



Vegetation and Floristic Analysis of Forest of Toranmal and Environs of the Satpuda Ranges

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Key Words:

Floristic analysis
Forest of Toranmal
Forest types
Satpuda Ranges

ABSTRACT

Four types of spatial vegetation distribution patterns have been found in the two qualitative forest types in the study area. The soil characteristics, topographic features, increased human activities and availability of water have influence on the formation of these vegetation and forest types and the dominance of certain plant species. Satellite images, aerial photographs and field observations interpretations indicated changing of the vegetation and land-use pattern nearby the human settlements. These changes are artificial and made by inhabitants for their survival. Floristic analyses lead to an identification of 109 families, 386 genera and 539 plant species belonging to angiospermic, pteridophytic and bryophytic plant groups. 376 plant species showed varied potential in them, and such plant species are seen to be exploited at a larger scale. Most of them have been locally threatened and become conservation dependent.

INTRODUCTION

Toranmal is situated at 1100m height from MSL in the ranges of Satpuda. It belongs to the Nandurbar district of Maharashtra state and has been identified as a hill station from the period of British. The study area under present investigation geographically falls between 21°45' N-21°55' N latitudes and 74°25' E-74°30' E longitudes. The pioneering work on forest of this region provided information on ecology, distribution patterns of plant species and effect of fire on the vegetation (Karnik 1956, 1961 & 1967). Almeida (1996) mentioned plant species of this region in his flora of Maharashtra. Information on plants community and association, formation and plant resources are given by Khairnar & Shirke (1995). Further, Khairnar et al. (2007) and Khairnar (2007) studied systematic and varied potential of plant species of this area. Passing through concluding remarks of these workers, it has been observed that the day by day increased activities of inhabitants for their survival are responsible for shifting cultivation, illegal tree felling and trading, annual burning and increased grazing. Further, being a hill station there is also implementation of development projects, increased pressure of tourists, land sliding in rainy days, impacts by bringing changes in vegetation and floristic composition, and land-use pattern in the forest area. Keeping all these in mind, efforts have been made to analyse vegetation and floristic composition of the area.

MATERIALS AND METHODS

Initially, study area was mapped by using Survey of India toposheet No. K/46 on 1:50,000 scale for preparation of locality and other base maps. Satellite image and aerial photographs were used to prepare vegetation and land-use maps. Data on floristic composition were collected by extensive

field visits made in different seasons. The plant specimens collected and preserved according to Jain & Rao (1977) were identified with the help of Floras and Keys (Cooke 1958, Dixit 1984, Patil 1992, Almeida 1996). Interpretations of ecological data and types of forests were identified following Champion & Seth (1968), Michael (1986) and Puri et al. (1990).

RESULTS AND DISCUSSION

Topographically, study area has high hillocks with steep to precipitous slopes (45° - 77°), flat topped hill ranges and plateaus, deep narrow gorges and steep side valleys and seasonal and perennial water springs (Khairnar 1999). Geologically, the area is constituted chiefly of basaltic lava flows (Nair et al. 1996). Ferrallitic and margalitic less fertile, respectively reddish brown and gray colours poorly productive soils have been observed. The aluvio-colluvial deposits have been observed along the

