

Asian Resonance

Life Forms and Biological Spectrum of Vegetation of Tehsil Deedwana, District Nagaur-Central Rajasthan, India

Abstract

The present study has been carried out to work out the life form composition and biological spectrum of the saline tract flora of Tehsil Deedwana, District Nagaur, central Rajasthan. A total of 331 tracheophytes have been listed and grouped into various life forms classes. Therophytes, Phanerophytes and Nano Phanerophytes are major life form classes present in the area. Hemicryptophytes, Geophytes, Hydrophytes, Parasites were observed to have comparatively low percentage. Biological Spectrum of the area has been compared with Raunkiaer's Normal Biological Spectrum as well the spectra of the adjacent regions.

Keywords: Life Forms, Biological Spectrum, Flora, Saline Tract, Tehsil Deedwana, Rajasthan.

Introduction

India occupies a special status in terms of ecosystem, species and genetic diversity because of its location in the tropical zone, physical features and eco-climatic conditions. Rajasthan is the largest State of India and is situated in the north-western part of India between 23°3'N and 30°12'N latitude and 69°30'E and 78°17'E longitude, occupying an area of 3,42,239 sq.km. The elevation of land surface varies from 214 to 1375 m. In shape, it is an irregular rhomb with north-south and east-west diagonals, the former about 784 km. and the latter 850 km. long. The western and north-western boundaries are marked by Pakistan. In the north and north-east, it is bounded by Punjab, Haryana and Uttar Pradesh, in the east and south-east by Madhya Pradesh and in the south-west by Gujarat states of India.

The remarkable feature of Rajasthan is the Aravalli range, perhaps the oldest folded mountain range in the world. It intersects Rajasthan from end to end, diagonally running from Delhi to the plains of Gujarat for a distance of about 692 km. Within Rajasthan, the range runs from Khetri in the north-east to Khed Brahma in the south-west for a length of about 550 km. The elevation of Aravalli range gradually rises in south-west direction, as it is 335 m at Delhi and in Rajasthan 792 m at Khetri, 1727 m at Mt. Abu. Further south-west wards, the elevation gradually decreases to the plains in Gujarat. It has a wide range of habitats, climatic factors, physiography, soil types and geological antiquity. Phytogeographically, the state of Rajasthan forms the eastern extremity of the great arid and semi-arid belt of the world; the great Sahara desert belt passes through the western part of the Rajasthan State. The major part of eastern and south-eastern region forms the western part of the gangetic plains; the southern region a part Deccan plateau. During post monsoon period and winters i.e. October to February the winds are very light and variable, with north westerly and northerly winds being more frequent. In the hot and rainy seasons, the winds usually move between south-west and west. During summers, dust storms are also very common. Hail storms are very rare and they generally occur from January-March. Fogs are comparatively more frequent, usually occurring between December to February.

Nagaur district is located in the centre of the Rajasthan state between 26°25' and 27°40' north latitudes and 73°10' and 75°15' east longitudes. This district covers an area of 17,718 sq. km. which is about 5.177% of total area of the state. The present study is a report based on survey of Angiospermic plants of Deedwana tehsil of Nagaur district over a period of five years. Regular and periodical visits to different habitats were



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made during these years of intensive survey. A total of three hundred thirty one species, grouped into two hundred eighteen genera, assigned to sixty five families according to Bentham and Hooker's system of classification have been recorded from Deedwana tehsil.

Review of Literature

In recent years a large number of publications dealing with the flora and floral composition of Rajasthan have been published. These have been reviewed by Jain (1970) Bhandari (1978), Sharma (1980). Publication of Flora of Indian Desert (Bhandari, 1990), Flora of north-east Rajasthan (Sharma & Tiagi, 1979) and Flora of Rajasthan (Shetty & Singh, 1987) have further added to our knowledge of the flora and floral composition of Rajasthan. District flora of Tonk (Shetty & Pandey, 1983) and Banswara (Singh, 1983) of Rajasthan have been published. Quereishi (2002, 2017, 2018 a and b) and Sharma & Aggarwal (2008), have significantly contributed towards our knowledge about the vegetation of Deedwana and Nagaur. Intensive botanical exploration of Nagaur district of Rajasthan is in progress including study of phytodiversity of Deedwana tehsil.

