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Comprehensive Changes of Vegetation of Forest Division of Jhalawar, Rajasthan: A Case Study

[*1] Dilip Kumar Sharma and [2]Dr. OP Sharma

[*1] Ph.D. Scholar and Assistant Professor, Department of Botany, S.M.M. Government Girls College Bhilwara, Rajasthan, India.

[2]Professor and Head, Department of Botany, Government College Bundi, Rajasthan, India.

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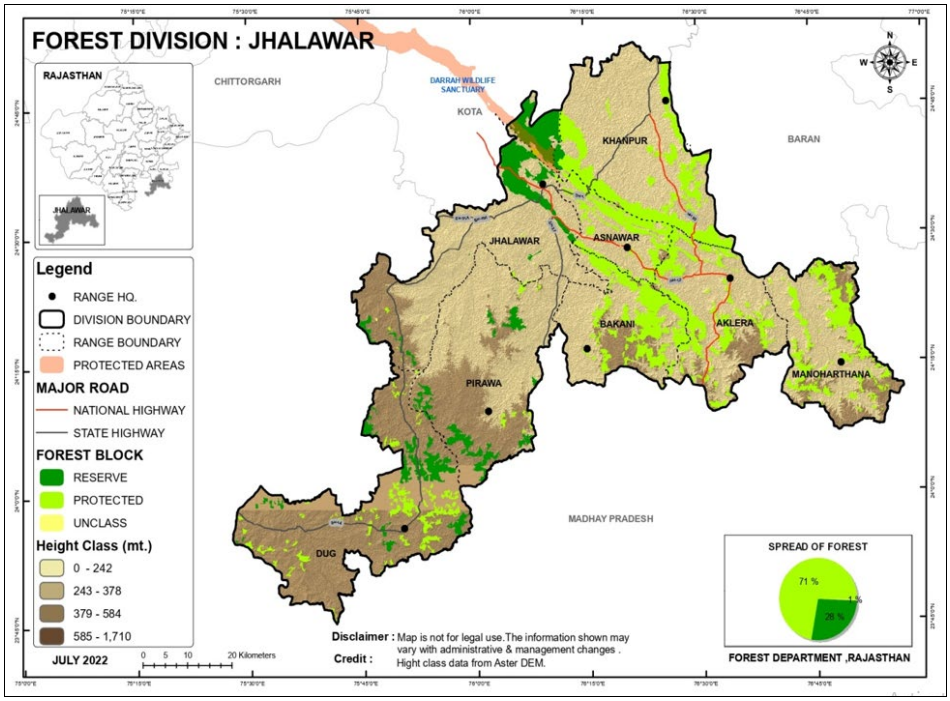
***Corresponding Author**
Dilip Kumar Sharma
Ph.D. Scholar and Assistant Professor, Department of Botany, S.M.M. Government Girls College Bhilwara, Rajasthan, India.

Abstract
Rajasthan has a wide range of agro-climatic conditions that support the diverse range of plant species. The livelihood or farming practices of ancient people are also truly sustainable in many ways to cultivate and conserve the plant species. The objective of this research was to answer the question of whether the floristic characteristics of the forest communities described in the working plan 1961-62 to 1970-71 have changed, and if so, what are the reasons for these changes and their environmental and economic consequences. The study showed a significant decrease in the number of native plant species due to natural or artificial changes in habitats, which evolved towards richness of invasive communities. The study identified that the disappearance of vegetation due to two main causes one is a natural cause, (regeneration of patches) and another is the anthropogenic disturbance. The impact is described more broadly and considers both the positive and negative roles of changing the floristic compositions of forest ecosystems.

Keywords: Plant biodiversity, phytosociology, patches, communities.

