



Documentation of the diversity, distribution pattern and seasonal variations of the plants belongs to Purandar tehsil Dist. Pune, M.S., India

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Abstract

Plant communities play a central role in the sustainable development as well as management by balancing biodiversity and safeguarding the environment. Plant diversity is the domain of Botany which includes variations, dissimilarities while Phytosociology is the subdomain of Plant Geography which includes distribution of plant species, number, types and interrelationships. The present researcher had performed to study diversity and ecological assessments, investigations, documentation by visiting to the Purandar fort and tehsil during 2014 to 2020. The essential approval from the Maharashtra State Biodiversity Board, Nagpur office was obtained for the photographic collection of plants. The coordinates for rare, endangered and threatened plants was noted by using GPS Instrument.

The field surveys has resulted in documentation of 1352 flowering plant species belonging to 138 families. The non flowering were also studied but not considered for an inventory. The accepted botanical names were checked, and confirmed through International Union for Conservation of Nature and Natural Resources (IUCN). The key assessment shows that, the forest pattern found in patches is deciduous and thorny scrub type due to variable climatic conditions as well climatic and edaphic factors. The present work was undertaken to discover the underexplored region with a view to bring about an account of vegetation.

Keywords: Documentation, diversity, environment, Purandar, vegetation

Introduction

Plant diversity and Phyto-geographical assessments and documentation of change in the composition of vegetation play a significant role in the economic development of the India. Since ancient times, wild plants have widely been used in traditional culture, and the link between wild plants and human life is a prominent feature. Wild plants are known to be used in ancient cultures for different purposes, such as food, medicines, production of goods, and magic and religious rituals (Ceccanti Costanza, 2018) [3].

Vegetation has treasured ability, nature has provided to meet the needed resources for the human in the form of food, fodder, fibre, fuel, medicine, timber, resin, oil, dyes etc. Plant communities play a vital role in sustainable development as well as management by balancing biodiversity and maintaining the environment.

India is a tropical country with a great heterogeneity of environments ranging from tropical rain forests to the deserts. As a result, it has rich biological heritage. India's Western Ghats is one of the ten 'mega-diversity hotspots' of the world (Myers, 1988), which is rich in endemic flora and fauna. The Western Ghats, or Sahyadri mountains, which represent the edge of Deccan Plateau of western India, are among the well-known global hotspots recognized for exceptional biotic diversity and endemism (Bhattarai, *et al.*, 2012). India is known for its rich diversity of medicinal plants and hence called as botanical garden of the world (Vedavathy, 1997) [12].

In Maharashtra state, the quantitative and qualitative structure of forest differ appreciably from dense valuable stands to bared slopes. Nearly one-third area of the state forest is infertile and very large areas are poorly kept. The countless factors affecting the forest represent varied plant communities in view of the wide range of physiographic and climatic conditions prevailing in the state.

Maharashtra is the fifth largest state of India. Its flora is heterogeneous in composition (Mahabale, 1987) [7]. Out of the total 3,700 higher plants reported from Maharashtra state, about 687 are known to be endemic (Tetali, *et al.*, 2000) [10]. Assessment of the plant diversity status is a main objective of the conservation organizations at international, national and regional levels. Plants are the important components of many ecosystems on an earth, forming their productive bases and physical structures, and producing resources which support a diversity of other organisms. Plant diversity and phyto-sociological studies acquire increasing importance in recent years in response to the needs of developing and under developing countries to assess their plant wealth (Ganorkar, *et al.* 2013) [4].

The pattern of vegetation distribution on ground is always associated with particular topographic features (Mahajan, 2006) [8]. The Eastern and Western Ghats consisting 10% of country's land area are expected to harbour about 55% of India's terrestrial and fresh water diversity (Venu, 1998) [13].

At provincial level, a large number of floristic assessments in Maharashtra have been done from time to time. Earlier workers put noteworthy inputs in the field of flora and vegetation of some certain areas of different regions in the state, like Flora of Purandar (Santapau, 1958), Singh and Kartikeyan (2000) [10] while published literature on floristic work is also available in the various regions for e.g. Flora of Kolhapur (Yadav and Sardesai, 2002) Flora of Baramati (Bhagat Rani, 2008) [1], Also a number of research papers have been published on the floristic components of different regions by different researchers in various journals.

Other than the monitoring methods, numerous methods of collection, preparation and preservation of plants are very much important for botanical field studies. The correctly identified and mounted specimens on herbarium sheets are stored in herbaria in which they are maintained and then used for taxonomic, phyto-sociological as well as phyto-

geographical, plant diversity studies. Such valuable evidence is used for reference purpose and as a display in educational institutes. Floristic composition is genuinely a matter of quality and vegetation is a matter of quantity. For small scale (large - region) studies and for habitat description ecological methods based on floristic composition are more significant (Goldsmith et. al, 1992) [5].