Aim of the Study

Conservation and protection of natural wealth is urgent need of human being for survival. The Phytodiversity study leads to an up to-date knowledge of the vegetation of the study area. In Rajasthan, many commercially and medicinally important species of tree flora such as *Commiphora wightii*, *Tecomella undulata*, and several others are facing severe threats of extinction due to grazing, mining and by the use of new instruments of ploughing. Some herbs specially Cucurbits like *Citrullus colocynthus* are also in same category. The present work on the flora of Deedwana tehsil has now been taken up by the author for investigation along the following lines. i. An enumeration of all the species of angiosperms occurring in Deedwana tehsil. ii. Preparation of artificial keys for the identification of families, genera and species. iii. A comparison of this flora with that of neighboring areas viz. Delhi, Upper Gangatic plains, Western Rajasthan. iv. Ecological studies including habitat-wise classification and distribution patterns of plant communities, effect of biotic and climatic stress conditions on this flora.

Methodology

The survey for plant collection and observation were conducted at regular interval throughout the year for five years using random quadrates of 100 X 100 cm². Ten samples were studied every time in different sites to facilitate biogeographical comparison of species richness. Thus floristic data were obtained from a total of 150 samples. Three growth forms were recognized-Trees, Shrubs and herbs. The biological life forms habit, height and the location of perennating buds of species were observed. The species were further placed in various life-form classes as per Raunkiaer system (Raunkiaer, 1934). The number of species in each life form was calculated. the percentage of species

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belonging to each life form were determined using following formula-

Percentage of Life Form= Number of species of a given life form / Total numbers of species in surveyed area X 100

Statistical Synopsis of the Indigenous Flora

The present work enumerates 331 species belonging to 218 genera and 65 families of flowering plants occurring in Deedwana tehsil of Nagaur district. It is clear from table 1 that the ratio of total number of genera to species is 1: 1.51, which is rather equal to a corresponding ratio for whole of India (1:7), but it is more in conformity with this ratio for the Gangetic plain region (1:2.2) and that of Delhi state (1:1.63) as reported by Maheshwari (1963). It is rather surprising that family Leguminosae tops the list of all flowering plants in Deedwana tehsil, while in the adjoining areas like western Rajasthan and eastern Rajasthan it is family Poaceae which occupies top position. It may be mentioned here that family Poaceae has been found to be the most dominant family in the Gangetic plains, Gujarat and Delhi regions also and next position in all these regions is occupied by family Leguminosae. Thus these two families have inter-changed their positions in the area presently investigated. Family Asteraceae occupies third position in the flora of Deedwana tehsil which is in conformity with Delhi and remaining areas of Flora of western Rajasthan. On the whole referred to as "Grass Legume" type. But in Deedwana tehsil which is a part of Nagaur district which in turn is a segment of western Rajasthan may be referred to as "Legume Grass" type on the basis of dominance of legumes in its flora followed by grasses. Most of the area of Deedwana tehsil comes under semi-arid climate. Consequently, it is characterized by sandy, salty and gravelly plain, more or less devoid of vegetation except in the rainy season when multitudes of ephemerals come up and transform the bare land in to a green carpet. These ephemerals complete their life-cycle before the advent of summer heat and the bulk of the area is again transformed into open sandy or salty plain.

In general the vegetation in this semi-arid region is sparse. Plants with only xerophytic adaptations are able to establish themselves. The bulk of vegetation consists of stunted, thorny or prickly shrubs and perennial herbs capable of drought resistance. These occur in open clump formations in the plains with plenty of vacant spaces between them. Distinctly scattered trees of stunted growth are found along depressions. The vegetation mainly consists of stunted or dwarf grasses interspersed with few characteristic desert shrubs. Permanent vegetation of the entire area is therefore, xerophytic in character and shows various xerophytic features like deep root, dry, hard and rod-like, thick or fleshy stems; spines and indumentum well-developed; leaves either absent or much reduced usually with a coating of wax or hair to prevent excessive transpiration. The main types of plant communities may be called as formations which are exclusively controlled by edaphic factors; these formations may further be divided in to smaller units known as associations and families. Since the climate

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is more or less homogenous, the vegetation can better be said to be edaphically controlled. Depending upon the rain water availability, the vegetation can also be distinctly divided into ephemerals and perennials.

Vegetation Types

Main series of natural vegetation of Deedwana tehsil of Nagaur district have been categorized as follows:

Acacia nilotica- Maytenus emarginata- Balanites aegyptiaca series

This is most characteristic of lower hill fringes and foothills, extending to the sandy plains.

Prosopis cineraria- Crotalaria burhia- Leptadenia pyrotechnica series

This is characteristic of the sandy expands. The vegetation is extremely sparse with scattered trees and bushes.

