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Floristic Diversity and Structure of Tropical upland Forests: An Review

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Abstract

The floristic diversity and plant composition of tropical forests are great importance in the context of study on the structure and plant communities for the sustainable development and management of forests. The floristic diversity of forest areas are necessary to understand the plant communities and their strata, species composition and diversity. The study of floristic diversity and their structure of Sal and Teak forests (tropical moist and dry deciduous forests) in Chilpi forest range of forest division Kawardha (CG) is the great significances and compare them with the other similar forests. This review article describes the tree diversity estimation and basal area increment and their correlation and high tree species richness on steep altitudinal and topographic gradients with edaphically different habitats of the forests of Chhattisgarh as well as India by the many research workers.

Diversity and dominance indices could be compared with most of the species rich forest community while detailed comparisons with other studies are inadvisable because of large differences in sample size, standard girth parameters, and environmental conditions. Tropical regions of the world are frequently decked with luxuriant vegetation rich in species. The diversity of tree species is a fundamental component of total biodiversity in many ecosystems because trees are ecosystem engineers that provide resources and habitats for almost all other forest organisms (Huston, 1994).

Keywords: Forest, Biodiversity, Trees, Species, Ecosystem, Plant Community.

Introduction

The Present study on floristic diversity and their structure of tropical upland was carried out in Chilpi forest range of forest division Kawardha, Chhattisgarh. The study is significant with the effect of topographic factor on floristic diversity and structure of forest ecosystems and generating the useful baseline data in order to conserve and manage the native flora of forest ecosystems in Chhattisgarh forests.

Aim of the Study

The Basic aim of the study is that to understand the effect of topographic factors on floristic diversity and forest ecosystem in Chhattisgarh state.

We have reviewed the article to find out the density , frequency and abundance of forest vegetation particularly tree diversity and species composition .The extensive field surveys was undertaken during year 2018 & 2019 and the data were collected to the random sampling method in the different forest compartments covering the all parts of Chilpi forest range. The floristic diversity analysis was carried out by Quadrate method and required quadrates of 20 m × 20 m size were laid out at the study sites. On the basis of the survey data from the quadrate sampler, the diversity and structural distribution of forest vegetation, was investigated.

We sampled 35 individuals/hectare represented by 43 species (including 8 unidentified) from 11 families and 30 genera (list of plants to be prepared) from the selected study area. Altogether 35 individuals/ha were recorded from the forest area and together they have contributed to 11.78/hectare basal cover. Based on the density distribution of tress, *Sal, Saja, Haldu, Tinsa, Bel* were among the most dominant species. There was a marked reduction in the density of species like *Kullu, Kaikad, Chichola, Kasai, Jamun, Tondri, Arjun etc.* Sal, saja, Haldu, Bahera, Tendu, Mahua and *Dhamen* had the larger girth in the forest stand and contribute to about 30% of the total basal cover of the forest. High species richness of trees in the forest was probably related to site climatic conditions and its transitional

nature; this vegetation type is an ecotone area suitable for both moist tropical tree species. Greater tree species richness particularly in the tree component could also be the result of the succession process that tends to increase species diversity in the community. The forest was dominated by high valuable timber species.

Understanding of vegetation composition, diversity of species, their habitats and comparisons with similar other habitats are becoming tools to understand the level of adaption to the environment and their ecological significance. Primary forests have been decreasing extensively or disappearing because of various disturbances. In India habitat destruction, over exploitations, pollution and species introduction are identified as major course of biodiversity loss (UNEP,2001). Tropical dry forest is the most widely distributed land cover type in the tropics. As the rate of land use change from forest to pasture or agriculture is high in tropics, it is becoming increasingly important to quantify the ecosystem biomass and its annual production.

