



e-flora of CCS University, Meerut, Uttar Pradesh, India.

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Abstract: A comprehensive study on the digitization of dendroids of CCS University, Meerut (UP) for the preparation of e-flora has been carried out during 2018-19. This e-flora is the first systematic approach for the digitization of dendroids in the Meerut region of Western Uttar Pradesh. It is a web-based program in which one can dynamically browse botanical name, vernacular name, family, and can search by name, distributional data, brief description, diagnostic features and images of all the dendroids located in the CCS University, Meerut (<http://efloraofccsumeerut.epizy.com/?i=1>). This study and web tool include 223 species of dendroids along with more than 1,133 images.

Key words: e-flora, dendroids, CCS University, Meerut

Introduction

e-flora, a new field of digital taxonomy, is a simple and easy way to get online information about plant diversity. 'Dendroids' refers to perennial, woody, arborescent (branching like a tree) trees. It includes shrub, tree as well as woody vines or climbers. According to Merriam-Webster *dendroid* describes something that "branches" in all directions from a central "trunk" in an irregular way. Digitization of dendroids to prepare e-flora is a comprehensive inventory and an interactive identification system of all dendroids of CCS University, Meerut. It is aimed to bring all native and naturalized dendroids of this university as an online catalogue of vascular plants. This digitization of dendroid flora is one of the simple web tools which will be highly useful to biologists as well as non-biologists for easy identification of plants and to understand their distribution. Review of literature reveals that Duthie (1903-1929), Murty and Singh (1961, 1964, 1967), Shishodia (2013) etc. are some the worker who worked on the flora of Upper gangetic plain and western Uttar Pradesh. Khanna *et al.* (1999), Uniyal *et al.* (1999), Srivastava (2004), Kishore *et al.* (2011), Malik (2015), Khanna (2017) etc. are most recent taxonomic paper dealing with flora of Uttar Pradesh.

The total area of forest in Meerut District is 21,314 hectares. Meerut city, Shardhana and Mawana are the three Tehsil in Meerut district which are further divided in to 13 blocks and about 850 villages. The district Meerut falls in Indo Gangetic Plains of India. Some works and website dealing with e-flora in India and outside India include,

<http://www.eflorakkl.in/>,
<https://sites.google.com/site/efloraofindia/>,
<http://www.efloraofgandhinagar.in/>,
https://www.cdac.in/index.aspx?id=st_ict_eFlora,
<https://sites.google.com/site/eflorapantnagar/>,
http://www.efloras.org/flora_page.aspx?flora_id=5,
http://www.efloras.org/flora_page.aspx?flora_id=2 etc.

The Survey of the literature revealed that no systematic work on digitization of plants has been done for Uttar Pradesh. This is a first systematic approach towards cataloguing the dendroids. CCS University, Meerut, is known for its lush green campus having a wide range of biodiversity. There is no documentary of the dendroids of this campus and during floristic study of Meerut district, exploration of plants of CCS University has remained untouched. This is why a comprehensive study for digitization of Dendroids of C.C.S. University, Meerut has been carried out.

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The first author has digitized the Dendroid of CCS University, Meerut. The study was carried out with the following objectives.

1. Documentation of dendroids of CCSU.
2. Preparation of web pages.
3. Digitization of dendroids including trees, shrubs and climbers.
4. To preparing a photo gallery of dendroids of CCS University, Meerut.

Materials and Methods

Field work

Study area is composed of variety of trees, shrubs and climbers. Majority of these are planted by the university and local people from time to time. Intensive exploration trips have been undertaken for about one year (2018-19). Field trips have been made at frequent intervals specially to obtain thorough collection of trees, shrubs and climbers. Special attention has been given to data relating to habit, habitat, association with other plants, frequency, distribution, height of the plants, color of the flower and fruit, local names, etc. Further every attempt has been made to study each plant by its phenology, relative abundance and distribution. Each specimen has been carefully examined in natural conditions.

Photography

The diversity of dendroids of CCS University, Meerut has been recorded by the capturing of images. We have used mobile and Nikon camera for photography. Photographs have been clicked for digitization. The digital photographs through camera have been captured by visiting regularly to all parts of the university. These digital images may provide an opportunity to future workers to re-examine this work against traditionally collected herbarium specimens. It has also reduced the cost of collection and maintenance. Besides, it has also reduced pressure on that species which is least in number and whose collection is strictly prohibited.