Prosopis cineraria- Capparis decidua- Tephrosia purpuria series

This series occurs naturally in all over the tehsil.

Suaeda fruticosa- Aristolochia bracteata- Cocculus series

This is characteristic of the salty area which is situated in the southern part of Deedwana tehsil, mostly near the Deedwana salt lake and at Daulatpura.

Ephemerals which constitute the bulk of vegetation of the area appear suddenly above the

Perennial Plants

Bud bearing shoots:

In Air

1. more than 2 m high

(a) Trees

Phanerophytes

(Ph)

(b) Shrubs

Nano Phanerophytes

(N)

2. Up to 25 cm high

Chamaephytes

(Ch)

3. On ground level

Hemicryptophytes

(H)

II. Beneath the soil-

Geophytes

(Ge)

III. Under water or

Beneath the soil in water-

Hydrophytes

(HH)

B. Annual plants

Perennating by seed embryo

Therophytes

(Th)

C. Parasitic plants

Parasites

(P)

Observation, Results and Discussion

In the present study, the Raunkiaer's system of life-form classification has been followed with some modification. 331 species collected from the study area grouped into the following life form Scatagories as Therophytes (146), Phanerophytes (38), Chamaephytes (42), Hemicryptophytes (24), and Geophytes (31). The phyto-spectrum of the present study shows variation from the normal biological spectrum of Raunkiaer (1934). The percentage of

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ground just after first showers and complete their life-cycle in an incredibly short time. They die out as soon as the soil gets dry or perennate by underground stems. Plants, depending upon the sub-soil waters are well adapted for xeric conditions. They generally possess well developed root system of extra ordinary length in comparison to their aerial parts. Most of these plants occur in open clump formations with plenty of vacant spaces between them, often occupied by ephemerals during monsoon period. Although rather poor in the number of species in a particular area, the whole region harbours a large number of well-defined plant associations confined to various edaphic conditions.

Biological Spectrum of Vegetation

The life-form of the plant is the physiognomic form produced in union with the environment. Raunkiaer (1934) has given an account of the life-form system in which the position of bud or plant propagule has been considered as the most important criterion for classification of plants into different life-forms. A biological spectrum is formed when all the species of higher plants of a community are classified into life-forms and their ratio expressed on numbers or percentage. Based on Raunkiaer (1934) and modified after Clapham (1935 J.Ed. 23: 247-249) and Cain (1950 Bot. Rev. 16:1-32) the percentage distribution of species among the life- forms of the flora of the Deedwana tehsil (i.e., Biological Spectrum), is grouped into the following categories:

Hemicryptophytes (7.25 %), and Phanerophytes (11.48%) were found to be much lower than that of Raunkiaer (1934). The percentage of Therophytes (44.1%) in the present study was higher than that of normal biological spectrum (13%). However, the percentage of Chamaephytes (12.68%), Geophytes (9.36%) were found to be much higher than the corresponding percentage in the normal spectrum which are 9% and 4% respectively.

Table 1: Proportional Relationship of Dicotylelonuos and Monocotylelonuos Taxa in Deedwana Tehsil

Group	FAMILIES		GENERA		SPECIES	
	NO.	%	NO.	%	NO.	%
DICOTS	58	89.23	185	84.86	284	85.80
MONOCOTS	07	10.77	33	15.13	47	14.19
TOTAL	65	100	218	100	331	100

Table 2: Life Forms of the Flora of Deedwana Tehsil

S.No	Life-form	Category	Percentage
1	Phanerophytes	(Ph)	11.48
2	Nanophanerophytes	(N)	10.27
3	Chamaephytes	(Ch)	12.68
4	Hemicyptophytes	(H)	7.25
5	Geophytes	(Ge)	9.36
6	Hydrophytes	(HH)	3.32
7	Therophytes	(Th)	44.1
8	Parasites	(P)	1.51

Table 3: Percentage Composition of life-forms in Deedwana Tehsil

REGION	PH.	N	Ch	H	Ge	HH	Th	P
DEEDWANA TEHSIL	11.48	10.27	12.68	7.25	9.36	3.32	44.1	1.51
CENTRAL RAJASTHAN	10.83	9.18	9.91	8.82	9.29	4.16	46.72	1.09
JAI PUR REGION	9.21	9.21	8.77	9.68	5.92	9.36	46.21	1.64
AJMER TEHSIL	11.81	8.18	10.91	7.82	9.09	4.36	46.72	1.09
DEGANA TEHSIL	10.32	8.18	9.88	9.62	10.82	3.10	46.83	1.25
RAUNKIAER's NORMAL SPECTRUM	28.01	5.0	9.0	26.0	4.0	2.0	13.0	8.0