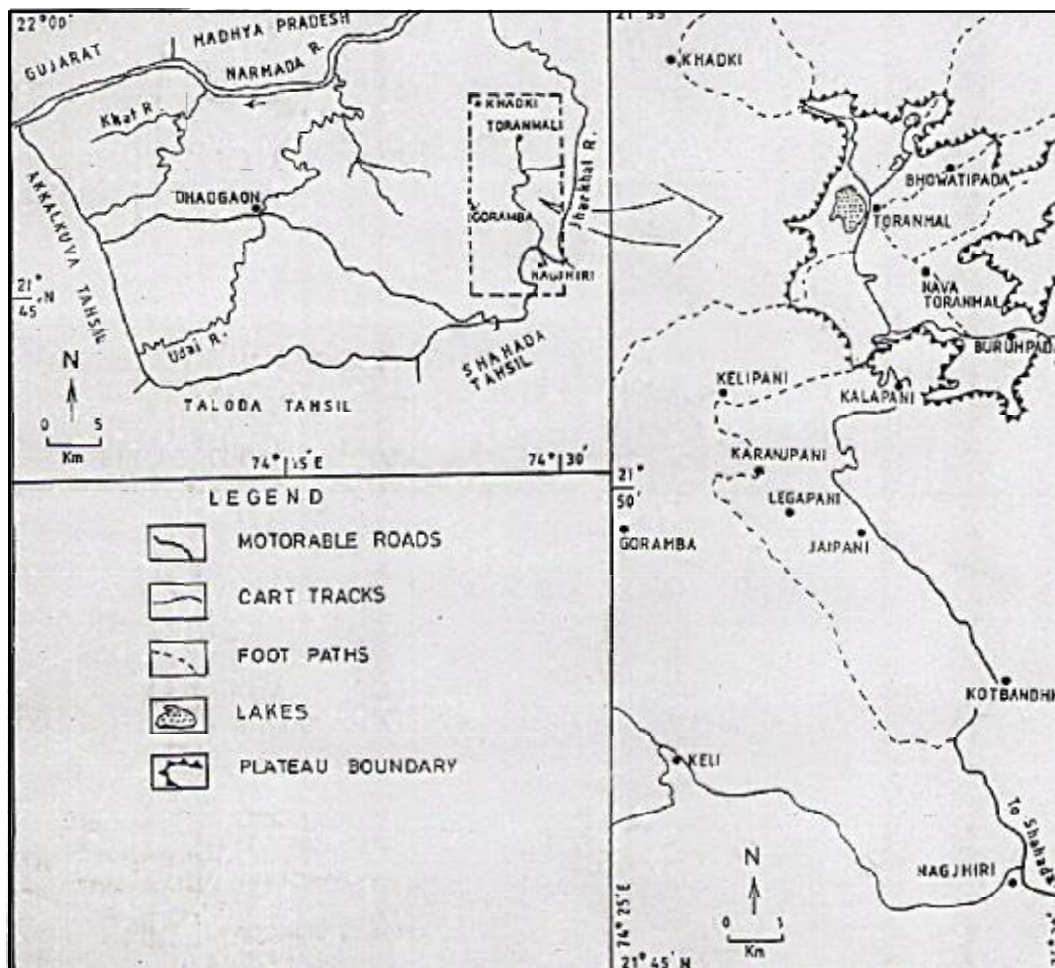


Fig. 1: Location map of the study area.

banks of stream courses and at the base of hills. The interpretation of aerial photographs and satellite image and field observations indicated very simple land-use pattern, viz., 55% forest land, 29.37% land under cultivation, and 15.62% barren land (Table 1). Further, occurrence of four types of vegetation distribution patterns in the study area namely, fairly dense vegetation at Jaiapani, Legapani, Karanjpani, Burumpada, Goramaba, Keli and Kotbandhani; low dense vegetation at Kalapani and Kelipani locality; agriculture and scattered trees; and scattered trees growing in forest (Table 2) at Navatoranmal, Bhowatipada, Khadki and Nagjhiri locality (Fig. 1). The classification of vegetation patterns is based on floristic composition in the tropical dry and moist deciduous forest types (Puri et al. 1990, Champion & Seth 1968).

Tropical dry deciduous forest: Most of the study area (56.12%) is under this type of forest. It is observed in low-lying localities surrounding to Toranmal plateau and high land spreads between Kalapani and Ngajhiri villages (Fig. 1). A virgin forest is observed at Nagjhiri, Keli, Khadki, Kotbandhani, Goramba, Bhowatipada and Burumpada etc. localities.

This forest is dominated by taller plant species such as *Tectona grandis*, *Anogeissus latifolia*, *Boswellia serrata*, *Lannea coromandelica*, *Diospyros melanoxylon*, *Terminalia arjuna*, *Madhuca longifolia*, *Buchnanian lanzan* and *Butea monosperma*. The plant species like *Schleichera oleosa*,

Table 1: Land-use pattern of the study area.