These images give an original look of fresh specimen of our collection rather than drier and pressed specimens which are degraded by and by. At least five images have been clicked for each plant including habit, flower, inflorescence

and other feature. For digitization we have selected quality images.

Identification

The living specimens were identified using several legal deeds and literatures like Hooker (1896), Brandis (1909), Duthie (1903-1929), Kanjilal (1928) etc. Identification has also been confirmed after matching the specimens with google images and opinion of experts. The collected images include at least five possible images of different parts of each species i.e; habitat, leaves, inflorescence, flower and fruits or sometimes seeds as possible as. The identification of images relies heavily on morphological features. The nomenclature of the plants was updated following the ICN (Shenzhen code, 2017), Plant list, IPNI etc. Several Facebook groups and pages like Flora of upper Gangetic plains and adjacent Siwalik, Plant identification public group, Plant wealth of India, Indian plant taxonomy, Indian flora, flora of western ghats, Flora of India, Plant identification and discussion public group have been used for plant identification.

Digitization

Now time has come to digitize all the published literature and organism. The flora of CCS University, Meerut has been digitized after making extensive floristic survey in campus. This online web tools has been developed by first author using HTML and Xara web designer. For converting information (notepad file) about particular species into database as .html document have been saved to compile plant database. A few initial steps of the coding are given below and the complete coding of this web tool can be seen on <http://efloraofccsumeerut.epizy.com/?i=1>.

Searching process: This web includes two major modules viz. information modules and simple search modules. Information module includes introduction, methodology, result and conclusions. Simple search modules include following tabs for searching the individual page of species easily. The search module of e-flora (<http://efloraofccsumeerut.epizy.com/?i=1>) is given below-

```

<!DOCTYPE
html>

<html lang="en">
<head>
<meta http-equiv="X-UA-Compatible" content="IE=EDGE"/>
<meta charset="utf-8"/>
<meta name="Generator" content="Xara HTML filter v.9.3.0.53"/>
<meta name="XAR Files" content="index_htm_files/xr_files.txt"/>
<title>index</title>
<meta name="viewport" content="width=device-width, initial-scale=1" />
<link rel="stylesheet" href="index_htm_files/xr_fonts.css"/>
<script><!--
if(navigator.userAgent.indexOf('MSIE')!=-1 || navigator.userAgent.indexOf('Trident')!=-1){
document.write('<link rel="stylesheet" href="index_htm_files/xr_fontsie.css"/>');}
if(navigator.userAgent.indexOf('Android')!=-1){ document.write('<link rel="stylesheet"
href="index_htm_files/xr_fontsrep.css"/>');}
--></script>
<script>document.documentElement.className="xr_bgh0";</script>
<link rel="stylesheet" href="index_htm_files/xr_main.css"/>
<link rel="stylesheet" href="index_htm_files/custom_styles.css"/>
<link rel="stylesheet" href="index_htm_files/xr_text.css"/>
<script src="index_htm_files/roe.js"></script>
<script src="index_htm_files/replaceMobileFonts.js"></script>
<script src="index_htm_files/prs4.js"></script>
<script src="index_htm_files/jquery.js"></script>
<link rel="stylesheet" href="index_htm_files/ani.css"/>
<style>
#xr_xr {top:0px;}
</style>
</head>

```

Simple search module:



Users can search the plant species according to their family, genera and species in a drop-down list which is alphabetically arranged. Each species page contains image gallery and information like family, habitat, brief botanical description and other features about plant species. An image gallery includes the image of particular species for its identification. It may

include images of plant habit, leaves, flower, fruits and sometimes seeds as available.

When users would click on the family navigation bar, a list of families will be opened and users can select a particular family from a drop-down list (Image-1). A genera list which is related to that family will be opened in the

adjacent column. If a user selects the genus, a list of species will also be open in the next column which is related to this genus. Then user can click “ok” on a particular species from a dropdown series to get information about that species. This species page includes botanical name of the plant, image gallery, family, vernacular names, brief description and diagnostic features about species, flowering and fruiting time and locality in the campus. The link for this eflora is <http://efloraofccsumeerut.epizy.com/?i=1>.