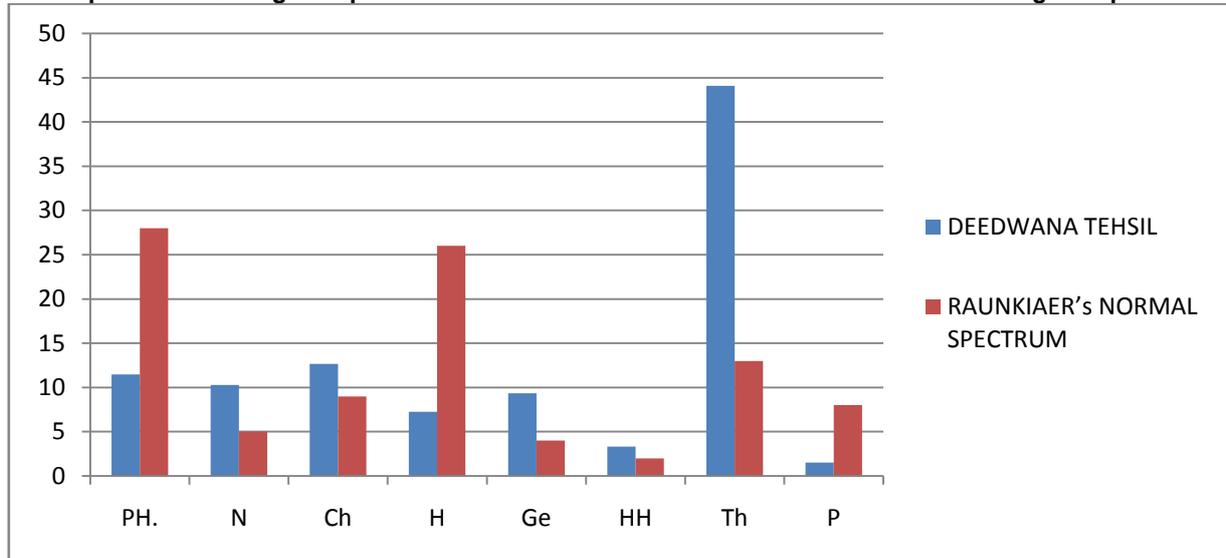
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Table 4: Number of Genera and Species in Each Families