Land-use	Area in sq. km	Percent area
Barren land	25	15.62
Cultivated land	47	29.37
Forest land	88	55.00

Table 2: Data on spatial vegetation distribution.

Vegetation categories	Area under vegetation in sq. km	% area
Scattered trees	05	3.12
Agriculture and scattered trees	12	7.50
Low dense vegetation	20	12.50
Fairly dense vegetation	74	46.25

Table 3: Data on plant species of varied potential.

Potential	No. of plant species
Fruit bearing cultivated plants	08
Fruit bearing wild plants	16
Wild edible plants	05
Medicinal plants	74
Timber yielding	25
Fuel yielding	10
Fiber yielding	08
Perfume and oil yielding	15
Fodder	52
Wrappers and others	75
Wild ornamental	60

Haldinia cordifolia, *Moringa concanensis*, *Bauhinia purpurea*, *Cassia fistula*, *Cochlospermum religiosum* and *Cordia dichotoma* are seen sparsely in this forest. The trees of intermediate heights namely *Holarrhena antidysenterica*, *Wrightia tinctoria*, *Lagerstroemia microcarpa*, *Morinda citrifolia* and *Helecteris isora* constitute significant portion of this forest type in the study area. The climbers such as *Mucuna pruriens*, *Abrus precatorius*, *Argyrea speciosa*, *Ipomea quamoclit*, *Rivea hypocrateriformis* and *Cissus quadrangularis* have been commonly observed in this forest type. The climber *Gloriosa superba* was found growing on the trunk of isolated trees in the forest.

Tropical moist deciduous forest: This type of forest occupies 43.75% of the total study area in the form of patches. These areas correspond to the Toranmal plateau and high land between Kalapani and Jaipani villages (Fig. 1). High altitude, availability of water, direction of drainage pattern and relatively thicker soil cover maintain moist conditions over a longer period of time in this area. These conditions have promoted luxuriant growth of semi-evergreen and moist deciduous plant

Table 4: Data of locally rare, endangered, conservation dependent and data deficient plants.

Plant Species	Nos. of Individuals	Locality	Threat Category
<i>Cochlospermum religiosum</i>	03	Karanjpani, Legapani	LT
<i>Ehretia laevis</i>	01	Jaipani	DD
<i>Erythrina stricta</i>	02	Legapani	LT
<i>Manilkara hexandra</i>	01	Manibeli	LT
<i>Hymenodictyon orixense</i>	01	Deogoi Ghat	LR
<i>Oroxylum indicum</i>	01	Deogoi Ghat	VR
<i>Moringa concanensis</i>	01	Legapani	LT
<i>Salix tetrasperma</i>	01	Toranmal Plateau	LT
<i>Schleichera oleosa</i>	01	Karanjpani, Legapani	LT
<i>Alangium salvifolium</i>	03	Jaipani	LT
<i>Butea superba</i>	01	Jaipani	LT
<i>Clematis gouriana</i>	01	Toranmal Plateau	LT
<i>Hiptage madalbota</i>	02	Jaipani	LT
<i>Milletia auriculata</i>	02	Jaipani	LT
<i>Ventilago madraspatana</i>	02	Jaipani	LT
<i>Amorphophallus commutatus</i>	05	Legapani, Jaipani	LT
<i>Arisaema murrayi</i>	01	Jaipani	LT
<i>Costus speciosus</i>	01	Jaipani	ED
<i>Habenaria grandifloriformis</i>	≥55	Toranmal Plateau	CD
<i>Habenaria commelinifolia</i>	≥35	Toranmal Plateau	CD
<i>Spermiodictyon saveolens</i>	01	Jaipani	LT
<i>Dendrobium barbatulum</i>	05	Toranmal Plateau	CD
<i>Albizzia odoratissima</i>	01	Toranmal Plateau	DD

