work, aimed to documentation and identification of trees. A survey was conducted during Dec-2022 to Decmber-2023. This paper investigates the diversity of tree species growing both within the built environment as well as road-side avenues in the seaside town of Shivamogga which is the administrative headquarters of Shivamogga district of Karnataka. The preliminary study of tree flora of Shivamogga comprises of about 89 species in which majority are indigenous species and few others involve exotic and introduced species. The dominant genera are *Ficus, Terminalia,* *Artocarpus and Syzygium.* The dominant species are *Pongamia pinnata ,Alstonia scholaris, Thespesia populnea, Terminalia catappa, Spathodia campanulata ,Ficus religiosa and Bauhinia purpurea.* The tree diversity represents a good assemblage of different utility categories such as wild and cultivated fruit yielding trees, shade and ornamental trees, sacred and religious trees, etc. Besides the high proportion of older trees of Rain tree and Ficus, presence of wild fruit yielding trees like *Artocarpus incisus* and *Spondias pinnata,* large sized sacred trees such as *Ficus religiosa* and *F*. *benghalensis,* rare medicinal species such as *Garcinia indica*, *Saraca asoca*, *Terminalia bellirica,* etc.*,* are some of the notable features of the urban tree flora of Shivamogga.

**Introduction**

Rapid urbanization is destroying natural ecosystems and degrading the environmental quality of towns and cities (Folke et al., 1997, Gregg et al., 2003, Alberti, 2004 and Marzluff, 2004). Many cities have been experiencing unprecedented growth, accompanied by severe environmental degradation (e.g. noise, carbon pollution, soil erosion, habitat loss, and species extirpation(Zipperer et al., 2011, Vesely, 2007, Young, 2010). Urban trees in parks, yards, streets, and remnant parcels have been features of urban design and landscape architecture for centuries ([Arnold, 1980](https://www.frontiersin.org/articles/10.3389/fevo.2021.603757/full#B5)), and are still integral components of civic spaces that are well-recognized for their public value.Presently,50% of total global population live in cities which occupy only 3% of the land are and it is expected that the urban population will further riseto67% in the next 50 years (Grimm *et al*., 2008). This kind of rapid urbanization is bringing complex changes to ecology, economy and society at local, regional, and global scales (De Fries and Pandey, 2010). Conservation and restoration of urban green spaces comprising of urban trees and forests are one important aspect of improving the environmental quality of urban areas. The term ‘urban trees’ generally includes trees growing both within the built environment as well as road-side avenues and public places in urban systems. In spite of their eco-sociological importance, urban trees have not received much scientific attention in India. There are only a few detailed studies on the urban trees of cities like Bangalore (Sudha and Ravindranath, 2000, Nagendra and Gopal, 2010), karwar (Shivanand *et al*., 2012) Chandigarh(Kohli *et al*., 1994) and Nagpur (Gupta *et al*.,2008).We have initiated a study of the urban trees of Shivamogga, Karnataka and the preliminary data on the species diversity of urban trees of this town is presented in this paper.

**Study area and methodology**

**Study area**

We selected Shivamogga which is located almost in central part of Karnataka, occupies an areas of 1058,000 hectares, it lies between 74o38’-76004 East latitude and 13027’-14o39’north longitude.

20 of the major roads of Shivamogga town, which together cover the different locations of the town, were selected for tree enumeration. All plants having an approximate girth of more than 15 cm. were considered as trees. All such trees visible on either side of the entire length of the selected roads were noted and their numbers counted, while walking from one end of the road to the other. They included trees occurring on road sides, parks and also inside the compounds of both public and private buildings. Trees were identified with the help of local flora and other relevant literature (Cooke, 1967; Bhat, 2003; Swaminathan & Kochhar, 2003,).

**Results and discussion**

The preliminary data on the species diversity of urban trees of Shivamogga town comprises of 89 species. These species represent a total of 72 plant genera and 36 families. A list of all these trees with their family, and common name provided as table 1. A total of 1876 trees belonging to all the species were enumerated during the present study. The tree species diversity of Shivamogga town is high when compared to the smaller area of the town. A comprehensive study of urban forests of 360 km2 area of Bangalore found 374 species in the different land-use categories (Sudha and Ravindranath, 2000). Urban forest in 43 ha of NEERI campusat Nagpur, Maharashtra has only46 tree species (Gupta *et al*., 2008). The 114 km2 area of Chandigarh which is considered to be the greenest city of India has about 200 species which includes about 66 multipurpose trees (Kohli *et al*., 1994).

Majority of the recorded tree species of Shivamogga are indigenous while only few species are introduced or of exotic nature. Majority of the introduced tree species are observed in the roadside, parks and in front of government buildings as avenue and ornamentals whereas the trees grown and maintained within the compounds of residential buildings and private lands are predominantly the indigenous types with various beneficial properties. A few gigantic sized trees of *Pongamia pinnata, Alstonia scholaris, Thespesia populnea, Terminalia catappa, Spathodia campanulata ,Ficus religiosa and Bauhinia purpurea* dominate the main roads of the town which represent the surviving older trees. Similarly, several large sized sacred and religious trees such as *Ficus religiosa, F. benghalensis, F. racemosa, Aegle marmelos, Mimusops elengi*, etc. are found at the vicinity of temples and other worship places.