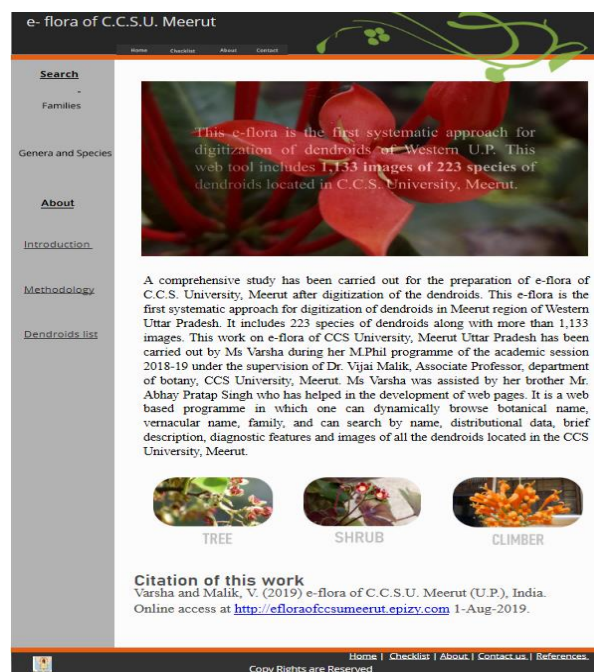
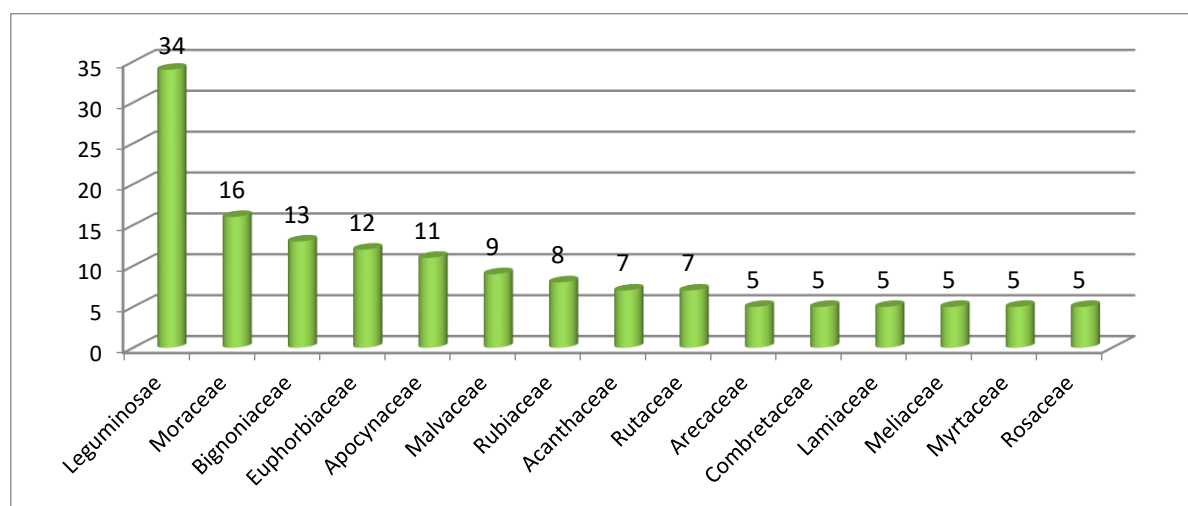


Image-1:



Graph 1. Status of dendroids in CCS University, Meerut.