As stated before, Father Santapau did floristic work of Purandar Fort, but the entire tehsil was not explored yet. So this content is concerned with documentation of the diversity, distribution pattern and seasonal variations and preparation a digital herbarium of plants. Other than the flowering plants, non flowering plants are also considered for the studies.

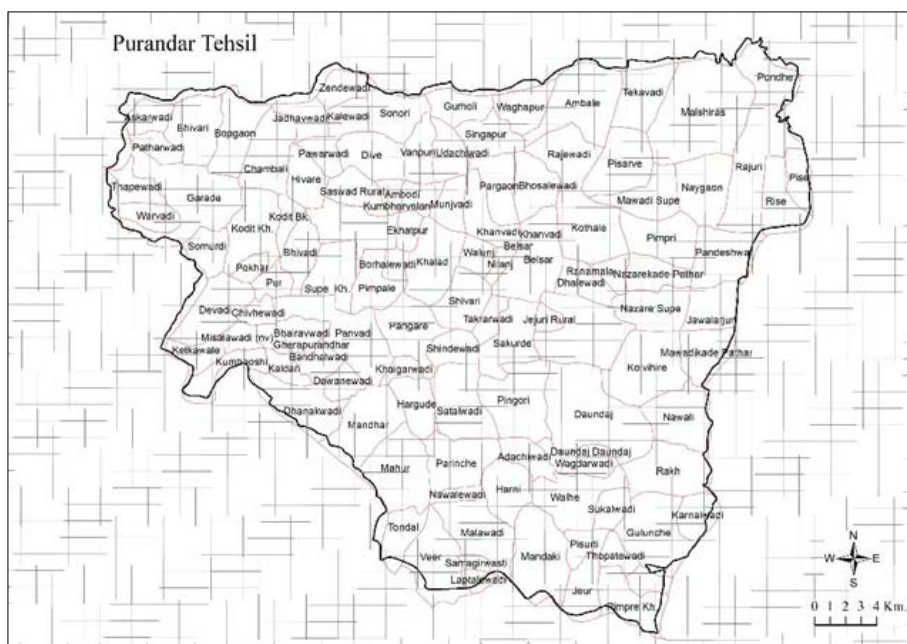


Fig 1: Map of Purandar Tehsil

Material

GPS Model GARMIN 72H (Geographical Position System) along with cells, Camera (SONY 20.4 Megapixels, 50X digital zoom, CORP DSC –HX300, 3.6 V, 4517842), Ecofriendly bags, Oil Paint to mark quadrats, Brush, Cloth, Rope, String, Nails, P.V.C. Rods locked in a single frame of 1m X 1m size, (04), Notebook, Field Diary, Pen, Pencil, Eraser, Ruler, Paper sheets, Secateurs, Sickle, Diggers, Stick, Scale-Tape, Special Folders, Field Press, Old Newspapers /Blotting Papers, Transparent Cellophane tape, Tags, Dissecting and Compound Microscopes, Dissection box, Big lenses, Floras, Field guide book, Herbarium sheets, Computerised plant list (alphabetical), Compiled photographs of plants etc.

Methods

Plant diversity and ecological assessments, investigations were performed by consistent visits to the Purandar fort and tehsil during 2014 to 2020. Initially The identification of plants was practiced by the random walk method and simultaneous listing of plants was done. Accomplishment of keen observations was a result of these visits. Plants were categorised based on their form into trees, climbers, shrubs and herbs. The field work, observations, empirical and interpretative approach was brought in the practice to the document the seasonal variations. Fig.2



Fig 2: Various Common and Abundant flowering plant species and their Habitat

Collection of common plant specimens for the identification

The essential approvals from the Incharge, Maharashtra State Biodiversity Board, and Nagpur were practiced. All documentary evidences and acknowledgements are preserved. As per the provisions of wildlife act, 1972 and regulations thereunder, the conditions for the research are maintained. The wildlife (Protection) act, 1972 is act of Parliament of India passed for the protection of flora and fauna. So, as far as possible, the collection of plants was strictly avoided. The plants which are very common were collected. The rare, endangered, threatened plants were not collected. Plant species were only observed at the frequent intervals and photographed.

The recognition, Identification of flowering plant species (Angiosperms) was done with the help of taxonomic literature especially by floras / inventory and also by using field guides etc. The identification of few genuine unidentified specimens were identified and confirmed by comparing them with trustworthy specimens at Botanical Survey of India, BSI, Western Circle, Koregaon Park, Pune. For the authentic identification of some of the flowering plant species, help of expert taxonomist was taken.