Introduction

Jhalawar district is located in south-eastern part of Rajasthan lies between Latitude 23º45’33’’N to 24º52’53”N and longitudes 75º 27’ 47’’E to 76 º 56’ 10’’E, spread an area of 6219 km^2. Forest Division of Jhalawar is spread over whole of Jhalawar district of Rajasthan. District forest area comprises of 128671.522 hectare distributed in eight forests ranges namely Aklera, Asnawar, Bakani, Dag, Jhalawar, Khanpur, Manoharthana and Pirawa it makes 19.08% of the total land area of Jhalawar district (forest.rajasthan.gov.in). The growth and development of plants are determined by habitat factors under natural conditions. The environmental balance is a product of natural evolution and natural selection. The man made environment with creative ideas is the outcome of his cultural evolution enforced by natural selection. Plant community analysis is a useful tool to determine the current state and diversity of the vegetation cover and recognize the degree of naturalness and dynamism of communities in a given study area. The pace of changes can be assessed as the current floristic composition and individual communities including the degree of coverage for each species expressed either as a percentage or by using the scale provided by Braun-Blanquet which makes it possible to identify potential threats to the ecosystem and take protective measures. The comparison has been taken with different old literature to allows the capture of vegetational changes that are taking place in recent years and thus aids the interpreting these changes. Although taxonomical, floral and phytosociological studies on vegetation of Jhalawar and its environs studied (Sharma and Shiringi, 1986) but comprehensive anthropogenic plant community changes of forest division of Jhalawar has not adequately been studied so far. It is therefore, the present investigation has been undertaken.



Source: forest.rajasthan.gov.in

Fig 1: Map of Forest Division of Jhalawar showing spread of forest

The directions and effects of the changes were investigated by considering the natural and economic consequences. These changes can be traced out at the species level and at the level of anthropogenic phytocoenoses. However, it seems that a common feature should be point out in well-defined research plots. Most field observations and experiments are short-term and yield quite limited knowledge regarding the dynamics of ecosystems operating under the influence of long-term factors. Therefore, an alternative to long-term observations of permanent research plots should be carried out. The concept underlying this type of research is described in 1929 by Conard and Galligar. The disadvantages of reproducing vegetation descriptions in a given area are mainly associated with possible shifts in the compared areas, as well as the subjectivity of the researcher. With the help of tools and techniques of science and technology have been given him a flourished life and protection against natural calamities. In the process of development and cultural evolution forest and pastures have been cleared, cultivation has been extended and made extensive, drainage system has been altered and the pattern of productivity of the natural crop has been changed. During last couple of years the outcome of rapid industrialization and urbanisation through the construction of barrages, dams, railway and roads and higher use of fertilizers and pesticides and waste accumulation have been depleted and upset the forest ecosystem. Deforestation is the direct result of the demand of the floral and faunal wealth. The discussion of pollution is mainly human centric aimed at improving human comfort and existence. Various steps has been taken by stack-holders of society for maintaining environmental balance and regeneration of forest but simultaneously there is large scale degradation of forest as remarkably evidenced in Bhimsagar, Kalisindh, paravan, Chhapi, Chanwali and Akawad dam projects. The Forest division at present losses approximate 100 tons of subsoil annually through erosion. The area is continually stripped bare of trees as well as of the humus rich soil. Only barren land and mineral wastes are ultimately left which don't normally allow the growth of any native vegetation. The responsibility of reclaiming the land and bringing his area to its original fertile state, is left to the mercy of forest department cannot be reversed and flourishes with invasive vegetation. Moreover, a large part of our forest vegetation is utilized by villagers, unless an alternative source of livelihood is provided. This paper discusses on effect of comprehensive anthropogenic activities on plant community or phytosociology in forest division of Jhalawar, is the ultimate consequence of the disturbance of natural equilibrium caused by man and his technology.

