



Life Forms and Biological Spectrum of the Flora of Shekhawati Region, Rajasthan

G K Barupal

Department of Botany, Phycology and Ecophysiology Lab., Govt. Dungar College, Bikaner, Rajasthan, India

Abstract

The present study was taken up to evaluate the floristic composition of Shekhawati region of Rajasthan, which topographically comprises of hillocks, sand –dunes, sandy plains and cultivated fields. A total 4 protected areas of Shekhawati region viz. Beer Jhunjhunu, Shakambhari Conservation Reserve, Tal Chhappar Wildlife Sanctuary and Leel ki Beer were selected in the present study. A total 384 plant species have been recorded from protected areas of Shekhawati region. Life forms and biological spectrum of the vegetation of protected areas of Shekhawati region has been prepared. In the present study for biological spectrum, phanerophytes showed maximum life form followed in a decreasing order by therophytes, cryptophytes, hemicryptophytes and chamaephytes of the total vegetation.

Keywords: Life forms, biological spectrum, flora, protected area, shekhawati region

Introduction

The Shekhawati region is a part of Great Indian Desert and located in the North-East part of Rajasthan. It comprises of three districts namely Jhunjhunu, Sikar and Churu. The region is not only a vast stretch of sand dunes, but also with the mountain range of Aravalli, interspersed with low hills and gravel plains. The south-eastern part of the region is semi-desert type with many hillocks and mountains of Aravalli and plains. Sikar and Jhunjhunu districts are including in this category. The north-west part of this region is a typical desert type which covered with thick layer of sand dunes. The Geographical spread of Shekhawati region is a good combination of plains, hills, sand mounds. A protected area is a clearly defined geographical space which recognized, dedicated and managed through legal or other effective means including ethno botanical aspects to achieve the ecosystem services and cultural values.

A life form of the plant is the total of all life processes and evolved directly in response to the environmental condition. Humboldt (1886) [7] proposed the concept of the life forms for which he considered the location of perennating buds or organs. Raunkiaer (1934) has given an account of the life-form system in which the position of perennating organ (bud or plant propagule) has been considered as the most important criterion for classification of plants into different life-forms. According to this system, plant species can be grouped into five main classes viz. phanerophytes, chamaephytes, hemicryptophytes, cryptophytes and therophytes. A biological spectrum is formed when all the species of a plant community are classified into life-forms and their ratio expressed on numbers or percentage. Raunkiaer (1934) constructed a normal spectrum which act as a null model against which different lifeform spectra could be compared. The occurrence of similar biological spectra in different regions indicates similar climatic conditions. Differences in the life-form distribution between the normal spectrum and a biological spectrum would point out which life form characterizes the phytoclimate or the vegetation under study. The biological spectra of different regions of India have been carried out by various workers (Das and Sarup, 1951 [6]; Sarup, 1952 [16]; Meher-Homji, 1964 [9]; Agarwal, 1974; Charan *et al.*, 1978

[5]; Shringi and Sharma, 1989 [22]; Pandey and Parmar, 1993 [10], Sharma and Dhakre, 1993 [17]; Reddy *et al.*, 1999 [15], 2002 [14]; Rana *et al.*, 2002 [12]; Sharma and Prajapat, 2002 [18]; Jamir *et al.*, 2006 [8]; Pattanaik *et al.*, 2007 [11]; Agarwal and Gena, 2017) [1].

The present work has been taken to study the assemblage of different life forms using floristic spectrum and vegetation spectrum and to prepare the biological spectrum to infer the existing phytoclimate of different sites along the climatic gradient in Shekhawati region of Rajasthan. In the present study, total 4 protected areas of Shekhawati region viz. Beer Jhunjhunu, Shakambhari Conservation Reserve, Tal Chhappar Wildlife Sanctuary and Leel Ki Beer were selected for the analysis of floristic, life forms and biospectrum. Beer conservation reserve area lies in Jhunjhunu district. Ecologically, Beer Jhunjhunu is almost plain with a semi-arid climate. Shakambhari Conservation Reserve is situated in Sikar and Jhunjhunu districts both and the topography of the area divided into hills, pediment zone and a few plains. The forest of this area is classified into tropical dry deciduous and tropical thorn forest. Tal Chhappar Sanctuary has open grassland with spread all over *Acacia* and *Prosopis* trees. High wind velocity, low relative humidity and scanty rainfall are the other climate characteristics of this area. However, it shows great floristic diversity. Leel ki Beer is situated in Rajgarh tehsil of Churu district.