Naidu and Kumar (2016) studied the knowing **s**pecies diversity is a useful tool in plant ecology and forestry to compare the composition of different species. Tree species diversity in tropical forests differ greatly from location to location mainly due to variation in biogeography, habitat, and disturbance (Neumann and Starlinger, 2001, Padalia et al., 2004). Plant diversity changes are compared in conjunction with human impacts. Certain changes are easy to predict, at least qualitatively. Population sizes when reduced may have deleterious consequences (Sukumar et al 1992). Hence, the present investigation was aimed at assessing the tree diversity changes in the Eastern Ghats of India.

Kumar *at. el.* (2010) estimated tree species diversity in the tropical dry deciduous forest of western India. A total of 24 families, 85 genera, 93 tree species, and 1724 individuals of trees were encountered in tropical dry deciduous forest of western India. Out of these, 16 families comprising 18 genera, 18 tree species and 538 individuals were recorded in site Butea forest, where as 23 families comprising 34 genera, 38 species and 728 individuals were recorded in siteTF and 20 families comprising 33 genera, 37 tree species and 458 individuals were recorded in Mixed forest. A total of 93 tree species belonging to 24 families was recorded. Among all families, Combretaceae had maximum number of species (9 species) followed by Rutaceae (7 species), Annonaceae, Euphorbiaceae, Fabaceae and Mimoseae (6 species) and Apocynaceae, Bignoniaceae and Caesalpiniaceae (5 species) and Burseraceae, Moraceae and Verbenaceae (4 species) and Arecaceae, Myrtaceae, Sterculiaceae and Ulmeae (3 species) and Anacardiaceae, Bombacaceae, Meliaceae, Sapotaceae and Simaroubaceae (2 species) and Balantiaceae, Ehretiaceae and Sapindaceae (1 species).

Biological Diversity

Several workers investigated biological diversity and productivity in various forest ecosystems. Sawarkar (2016) studied the biological diversity combine to provide ecological services; these are many; those somewhat understood are taken for granted and mostly ignored while many are still being discovered. The Millenium Ecosystem Assessment Report of 2005 is an excellent place to start developing that understanding. Biological diversity can be assessed and measured at six levels –genes, species, communities, populations, landscapes and ecosystems.

Singh *et. al.* (2016) estimated forests are dominated by different species of oaks (*Quercus* spp.) at different altitudes. These oaks are intimately linked with hill agriculture as they protect soil fertility, watershed, and local biodiversity. They also play an important role in maintaining ecosystem stability. This work was carried out to study the diversity and regeneration status of some oak forests in Garhwal Himalaya, India. A total of 18 tree species belonging to 16 genera and 12 families were reported from the study area. Species richness varied for trees (4–7), saplings (3–10), and seedlings (2–6). Seedling and sapling densities (Ind/ha) varied between 1,376 Ind/ha and 9,600 Ind/ha and 167 Ind/ha and 1,296 Ind/ha, respectively. Species diversity varied from 1.27 to 1.86 (trees), from 0.93 to 3.18 (saplings), and from 0.68 to 2.26 (seedlings). Total basal area (m^2/ha) of trees and saplings was 2.2–87.07 m^2/ha and 0.20–2.24 m^2/ha, respectively, whereas that of seedlings varied from 299 cm^2/ha to 8,177 cm^2/ha. Maximum tree species (20–80%) had "good" regeneration. *Quercus floribunda*, the dominant tree species in the study area, showed "poor" regeneration, which is a matter of concern, and therefore, proper management and conservation strategies need to be developed for maintenance and sustainability of this oak species along with other tree species that show poor or no regeneration.

Premvani *et. al.*(2017) attempted the forest biodiversity threats of north central eastern ghats in India. Forests are a rich repository of India's biodiversity but wide spread habitat destruction is threatening its status plant diversity in tropical forests was mostly associated with forests structure and species composition. Quantitative inventory of tree species diversity revealed a considerable variation in the composition of dominant species and stood density between forests areas.