Material & Methods

The basis of this study was a comparison of plant community descriptions made in 1961-62 to 1971-72 working plan of forest division of Jhalawar with the current status of those plant communities. The reconstruction of research plots by creating a numeric map layer in the ArcGIS 10 software. This procedure allowed the determination of geographical coordinates for the research plots to mark field locations, which provided the basis for comparative studies. The GPS map device was used to locate the plots in the field using geographical coordinates. The size of the research areas for the comparative studies used approximately 500 m^2. However, the comparative studies focused more on qualitative changes than quantitative changes within the described plant species. The descriptions were prepared in accordance with the Braun-Blanquet method, which is commonly used in this respect. All of the initial phytosociological plots after comparing them with the present state were grouped into pairs, which enabled capture of the differences between the individual research areas. To highlight human impacts on forest vegetation and forest soils ecosystems analyzed with current status of similar habitat condition were selected. These differences were determined by a list of species that had disappeared in a given place, a list of species that had entered over the past several decades and a list of species that had been recorded and that are currently present. These types of observations have been carried out in different parts of the world and in different types of plant communities. In Canada, the results of a 40-year study of the alpine floor tundra were published by Danby *et al*. pointing to an increase in the

number of species in the studied communities and linking this fact to global warming. Holzinger *et al*., Kullman, Vittoz *et al*. and Odland *et al*. obtained similar results for alpine and subarctic communities. Becker *et al*. presented the results from 40 years of observations of vegetation changes in former coppice forests in the central part of Germany and indicated that the reasons for the changes were associated with the manner of development as well as eutrophication of water bodies. Important studies on the floristic and ecological work of various part of India have been made by Mathur (1960), Champion and Seth (1968), and Sharma (2020 and 2022).

Results & Discussions

Forest Plant species have been found to be affected by sulphur oxides, oxidants, ozone, PAN, nitrogen oxides, heavy metals like mercury, halogen derivatives leads high rate of mortality, chlorosis, suppress photosynthesis, bleaching, and even necrosis. The sensitivity is generally maximum during period of high light intensity and high temperature. Damage from paniculate matters from cement dust, construction road and dam's site leads injury in stomata and chlorosis in leaves and shoots. Indiscriminate use of herbicide and pesticide have serious repercussions as they often attack the non-target plants and remain for long periods in environment even, interfere with the reproduction of birds which directly related to dispersion of seeds and accelerating soil erosion by killing the soil binders which disrupt the ecological balance. They may cause siltation of the fresh water bodies with eutrophication and water table as well. Another facet of the problem of pollution is evolution of resistant plant species. Such evolution may be very rapid in relation to plants exposed to acute and chronic pollution hazard. This is of special ecological significance as it enlarges the tolerance range of the species enabling it to survive in a polluted situation as seen in *Lantana camara* and *Prosopis juliflora* at road site and *Pontenderia crassipes* (formerly *Eichornia crassipes*) and *Ipomoea carnea* in water bodies are results of natural selection. Such plants can be effectively used as indicators and pollutant avengers. Thus plantation programmes needs knowledge of pollution resistant plants.

The forest-forming species of forest division of Jhalawar are *Annogeissus pendula* (Kali dhonk) mixed with *Diospyros melanoxylon* (Tendu), *Aegle marmelos* (Bel), *Acacia catechu* (Khair), *Mitragyna parvifolia* (Kalam), *Acacia leucophloea* (Subabul), *Acacia nilotica* (Babul), *Madhuca indica* (Mahua), *Emblica officinalis* (Anwala), *Annona squamosa* (Sitaphal), *Terminalia tomentosa* (Sadaria), *Terminalia bellerica* (Bahera), *Terminalia arjuna* (Arjun), *Cassia fistula* (Amaltas), *Albizia lebbek* (Kali siris), *Albizzia procera* (Safed siris), *Butea monosperma* (Palash), *Sterculia urens* (Kadaya), *Wrightia tomentosa* (Dudhi), *Balanites aegyptiaca* (Hingotia), *Feronia limonia (Limonia acidissima or* Kaint), *Schleichera oleosa* (Kusumb), *Boswellia serrata* (Salar), *Dichrostachys cinerea* (Khairi), *Pterocarpus marsupium* (Bija), *Delbergia latifolia* (Shisham), *Lannea coromendelica* (Gurjan), *Holoptelea integrifolia* (Churel), *Ougenia dalbergioides (Desmodium oojeinense or* Tinsa) have been growing intensively. Rare species like *Schrebera swietenioides* (Mokha), *Pandanus odoratissimus* (Kewara), *Crateva adansonii* (Barna), *Syzygium cumini* (Jamun), *Cratea nurvala* (Chhotabarna), *Bridelia squemosa* (Kaljharia), *Acacia pinnata* (Kumta), *Capparis spinosa* (Kalwari), *Salvadora oleoides* (Peelu), *Anogeissus latifolia* (Safed Dhonkda), *Sterculia villosa* (Udal), *Boswellia serrate* (Salar) and *Buchanania lanzen* were recorded.