LT-Locally Threatened; DD-Data Deficient; LR-Locally Rare; VR-Vulnerable; ED-Endangered;
CD-Conservation Dependent

species. The semi-evergreen plant species, such as *Mangifera indica*, *Syzygium cumini*, *Ficus benghalensis*, *Deris indica*, *Holoptela intergrifolia*, *Haldinia cordifolia*, *Mallotus philipensis*, *Dendrocalamus strictus* etc. have been observed, especially on the high altitude plateaus and in the valleys in the form of patches. The plant species like *Tectona grandis*, *Anogeissus latifolia*, *Boswellia serrata*, *Madhuca longifolia*, *Buchnanania lanzan*, *Butea monosperma* and *Ougeinia dalbergioides* have been observed occasionally in this forest. The plant species like *Alangium salvifolium*, *Lagerstroemia microcarpa*, *Carissa congesta*, *Zizyphus rugosus*, *Ensete superbum*, *Carvia callosa*, *Pogostemon parviflorus*, *Colebrookea oppositaefolia*, *Aerva lanata*, *Barleria prionitis*, *Leea macrophylla* and *Plumabago zeylanica* have been seen to occupy significant areas of this forest type. This forest occasionally shows growth of lianas and other minor climbers, which include *Ventilago madraspatana*, *Butea superba*, *Combretum ovalifolium*, *Milletia auriculata*, *Cryptolepis buchmani*, *Dioscorea bulbifera*, *Hiptage madalbota*, *Argyreia speciosa*, *Antigonon leptopus*, *Clematis gouriana* and *Asparagus racemosus*. The most common herbaceous species occurring in this forest are *Amorphophallus commutatus*, *Costus speciosus*, *Curculigo orchioides*, *Curcuma pseudomonatana*, *Arisema murrayi* and pteridophytes such as *Cheilanthes chrysophylla*, *Athyrium hohenakerianum*, *Atherium filix-foenium*, *Adiantum capillsveneris* and *Actinopteris dhichotoma* etc., which grow luxuriantly in this forest type. At high altitude, i.e., 1100m, the unique herbaceous plant species like *Smithia purpurea*, *Habenaria grandifloriformis*, *Habenaria commelinifolia*, *Biophytum sensitivum*, etc. are found frequently in rainy season on the top of plateau.

A few trees in both the type of forests had parasites and epiphytes such as *Viscum articulatum*, *Dendrophthoe falcata*, *Vanda roxburghii* and *Dendrobium barbatulum*. The parasites may cause considerable damage to the forest (Singh & Ananad Prakash 1994).

The grasses like *Apluda mutica*, *Cymbopogon citratus*, *Heteropogon contortus*, *Themeda quadrivalvis*, *Alloteropsis cimciana*, *Polypogon monospeliensis*, *Spodiopogon rhizophous*, *Urochloa panicoides*, *Digitaria stricta*, etc. are more or less found in both the forest areas but they are distributed as per topography (Srivastava et al. 1994).

Despite of civilization advancement, man still depends largely on plants and their products (David et al. 2007). Numerous plant species useful to both tribal and advanced civilization occur in the forest (Table 3). In spite of cultivated ornamental plants, it has been seen that the wild endemic plants of western ghat have a good ornamental potential. In the study area also 60 wild plant species are having ornamental potential.

The plant species like *Cochlospermumu religiosum*, *Ehretia laevis*, *Erythrina stricta*, *Manilkara hexandra*, *Hymenodictyon orixense*, *Oroxylum indicum*, *Moringa concanensis*, *Salix terasperma*, *Schleichera oleosa*, *Alangium salvifolium*, *Butea superba*, *Clematis gouriana*, *Hiptage madalbot*, *Milletia auriculata*, *Ventilago madraspatana*, *Amorphophallus commutatus*, *Arisaema murrayi*, *Costus speciosus*, *Habenaria*, etc. are locally threatened and conservation dependent (Table 4). The fallow land in the study area may be planted by threatened species. Besides, efforts should be made to plant *Emblica officinalis*, *Terminalia arjuna*, *Terminalia bellerica*, *Carisa congesta*, *Madhuca longifolia*, *Buchnania lanzan*, *Dendrocalamus strictus*, *Diospyros melanoxylon*, *Butea monosperma* and scented grass *Cymbopogon citratus* on barren lands employing inhabitants. It will also minimize shifting cultivation, illegal tree felling and trading.

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