When population density was considered, the top ten most common tree species are *Pongamia pinnata ,Alstonia scholaris, Thespesia populnea, Terminalia catappa, Spathodia campanulata ,Ficus religiosa and Bauhinia purpurea.* These 07 species together account for about 65% of the total trees of Shivamogga in which the share of the first five species is almost 50%. The other 82 species together account for only 35% of trees. Among them, about few species are represented by only five or less number of trees each. Notable among such rare species with five or less number of trees are *Artocarpus gomezianus, Adenanthera pavonia*, *Averrhoa bilimbi* , *Dalbergia latifolia* , *Kigellia pinnata*, *Mimusops elengi, Santalum album* and *Strychnos nux-vomica.* In general, the tree diversity represents a good assemblage of different utility categories such as wild and cultivated fruit yielding trees, shade and ornamental trees, sacred and religious trees, medicinally useful trees etc. Besides the high proportion of older trees of wild mango and jackfruit, presence of other wild fruit yielding trees like *Artocarpus incises* and *Spondias pinnata,* large sized sacred trees such as *Ficus religiosa* and *F*. *benghalensis,* gigantic exotic avenue trees such as *Samanea saman* and *Peltophorum pterocarpum,* rare medicinal species such as *Garcinia indica*, *Saraca asoca*, *Terminalia bellirica,* etc.*,* are some of the notable features of the urban tree flora of Shivamogga.

Table1. Tree species recorded from Shivamogga town.