The pure patches of *Lagerstroemia parviflora* arises by anthropogenic circumstances due to selective felling of *Annogeissus latifolia* and *Annogeissus pendula* in Manoharthana range. *Terminalia tomentosa* and *Ougenia dalbergioides* patches arises due to selective felling of *Annogeissus pendula* in Khanpur range. A drastic decrease has been seen in *Acacia catechu* and its variety *sundra* because of soil degradation. Most of the forest species reproduce by coppice and runners, regeneration by seed is almost absent. *Dendocalamus strictus* paches only left in Thandi Jhir. *Tectona grandis* large tree patches disappeared from Nakti ki Tapri, Ghantoli, Malanwasa, Sagoni, Dhanoda, Kotra Chamargarh and whole Manoharthana range. *Boswellia serrate* is observed commonly attacked by *Loranthus* and *Sterculia urens* decrease due to excessive tapping in Manoharthana range. *Butea monosperma* replaced by *Zizyphus mauritiana* in plains. *Acacia nilotica* in Khanpur range decreased due to excessive grazing. The incidence of *Santalum album* in Sarod and Pirawa range is very poor because haustorising on *Anogesus pendula* and *Carissa spinarum*. *Buchanania lanzan* and *Comiphora mukul* totally disappeared in natural paches. *Diospyros melanoxylon* drastically decresed in Bakani range.

Experimental Forest area where plantation activities carried out appeared with *Ficus benghalensis, Polyalthia longifolia, Melia azedarach, Erythrina suberosa, Tamarindus indica, Dalbergia sissoo, Azadirachta indica*, *Acacia nilotica, Ficus religiosa.* Replacement of tree species by shrub and grasses is another notable feature the main shrub species are *Grewia flavescence, Nyctenthes arbortristis, Flacourtia indica, Carissa spinarum, Balanites aegyptica, Gymnosporia spinosa and Zizyphus xylopyra, Zizyphus muritiana, Zizyphus glabberrima, Capparis spinosa and* grasses like *Apluda mutica, Themeda quadrivalvis.*

Depending on the species compositions of the stands, which are affected not only by habitat conditions but also by anthropogenic approach? Some of the plants communities play a special role in ecosystem known as keystone species. The phytosociological studies in 2024-25 showed the richness of only 45 species. Biological and environmental impact is higher than speed of regeneration. Elimination of keystone species for plant association leads invasion of grasses and shrubs. The alluvial soil along rivers, streams and foothills contain mixed miscellaneous forest, due to infrastructure activities like dams, roads irrigation projects and railway lines this mixed miscellaneous forest replaced by shrub and grasses. This led to the elimination of 46 species patches that were recorded in various forest blocks earlier. Impacts on the species compositions of plant communities have been seen as appearance of *Prosopis Juliflora, Lantana camara, Lantana veronicifolia, Ichnocarpus frutescens, Alstoniascholaris, Ipomoea carnea subsp. fistulosa, Parthenium hysterophorus, Dendrophthoe falcate and Vitex negundo* which is not consumed by herbivores played a key role in history of changes of vegetation cover. These species was not noted earlier in the middle of the forest but today it formed a layer of shrubs with a coverage of 75% - 100% (grade 5 on the Braun-Blanquet scale) and had displaced most species from the forest floor by shading harmful to coppice regeneration or through allelopathic interaction (or both factors combined). From a natural point of view, a significant negative effect of the changes in vegetation is the loss of natural plant communities. Restoration of these habitats needs to be associated with the restoration of species described specific habitat conditions.