Upadhyay and Mishra (2014) estimated the ecological investigation of mangrove ecosystem of Bhitarkanika sanctuary in Odisha. The structural parameters like height, diameter and basal area of mangrove tree species at four sites of the sanctuary viz., Bhitarkanika, Dangmal, Thakurdia and Kakranasi, were measured and compared with the mangroves of other parts of the world. Dominance diversity curve was found lognormal in shape for this area representing high diversity condition. Of the 29 species recorded from the study sites, only 8 species were common at all sites. The trees with higher DBH classes were found in the protected core sites of Bhitarkanika and Dangmal. The Riverine species of Bhitarkanika ecosystem have much higher complexity index values than other mangrove ecosystems of the

world, which indicates that this ecosystem is favourable to a diversity of mangrove species

Parthasarathy and Karthkeyan (1997) estimated the species diversity, population structure, abundance and dispersion patterns of all woody plants ≥10cm gbh were inventoried in two 1-ha plots of tropical dry evergreen (sacred grove or temple) forests at Kuzhanthaikuppam (KK) and Thirumanikkuzhi (TM) on the Coromandel coast of south India. Site KK is a stunted forest (average tree height ca 6 m) and TM a tall forest (average tree height ca 10 m). A total of 54 species (in 47 genera and 31 families) were recorded. Species richness and stand density were 42 and 38 species and 1367 and 974 individuals ha−1 respectively for the sites KK and TM. About 50% of the total species were common to both the sites. Site TM is twofold more voluminous (basal area 29.48 m2 ha−1) than KK (basal area 15.44 m2 ha−1). Nearly one third of the individuals are multi-stemmed in the low-statured site KK whereas one fourth of the tree density is multi-stemmed in TM. Species abundance pattern varied between the two sites. The abundance of three species in KK and two species in TM is pronounced.

Kushwaha and Nandy (2012) studied that the forests were quantitatively analysed to work out the species richness, diversity, evenness, dominance, importance value, stand density and the basal area. The analysis showed that plant richness and diversity in moist sal forests of northern West Bengal are higher than the dry sal forests of south-west Bengal; a total of 134 tree (cbh ≥30 cm), 113 shrub and 230 herb species were recorded in the moist sal forest compared to 35 tree, 41 shrub and 96 herb species in dry sal forest.

Jayakumar and Nair (2013) studied the species diversity of trees varied across vegetation types in the Western Ghats landscape. Rarefaction curves show that species diversity is highest in SEMI and EVER and lowest in WOOD while species abundance is highest in MONT. Vegetation types of study area are in heterogeneous in distribution. There were large differences in species composition of adult trees and regenerating individuals in the disturbed vegetation types as compared to undisturbed stands. The study reveals that the anthropogenic disturbance causes disruption of forest structure and change in species composition which ultimately leads to reduction of tree species richness and abundance which are the major attributes of forests. New recruits were found in all vegetation types, indicating that they were not headed to extinction; however, disturbed stands may move to new species compositions in the future.

Swaine and Whitmore (1988) studied that the species richness of tropical rain forests creates difficulties for ecological analysis. It may usefully be simplified by defining ecological species groups whose members share characteristics of importance for determining forest structure and composition. Many such classifications have been published, but few are properly explained. The terminology is confused from lack of precise definitions. We propose a simple division of tree species into two groups or guilds, pioneer and non-pioneer (or climax), based on seed germination and seedling establishment. Within each guild there is continuous variation and we recommend arbitrary subdivision by height at maturity. We believe this classification to be applicable in all tropical rain forests.

Conclusion

The natural vegetation had declined and the natural habitats were fragmented due to repeated disturbances, this can be restored by providing different levels of protection. Restoration and conservation of forests would definitely help to improve the condition of the forests. The productivity of dry tropical forests is comparatively lower than moist tropical forests. Relatively low rain fall and high temperature in summer and poor fertility in land and low site quality in forest floor lead to low productivity. Beside the anthropogenic disturbances are moderate to severe in these forests.

Forest fire, illicit felling and grazing problems further degrade these forests as most of the villagers in vicinity greatly depend on these forests for their subsistence and livelihood.

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