Material and Methods

The four areas of Shekhawati region shows great variation in climatic conditions i.e. mean annual rainfall and elevation. Field studies were carried out in wet and dry seasons to cover the overall vegetation and species diversity. Phytosociological data was collected by laying 20m x 20m quadrats for tree species, 5m x 5m for shrubs, 1m x 1m for herbs and grasses. Information of habit, habitat, flowering and fruiting period, vegetation type, the nature of perennating bodies was collected to draw a biological spectrum, following the concept of Raunkiaer (1934). Life form category of all the species were recorded during the study. The Floras (Bhandari, 1978 [3], 1990 [4]; Parmar, 1987; Shetty and Singh 1987 [19], 1991 [20], 1993, [21]) were consulted for species identification. In the construction of floristic spectra each species was assigned to a single life

form. The simple metrics was used to analyze proportions of life forms.

Results and Discussion

Biological spectrum is considered as the sensitive indicator of the prevailing physical and biological factors. It is formed when all the species of a plant community are classified into life-forms and their ratio expressed on numbers or percentage. The occurrence of similar or different biological spectrum indicates the phytoclimate of that particular vegetation under study. Qualitative characters of the flora of Shekhawati region were analysed in the present study. The life form composition of the community is the manifestation of the adaptations of its component species to the climatic condition, contributes to community architecture (Jamir *et al.* 2006) [8]. Among the various qualitative characters, life forms of a plant community from protective areas were studied. 5 life forms viz.

Phanerophytes, Chamaephytes, Cryptophytes, Hemicryptophytes and Therophytes were observed and biological spectrum of studied area was analysed on the basis of their percentage contribution. A total 384 plant species have been recorded from protected areas of Shekhawati region. Habit wise information of species provides a clear picture of high species richness among herbaceous category. Out of 384 plant species, phanerophytes constitute maximum 120 species (31.25%). Chamaephytes were represented by 32 species (8.33%), cryptophytes by 73 species (19.01%), hemicryptophytes by 61 species (15.89%) and therophytes constitute 98 species with 25.52%. Phanerophytes showed the peak of biological spectrum. The next dominant life form in the present was therophytes. Dominance of trees and shrubs vegetation showed the significance of Phanerophytes and therophytes are the annual plants that complete their life cycle in favourable condition and survive in the form of seeds during unfavourable conditions.

Table 1: Comparison in Biological Spectra of Shekhawati Region and Raunkiaer's Normal Spectrum

SNo	Locality of Life-forms	Life Forms				
		Ph	Ch	Cr	HCr	Th
1.	Shekhawati Region (Total= 384 species)	31.25 % (120 species)	8.33 % (32 species)	19.01 % (73species)	15.89 % (61 species)	25.52 % (98 species)
2.	Normal Spectrum (of Raunkiaer)	28.01 %	9.0 %	4.0 %	26.0 %	13.0 %

*Ph-Phanerophytes; Ch-Chamaephytes; Cr-Cryptophytes; HCr-Hemicryptophytes; Th-Therophytes

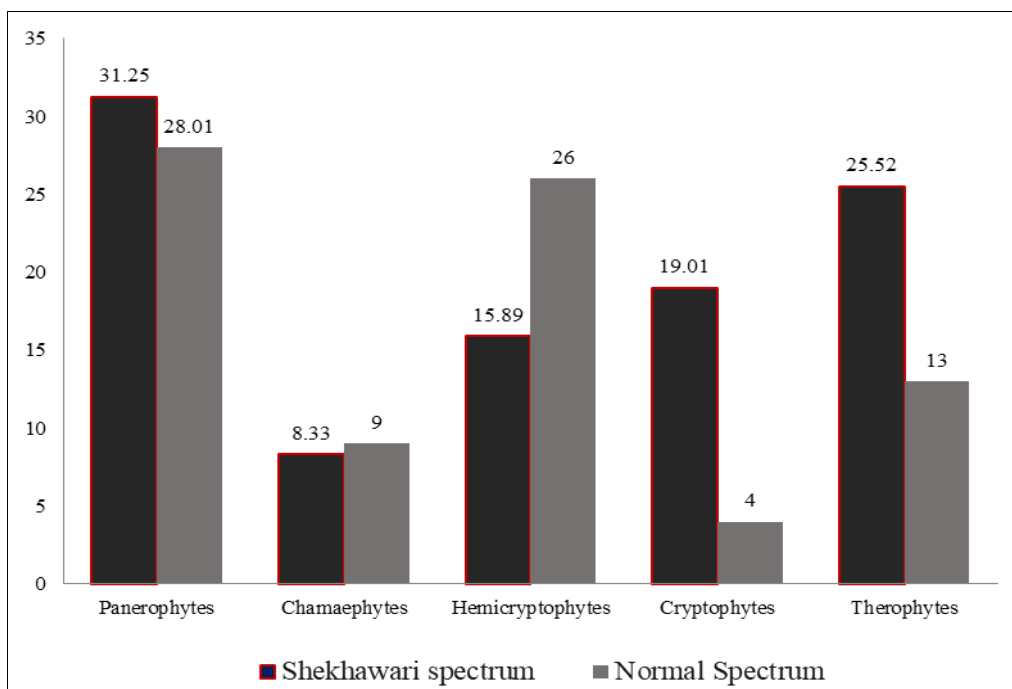


Fig 1: Comparison in Biological Spectra of Shekhawati Region and Raunkiaer's Normal Spectrum