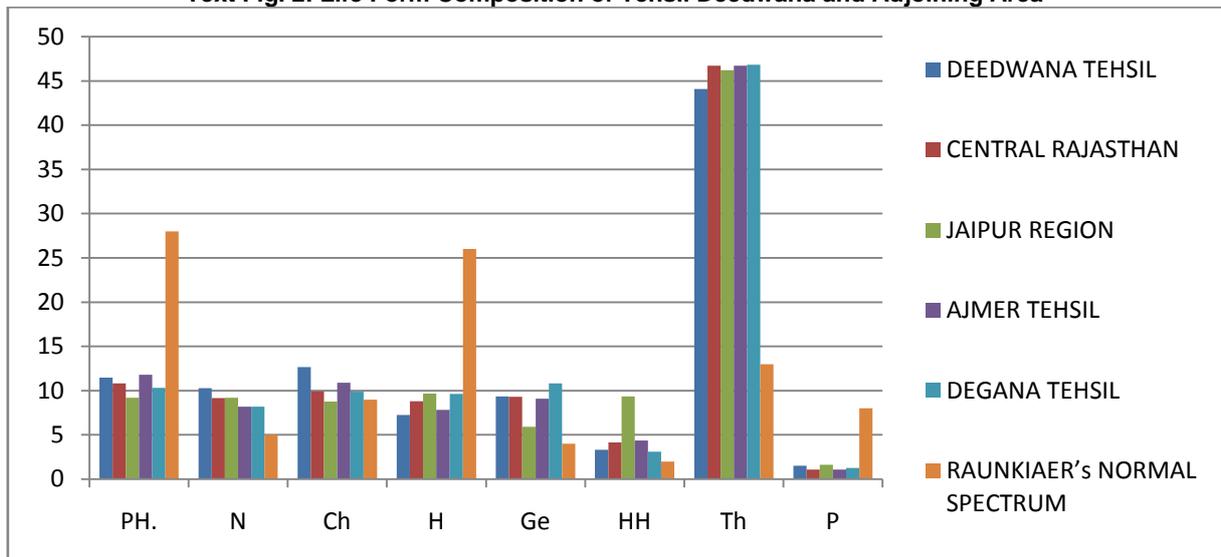
S.No	FAMILY	Genus/Genera	No. of Species	S.No.	FAMILY	Genus/Genera	No. of Species
1	MENISPERMACEAE	2	3	34	SALVADORACEAE	1	2
2	PAPAVERACEAE	1	1	35	APOCYNACEAE	1	1
3	FUMARIACEAE	1	1	36	ASCLEPIADACEAE	5	5
4	BRASSICACEAE	2	2	37	PERIPLOCACEAE	1	1
5	CLEOMACEAE	1	6	38	GENTIANACEAE	1	1
6	CAPPARACEAE	3	4	39	BORAGINACEAE	5	11
7	POLYGALACEAE	1	2	40	EHRETIACEAE	1	2
8	CARYOPHYLLACEAE	3	3	41	CONVOLVULACEAE	7	16
9	PORTULACACEAE	1	3	42	CUSCUTACEAE	1	2
10	TAMARICACEAE.	1	2	43	SOLANACEAE	5	9
11	ELATINACEAE	1	2	44	SCROPHULARIACEAE	8	9
12	MALVACEAE.	6	10	45	OROBANCHACEAE	2	2
13	TILIACEAE	2	6	46	BIGNONIACEAE	1	1
14	ZYGOPHYLLACEAE	4	6	47	PEDALIACEAE	2	2
15	OXALIDACEAE	1	1	48	MARTYNIACEAE	1	1
16	SIMAROUBACEAE	1	1	49	ACANTHACEAE	7	7
17	BALANITACEAE	1	1	50	VERBENACEAE	2	2
18	BURSERACEAE	1	1	51	LAMIACEAE	3	5
19	MELIACEAE	2	2	52	NYCTAGINACEAE	1	1
20	CELASTRACEAE	1	1	53	AMARANTHACEAE	8	13
21	RHAMNACEAE	1	2	54	CHENOPODIACEAE	4	6
22	MORINGACEAE	1	1	55	POLYGONACEAE	3	3
33	FABACEAE	16	33	56	ARISTOLOCHIACEAE	1	1
24	CAESALPINIACEAE	3	3	57	EUPHORBIACEAE	4	8
25	MIMOSACEAE	6	12	58	MORACEAE	1	2
26	COMBRETACEAE	1	1	59	HYDROCHARITACEAE	2	2
27	LYTHRACEAE	1	1	60	AGAVACEAE	1	1
28	CUCURBITACEAE	10	17	61	LILIACEAE	2	2
29	CACTACEAE	1	1	62	COMMELINACEAE	1	2
30	MOLLUGINACEAE	5	6	63	ARECACEAE	1	1
31	A IZOACEAE	3	5	64	CYPERACEAE	3	9
32	RUBIACEAE	4	5	65	POACEAE (GRAMINEAE)	23	29
33	ASTERACEAE	21	26				

Text Fig-1

Comparison of Biological Spectrum of Tehsil Deedwana with Raunkiaer's Normal Biological Spectrum



Text Fig. 2: Life Form Composition of Tehsil Deedwana and Adjoining Area



Conclusion

In all 331 species of vascular plants were recorded from Deedwana tehsil. Biological spectrum is represented by life forms like phanerophytes constitute 11.48% of the vegetation of Deedwana while nanophanerophytes constitute 10.27% of this vegetation. Chamaephytes and hemicryptophytes are represented by 12.68% and 7.25% respectively. Similarly geophytes and hydrophytes constitute 9.36% and 3.32% of the total vegetation. Therophytes form the major segment of this vegetation (44.10%). Parasites are only 1.51% of the total vegetation. (Text Figure 1)

A comparison with the normal spectrum of Raunkiaer's (1934) for the world and that of the adjoining Ajmer tehsil and other adjoining areas have been recorded in Table- 3 from the study of biological spectrum (Table-3) and (Text Figure 2), it is seen that the percentage of phanerophytes and hemicryptophytes is much less vis-à-vis normal biological spectrum. The percentage of therophytes is

about two and half to three times higher than those of same life-form in the normal biological spectrum. From the scrutiny of this data, it is conclude that phytoclimate of this tehsil is therophytic because the percentage value of therophytes is much higher.

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