Result and Discussion

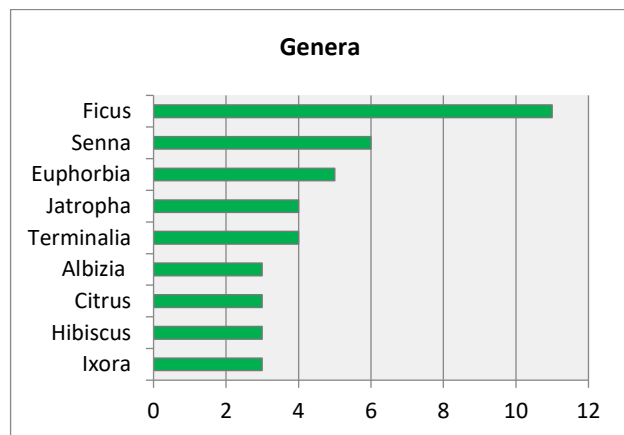
The present study has been carried out during the years 2018–2019. It includes digitization of dendroid diversity of CCS University, Meerut. During the study we observed and digitized 223 species of dendroid belonging to 175 genera and 68 families in CCS University, Meerut. In this study it has been found that Leguminosae are the dominant family and are represented by 26 genera and 34 species. The top dominant five families in the study are given in Graph-1. Out of the top 5 families *Ficus* is the most dominant genus and it include 11 species. The top five families of the study area are Leguminosae, Moraceae, Bignoniaceae, Euphorbiaceae and

Apocynaceae which include 33, 16, 13, 12 and 11 species respectively. Families like Acanthaceae, Rutaceae, Areaceae, Combretaceae, Lamiaceae, Meliaceae, Myrtaceae and Rosaceae are represented with same number of species.

Genera

Ficus has been found as dominant genus with 11 species. It is followed by *Senna* (6 species), *Euphorbia* (5 species), *Jatropha* (4 species), *Terminalia* (4 species). Genera like *Albizia*, *Citrus*, *Hibiscus*, *Ixora* and *Magnolia* are represented by 3 species each. Genera like *Acacia*, *Artocarpus*, *Barleria*, *Calotropis*, *Cinnamomum*, *Clerodendrum*,

Cycas, *Dracaena*, *Ipomea*, *Jasminum*, *Justicia*, *Lagerstroemia*, *Malus*, *Morus*, *Murraya*, *Rauvolfia*, *Sterculia* and *Thunbergia* are represented by 2 species each. The remaining genera contains only single species.



Graph 2: Genera and Species of dendroids in CCS University, Meerut

Acknowledgement

The authors are grateful to Dr. Rup Narayan Head, department of botany, CCS university, Meerut for support and encouragement.

References

1. "Eflora of India (2007 onwards). Database of India Plants-developed by the members of E-flora of India Google group. Accessed at <https://sites.google.com/site/efloraofindia/> on [25 July 2016]".
2. Duthie JF, Flora of the Upper Gangetic Plains and of the Adjacent Siwalik and sub-Himalayan Tracts. Calcutta, (1903-1929).
3. Khanna KK, Angiospermic plants of Uttar Pradesh- A Check- list. *Jour. Geophytology*, 47 (2017).
4. Kishore K, Tripathi AM, Roy S, Chaudhary LB, Assessment and Preservation of Tree Diversity of Uttar Pradesh, India, (2011): 68-75.
5. Malik V, Trees and Shrubs of Saharanpur, Botanical Garden, India, *Int. Res. J. bio. Sci.*, 4(6) (2015): 10 – 15.
6. Murty YS, Singh V, Flora of Hastinapur. *Agra Univ. J. of Res*, 10 (1961): 193-241.
7. Murty YS, Singh V, Two New Plant Records for the Upper Gangetic Plain. *Sci. & Cult*, 32 (1964): 597-598.
8. Murty YS, Singh V, *Eleocharis fistulosa* Schult, A new record for the Upper Gangetic Plain. *Jour. Bom. Nat. Hist. Soc*, 63 (2) (1967): 462-463.
9. Sambandan K, Dhatchanamoorthy N, Jagadeesan J, eFlora of Karaikal District, U.T of Puducherry, India, (2015): Online edition access at <http://www.eflorakkl.in> 10-Sep-2015.
10. Shishodiya, J. Study of Flora of District Meerut in Form of Digital Herbarium Database. Ph.D. Thesis CCS University, Meerut (2013).

Cite this article as:

Varsha and Vijai Malik. E-flora of CCS University, Meerut. *Annals of Plant Sciences* 9.1 (2020) pp. 3676-3680.

 <http://dx.doi.org/10.21746/aps.2020.9.1.1>

Source of support: CCS University, Meerut.
Conflict of interest: Nil.