Conclusion

Comparative anthropogenic impact on vegetation of forest division of Jhalawar has been conducted at different times with long intervals have significant scientific and practical meaning. The study provides information on the dynamics of plant cover as related to the effects of human activity, climate change, dynamics of endangered and invasive species and all other factors affecting plant development. The comparison and interpretation presented in this paper shows the effects of forest management on floristic changes over 60 years can be treated as a case study. It has been noted that the consequences of the disappearance of each species could be considered separately both in terms of nature as well as economic point of view. For further research phytosociology provides the opportunity to preserve wild germ plasm from extinction and their conservation and sustainable utilization as seen in gene pool reserve and gene sanctuaries in NEFA and Arunachal Pradesh. Environment impact assessment of rare, endangered and commercially important species should be updated in view of the dynamics of evolution. Non biological or synthetic pollutants are always a systematic increase with increase in the number of human being and livestock. Several of these compounds are extremely stable and persist in the environment for a considerable period with the potentiality of causing long term environmental hazard. The use of fertilizers and pesticides in agriculture, industrial effluent and catalyst, discharge of automobile sector like solvent, stabilizers, coolants, lubricants, smoke, domestic sewage with detergent, mining, construction of roads, dams and barrages results in the depletion of vegetation cover, soil erosion and invasion of exotic weeds.

References

1. Conard H, Galligar G. Third Survey of a Long Island Salt Marsh. Ecology. 1929; 10:326-336.
2. Mathur CM. Forest types of Rajasthan. Indian forester. 1960; 86:734-739.
3. Braun-Blanquet J. Pflanzensociologie. Grundzüge der Vegetationskunde. 3. Auflage Springer Verlag, Wien, 1964.
4. Champion HG, Seth SK. A revised survey of the forest types of India. Government of India publication, Delhi-6., 1968.
5. Linzon SN. Effect of air pollutants on vegetation, 143, ed. BM Mc Cormere, Reidel Holland, Scientific study of atmospheric pollution, 1971.
6. Bhattacharya SK, Bose R, Dutta SC, Ray AB, Guha SR. Neuropharmacological studies on strictamine isolated from Alstoniascholaris. *Indian Journal of Experimental Biology*. 1979; 17(6):598-600.
7. Bakker JP, Olff H, Willems JH, Zobel M. Why Do We Need Permanent Plots in the Study of Long-Term Vegetation Dynamics? *Journal of Vegetation Science*. 1996; 7:147-156.
8. Holzinger B, Hülber K, Camenisch M, Grabherr G. Changes in Plant Species Richness over the Last Century in the Eastern Swiss Alps: Elevational Gradient, Bedrock Effects and Migration Rates. Plant Ecology. 2008; 195:179-196.
9. Dazy M, Jung V, Férard JF, Masfaraud JF. Ecological recovery of vegetation on a coke factory soil: Role of plant antioxidant enzymes and possible implications in site restoration. Chemosphere. 2008; 74:57-63.
10. Vittoz P, Randin C, Dutoit A, Bonnet F Hegg O. Low impact of climate change on subalpine grasslands in the Swiss Northern Alps. Global Change Biology. 2009; 15:209-220.
11. Odland A, Høitomt T, Olsen SL. Increasing Vascular Plant Richness on 13 High Mountain Summits in Southern Norway since the Early 1970s. Arctic, Antarctic, and Alpine Research. 2010; 42:458-470.
12. Konatowska M. Rutkowski, P. Department of Forest Sites and Ecology, Faculty of Forestry, Poznań University of Life Sciences, Poznań, Poland. Phytosociology-A Useful Tool for the Assessment of Past and Future Human Impacts on Plants and Forest Ecosystems, 2019.
13. Ziaja M, Wójcik T, Wrzesien M. Phytosociological Data in Assessment of Anthropogenic Changes in Vegetation of Rzeszów Reservoir. Sustainability. 2021; 13:9071.
14. Sharma OP. Invasive Plant Species of Rajasthan and their Impact on Natural Habitat, *International Journal of Science and Research*. 2022; 11(12).