The biological spectrum of protected areas of Shekhawati region was compared with the normal spectrum of the Raunkiaer's system (1934) for the word. Comparative study revealed that the phanerophytes, cryptophytes and therophytes showed the higher value of spectrum as compare to Raunkiaer's normal spectrum. The cryophytes in present study was observed to be 4 times higher and therophytes was observed to be 2 times higher than normal spectrum. Chamaephytes and hemicryptophytes were observed to be less than normal spectrum.

Acknowledgement

Authors were thankful to Prof. R. K. Gehlot, Former Head, Department of Botany for providing valuable guidance and constant encouragement.

References

1. Agarwal S, Gena D. Life forms and Biological spectrum of the vegetation of Nasirabad Valley, Ajmer district, Rajasthan. International Journal of Science and Research,2017;6(10):107-109.

2. Agarwal S K. The biological spectrum of the flora of Gogunda and Prasad (Udaipur, Rajasthan). *J. Biol. Sci.*,1974:17:67-71.
3. Bhandari M M. Flora of the Indian Desert. Scientific Publishers, Jodhpur, 1978.
4. Bhandari M M. Flora of the Indian Desert. Scientific Publishers, Jodhpur (Revised Edition.),1990.
5. Charan A K, Sen D N, Rajpurohit K S. Biological spectrum of the vegetation of western Rajasthan Desert. *Ind. J. For.*,1978:1 (3):226-228.
6. Das R B, Sarup V. The biological spectrum of Indian desert flora. *Univ. Rajasthan Stud. (Bio.)*,1951:1:36-43.
7. Humboldt A. *Ideen zu einer Physiognomik der Gewechra*. Tubingeon,1806.
8. Jamir S A, Upadhaya K, Pandey H N. Life form composition and stratification of montane humid forests in Meghalaya, northeast India. *Trop. Ecology*,2006:47(2):183-190.
9. Meher Homji V M. Life forms and biological spectra as epharmonic criteria of aridity. *J. Indian Bot. Soc.*,1964:43:424-430.
10. Pandey R P, Parmar P J. An assessment of Biological spectrum of the flora of Rajasthan Desert. *J. Econ. Taxon. Bot.*,1993:17 (1):99-103.
11. Pattanaik C, Reddy C S, Biswal A K. Life Forms and Biological spectrum of Bhitarkanika National Park, Orissa, India. *Indian J. Forestry*,2007:30(3):307-313.
12. Rana TS, Datt B, Rao R R. Life forms and biological spectrum of the Flora of Tons Valley, Garhwal Himalaya (Uttaranchal), India. *Taiwania*,2002:47(2):164-169.
13. Raunkiaer C. *The Life forms of plants and statistical plant geography*, Oxford University Press, Oxford, 1934, 632.
14. Reddy KN, Jadhav SN, Reddy CS, Raju VS. Life forms and Biological spectrum of Marriguda Reserve Forest, Khammam district, Andhra Pradesh. *Indian Forester*,2002:128(7):751-756.
15. Reddy C S, Bhanja M R, Raju V S. Angiospermic flora and Biological spectrum of Jakaram reserve forest, Warangal district, Andhra Pradesh. *Indian Forester*,1999:125:1152-1166.
16. Sarup S. The biological spectrum of the flora of Mt. Abu. *Univ. Rajasthan. Stud. (Biol.Sci.)*, 1952: 2:1019.
17. Sharma SC, Dhakre JS. Life form classification and biological spectrum of the flora of Shahjaahanpur district, Uttar Pradesh (India). *Indian J. Forestry*,1993:16(4):366-371.
18. Sharma S C, Prajapat R R. Biological spectrum of the vegetation of Bikaner district of Rajasthan. *Oikoassy*,2002:1:15-16.
19. Shetty BV, Singh V. *Flora of Rajasthan*. Botanical Survey of India, Kolkata, 1987, 1.
20. Shetty BV, Singh V. *Flora of Rajasthan*. Botanical Survey of India, Kolkata, 1991, 2.
21. Shetty BV, Singh V. *Flora of Rajasthan*. Botanical Survey of India, Kolkata, 1993, 3.
22. Shringi OP, Sharma N K. Botany of Jhalawar district, Rajathan IV. The biological spectrum. *J. Econ. Taxon. Bot.*,1989:13 (3):599-604.