The digitized images of the photo slides were transferred to Laptop /Computer for further studies. The online databases like international plant name index, red data book, Social media consisting taxonomists groups, etc was used for the initial determination of taxa and then expert taxonomist were consulted. Flora of Purandar by Santapau consists 687 plant species were thoroughly studied with respect to their

Habit, Family, Local name, Origin, Flowering and Fruiting period, current status.

The present work is actually an extension work with many differences. In earlier studies, emphasis was given to the Purandar fort only. But the present study is based on the plants of entire tehsil. The present study has also emphasized wild and garden plants, exotic and non exotic plants etc. The field studies involve the preparation of an Inventory of various species of plants in the plant community. The floristic studies includes-

- Name of the Plant Species (Botanical name)
- Plant family
- Vernacular name
- Form /Habit of the Plant: Tree/ Climber/ Shrub- Undershrub /Herb etc
- Origin of the Plant
- Non flowering plants
- Flowering and fruiting data for flowering plants
- Remarks like Epiphytes, Parasites etc

The plant diversity assessments were directed to list plant species to find out the ecological, economical standings. The cryptogamic plants forms which include algae, fungi, lichens, Bryophytes and pteridophytes were also observed, identified and studied. Pteridophytes observed and studied were *Actinopteris dichotoma*, *Adiantum caudatum*, *Athyrium falcatum*, *Azolla pinnata*, *Lygodium sp.*, *Marsilea quadrifolia*, *Microsorium membranaceum*, *Microsorium punctatum*, *Nephrolepis cordata*, *Pteris sp.*, *Salvinia sp.*, *Selaginella krausiana*, *Tectaria cicutaria*. Fig.3



Fig 3: Pteridophytes studied at the Purandar Tehsil

Gymnosperms noted in the tehsil were very few. *Cycas circinalis*, *Pinus roxburghii*, *Thuja orientalis*, *Araucaria bidveli* were noted and studied.

Plant Diversity Data Analysis

To note the field observations and other details of the Purandar tahsil like geographical parameters, historical accounts, local names of the plants asked to the villagers etc. Field diary was maintained. The inventory of all explored plant species within the tehsil was entered in Computer/ Laptop for further studies. Plant inventory was

then processed statistically by using Microsoft Excel software. Plants were categorised habit wise, and applying other assessment criteria's. The data which was in the tabular form after processing by Excel was again transferred to Microsoft Word software to prepare charts and graphs. The accepted botanical names were checked, confirmed through valid online literature like International Union for Conservation of Nature and Natural Resources (IUCN). Determination of Indigenoussness / Nativity: To find out the origin of the plant species, a bio-geographic methodology was approached. All the plant species outside the political

borders of India were considered as exotic, whose indigenous ranges occur outside the boundaries of Indian Territory. There are forty eight Asian countries including India. The neighbouring countries like Bangladesh, Pakistan, Nepal, Bhutan etc. The origin / indigenous assortment for each and every species was originally obtained from various references like Dictionary of Plants (George Usher, 1984) [11] and it was confirmed with data from the internet sources. (Google, www.plant quarantine india.org; etc).

The exotic plants grown in formal gardens, nurseries, parks have also been incorporated in the inventory. The intension behind in doing so was, to avoid emission of any plant species. The domestic, non-domestic, cultivated, wild plants has been considered for the present revision. The taxa were well-thought-out at the taxonomic rank of species, subspecies and variety. As stated before, the species name was updated with the help of taxonomic online data bases like <http://www.ipni.org> (International Plant Name Index).

Result and Conclusion

The key assessment shows that, the forest pattern found in patches is deciduous and thorny scrub type due to variable climatic conditions as well and edaphic factors. The floristic assessment for herbaceous and woody vegetation was performed. The field surveys done by present author has resulted in documentation of 1352 flowering plant species belonging to 138 families. The accepted botanical names were checked, confirmed through International Union for Conservation of Nature and Natural Resources (IUCN). The non flowering plants were observed, photographed and listed for further studies.

For phyto-sociological studies the sampling unit, quadrat of one square meter for herbaceous vegetation and 30x30m for woody vegetation were laid down. In all 470 quadrats were laid down for the quantification of both the herbaceous and woody vegetation communities. 300 quadrats were laid down for herbaceous vegetation and 170 quadrats were laid down for woody vegetation in the entire Purandar tehsil. According to the Raunkiaer's law of frequency classes, Purandar tehsil represents heterogenous vegetation. The overall abundance and dominance for both herbaceous and perennial vegetation was noted location wise. The primary and secondary associations were also documented for all the regions of the tehsil where herbaceous and perennial vegetation was studied. The present research work will help in the preparation of the district flora and for providing materials for the flora of a state and the nation.

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