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| --- | --- | --- | --- |
| Sl No | Name of the species | Family | Common name |
| 1 | *Acacia auriculiformis* | Fabaceae | Acacia |
| 2 | *Acacia nilotica* | Fabaceae | Acacia |
| 3 | *Adenanthera pavonia* | Fabaceae | Gulugunjimara |
| 4 | *Adina cordifolia* | Rubiaceae | Yethiga |
| 5 | *Aegle marmelos* | Rutaceae | Bilva |
| 6 | *Ailanthus triphysa* | Simoaroubaceae | Gugguladhoopa |
| 7 | *Albizia lebbeck* | Fabaceae | Bage |
| 8 | *Alstonia scholaris* | Apocynaceae | Halemara |
| 9 | *Anacardium occidentale* | Anacardiaceae | Geru,Godambi |
| 10 | *Annona reticulata* | Annonaceae | Rama phala |
| 11 | *Annona squamosa* | Annonaceae | Seethapala |
| 12 | Anthocephalus cadamba | Rubiacea | Kadamba |
| 13 | *Artocarpus gomezianus* | Moraceae | Vaatehuli |
| 14 | *Artocarpus heterophyllus* | Moraceae | Halasu |
| 15 | *Artocaprus incisus* | Moraceae | Deevi/Neeru halasu |
| 16 | *Averrhoa bilimbi* | Oxalidaceae | Bimbuli |
| 17 | *Averrhoa carambola* | Oxalidaceae | Carabalu |
| 18 | *Azadirachta indica* | Meliaceae | Kahibevu |
| 19 | *Bauhinia purpurea* | Caesalpiniaceae | Mandara |
| 20 | *Bauhinia tomemtosa* | Fabaceae | Mani Mandara |
| 21 | *Borassus flabellifer* | Arecaeae | Talemara |
| 22 | *Butea monosperma* | Fabaceae | Muthaga |
| 23 | *Caesalpenia pulcherrima* | Fabaceae | Rathnagandhi |
| 24 | *Callistemon citrinus* | Myrtaceae | Bottlebrush |
| 25 | *Calophyllum inophyllum* | Clusiaceae | Sura Honnemara |
| 26 | *Cassia siamea* | Fabaceae | - |
| 27 | *Cassia fistula* | Fabaceae | Kakkemara |
| 28 | *Casuarina equisetifolia* | Casuarinaceae | Galimara |
| 29 | *Ceiba pentandra* | Bombacaceae | Biliburuga |
| 30 | *Cordia myxa* | Boraginaceae | Challehannu |
| 31 | *Couroupita guianensis* | Lecythidaceae | Nagalinga pushpa |
| 32 | *Croton roxburghii* | Euphorbiaceae | Somaru |
| 33 | *Dalbergia latifolia* | Fabaceae | Sissum |
| 34 | *Delonix regia* | Fabaceae | May flower/ Kempu torai |
| 35 | *Dichrostachys cinerea* | Fabaceae | Banni |
| 36 | *Eucalyptus globulus* | Myrtaceae | Neelagiri |
| 37 | *Ficus benghalensis* | Moraceae | Alada mara |
| 38 | *Ficus elastica* | Moraceae | Rubbermara |
| 39 | *Ficus hispida* | Moraceae | Geritalu |
| 40 | *Ficus microcarpa* | Moraceae | Kirugoli |
| 41 | *Ficus racemosa* | Moraceae | Atti mara |
| 42 | *Ficus religiosa* | Moraceae | Arali/Ashwatha |
| 43 | *Garcinia indica* | Clusiaceae | Murugalu |
| 44 | *Gliricidia sepium* | Fabaceae | Gobbaramara |
| 45 | *Grevillea robusta* | Proteaceae | Silveroak |
| 46 | *Haldina cordifolia* | Rubiaceae | Heddimara |
| 47 | *Kigelia pinnata* | Bignoniaceae | Cucumber Tree |
| 48 | *Lagerstroemia speciosa* | Lythraceae | Nandi,Hole |
| 49 | *Leucaena leucocephala* | Fabaceae | Wild Tamarind |
| 50 | *Macaranga peltata* | Anacardiaceae | --- |
| 51 | *Mangifera indica* | Anacardiaceae | Mavu |
| 52 | *Manihot esculenta* | Euphorbiaceae | Maragenasu |
| 53 | *Melia azedarach* | Meliaceae | Hucchubevu |
| 54 | *Michelia champaca* | Magnoliaceae | Sampige |
| 55 | *Mimusops elegngi* | Sapotaceae | Spanish cherry |
| 56 | *Moringa oleifera* | Moringaceae | Nuggemara |
| 57 | *Muntingia calabura* | Elaeocarpaceae | Singaporecherry |
| 58 | *Myristica fragrans* | Myristicaceae | Jayikayi |
| 59 | *Nyctan thus arbor- tristis occidentale* | Oleaceae | Parijata |
| 60 | *Peltophorum pterocarpum* | Fabaceae | Gulmohur |
| 61 | *Phyllanthus cidus* | Euphorbiaceae | Rajavale |
| 62 | *Phyllanthus emblica* | Euphorbiaceae | Nellikayi |
| 63 | [*Pithecellobium* dulce](https://www.google.com/search?sca_esv=765b776112ffe1b3&rlz=1C1CHBD_enIN1009IN1009&q=Pithecellobium+dulce+family&spell=1&sa=X&ved=2ahUKEwjt2Zqd2byEAxW51zgGHfdrBwQQkeECKAB6BAgLEAI) | Fabaceae | Sihi hunese |
| 64 | *Plumeria obtusa* | Apocynaceae | Sampige |
| 65 | *Plumeria rubra* | Apocynaceae | Gosampige |
| 66 | *Polyalthia longifolia* | Annonaceae | Falls Ashoka |
| 67 | *Pongamia pinnata* | Fabaceae | Honge |
| 68 | *Samanea saman* | Fabaceae | Rain tree |
| 69 | *Santalum album* | Santalaceae | Gandha |
| 70 | *Sapindus trifoliatus* | Sapindaceae | Soapnut |
| 71 | *Saraca indica* | Fabaceae | Ashoka |
| 72 | *Simarouba glauca* | Simaroubaceae | Paradise tree |
| 73 | *Spathodia campanulata* | Bignoniaceae | Flametree |
| 74 | *Spondias pinnata* | Anacardiaceae | Amatekayi |
| 75 | *Strychnosnux-vomica* | Loganiaceae | Kasaraka |
| 76 | *Syzygium cumini* | Myrtaceae | Nerale |
| 77 | *Syzygium malaccensis* | Myrtaceae | Jambunerale |
| 78 | *Syzygium aromaticum* | Myrtaceae | Lavanga |
| 79 | *Tabebuia rosea* | Bignoniaceae |  |
| 80 | *Tamarindus indica* | Caesalpiniaceae | Hunese |
| 81 | *Tectona grandis* | Verbenaceae | Saguvani |
| 82 | *Terminalia catappa* | Combretaceae | Indian almond |
| 83 | *Terminalia paniculata* | Combretaceae | Hunalu |
| 84 | *Terminalia arjuna* | Combretaceae | Arjuna |
| 85 | *Terminalia bellirica* | Combretaceae | Shantimara |
| 86 | *Thespesia populnea* | Malvaceae | Huvarasi |
| 87 | *Alstonia scholaris* | Apocynaceae | Karaveera |
| 88 | *Trema orientalis* | Ulmaceae | Kiruhale |
| 89 | Ziziphus mauritiana | Rhamnaceae | Borehannu |

**Conclusion**

Urban trees serve many useful functions such as climate change mitigation by carbon sequestration, air quality improvement by air pollution abatement, biodiversity conservation and source of ecosystem goods to urban inhabitants. They also have aesthetic, socio-religious and recreational value in urban contexts. In spite of the importance, they have not received much scientific attention. In this work, aimed to documentation and identification of trees. The preliminary study of tree flora of Shivamogga comprises of about 89 species in which majority are indigenous species and few others involve exotic and introduced species. The tree diversity represents a good assemblage of different utility categories such as wild and cultivated fruit yielding trees, shade and ornamental trees, sacred and religious trees.

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