

PHYTOGEOGRAPHY OF HADOTI PLATEAU - S. E. RAJASTHAN

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About 1048 species which are naturalized in Hadoti area have been ascribed phytogeographically to four main types viz. Western, Eastern, Indian and General element. General element is represented by 43.72% species, Indian element contributes about 25% species while Western and Eastern element are worked out to be 16.05 and 15.1 percent respectively. The ratio between Eastern to Western element is worked out to be 1 : 1 in the area of study, (Endemic element totally absent). These have been compared with the floristic elements of different parts in the state of Rajasthan and it is found that the flora of present area is more akin to that of Mt. Abu. The general element is predominating almost every where in Eastern Rajasthan, perhaps on account of increased biotic factor which has resulted in deterioration of forests. Present observations support the Drude's line of demarcation between Eastern and Western elements.

Keywords : Drude's line; Element Biotic Influence; Flora.

Introduction

South-east Rajasthan (Hadoti plateau) is situated at the edge of Malwa plateau at 23°45' to 25°53' N latitude and 75°09' to 77°26' E longitude in south eastern corner of Rajasthan state. The total area is 24156.6 sq. kms, and it includes Kota, Bundi, Jhalawar and Baran district respectively. Its eastern, southern and south western boundaries touch with Madhya Pradesh, while northern and north western limits are adjoining with Sawai Madhopur, Tonk, Bhilwara and Chittorgarh districts. Hadoti plateau region is quite unique due to its historical, cultural and geographical heritage. The region has got an average height of 300 mts above M.S.L. and is an extension of northern Malwa plateau, with numerous natural diversities. Peculiarities of surface physiography and soil composition make this region a specific physical unit. Geographical entity of the plateau can be recognized by the fact that this part of the country largely forms part of the Madhya Bharat Pathar. It reflects queer and confused amalgam of lowland and upland topography. It is bounded in the north west by the great boundary fault of the Aravallis and extends eastwards across the Rajasthan border. The region has got general slope from South-West to North-East. The average annual rainfall of the area is about 852 mm and temperature fluctuates between 3.9°C (during winters) to 47°C (during summers).

Material and Methods

The area under study is interesting phytogeographically, since it is located near the junction of several phytogeographic provinces and is composed of diverse floristic elements. About 1048 species of angiosperms which are naturalized in present area have been ascribed into five main types of floristic elements i.e. (1) Western (2) Eastern (3) Indian (4) Endemic and (5) General.

1. Western element included the species belonging to arid zone which spread from tropical to mediterranean element, including North Africa. It comprises of Indian desert element and tropical and North-African-Indian desert element of Blatter & Hallberg¹ Tropical African - Indian element and Mediterranean - Oriental - European element.
2. The eastern element; composed of species which are distributed over Indo-Malayan regions.
3. The Indian element composed of those species which are of widespread occurrence in the Indian subcontinent.
4. The endemic element; composed of species which are restricted to the semi arid regions.
5. The general element includes tropical species, species of warm countries, temperate and cosmopolitan species.

A general comparison have been made with floristic elements of other localities viz., North-West Rajasthan, Sind, North-east Rajasthan, Mt. Abu and Banswara Distt. (South Rajasthan) in order to determine the phytogeographical patterns, climatic and edaphic conditions and degree of biotic interference, in the area under study.

Results and Discussion

According to Blatter and Hallberg¹ the ratio of eastern (Indo Malayan) to the western element is 1:7 for the Indian desert and Indus delta region. This finding of Blatter and Hallberg confirms Drude's^{2,3} line between the Indo-Malayan flora and Perso-Arabian flora from the Gulf of Cambay northwards along the Aravallis. Saxton and Sedwick⁴ and later Biswas and Rao⁵ also supported this demarcation. The findings of Phytogeographical analysis of N.W. Rajasthan by Bhandari⁶ were in conformity with the analysis of the region by Blatter and Hallberg¹.

In North-eastern Rajasthan contrary to western Rajasthan, the ratio of eastern to western element is 1:3 for Lohargal, Harshnath, Ajit Sagar bundh and Jaisamand lake area as reported by various workers⁷⁻¹⁰. It is 2:1 for Jaipur district¹¹ while in Southern parts of Rajasthan (Banswara district) it is 1:2¹². Looking to the dominance of western element in Eastern Rajasthan, a possibility was put forward by Nair and Kanodia⁹, Vyas¹³ and Ramdeo¹⁴ regarding eastward shifting of the line of demarcation even beyond the limits of Rajasthan territory. However in present course of study the ratio of eastern to western elements has been recorded about 1:1 (15.1 : 16.05), which seems nearer to the analysis propounded by Sabnis and Bhatt¹⁵. They studied phytogeography of the Khedbrahma region in North Gujarat and opposed any view about shifting of line of demarcation. According to them the ratio of eastern to western element was 1 : 1 for Khedbrahma region which incidentally was along Drude's

line. They suggested that the dominance of western elements in some parts of Eastern Rajasthan was due to biotic influences which favoured the penetration of more of western and general elements thus apparently suggesting the shifting of line of demarcation beyond the Aravallis. According to them the ratio of eastern to western elements was 1 : 1 for Khedbrahma region which incidentally was along Drude's line. It is therefore expected that in the absence of such excessive biotic interferences the ratio of eastern to western elements would be nearly 1 : 1 even in east Rajasthan as found in present course of studies. This is an additional support to the hypothetical line of Drude^{2,3}.

Further the phytogeographical analysis of the area has revealed that the general element is predominating (43.72%) over other elements. The Indian element constitutes 25.11% of the flora, while Eastern and Western elements are 15.1% and 16.05% respectively. Endemic element is not recorded in the area under study (Table 1). This observation is somewhat similar to Banswara district and North East Rajasthan where general element is 40.3% and 51.4% and Indian element 30.9% and 31.3% respectively^{12,16}. Endemic element is not recorded in Banswara district and poorly represented in North East Rajasthan (0.2%)¹⁶.

Besides this comparison with phytogeographical elements (Table 2) of the flora of some other parts in Rajasthan and flora of Delhi (a part of the Gangetic plains - The adjoining phytogeographical region) reveals that the vegetation of present area is almost identical to that of Mt. Abu¹⁷. The ratio of Eastern elements to western and eastern elements in the flora of both these regions comes to 1 : 1. More over contribution of western and eastern elements in the flora of Hadoti plateau (16.05 and 15.11 percent) and that of Mount Abu (16.37 & 17.7 percent) is almost identical. Majumdar¹⁸ also arrived at a similar

Table 1. Floristic elements of various regions/localities. (The percentage of floral elements are given in parenthesis).

1.	North west Rajasthan ⁶	Sind ²²	North east Rajasthan ¹⁶	Northern Semi arid Zone ²³	Banswara ¹²	Present work
	2.	3.	4.	5.	6.	7.
1. General Element	132 (24.0)	96 (36.2)	312 (51.4)	351 (36.2)	282 (45.4)	458 (43.72)
Cosmopolitan	62 (11.3)	6 (2.3)	80 (13.2)	21 (2.2)	-	32 (3.02)
Tropical	70 (12.7)	31 (11.7)	15 (2.5)	91 (9.4)	-	158 (15.10)
Warm Countries	-	58 (21.9)	183 (30.1)	209 (21.5)	-	240 (22.89)
Temperate	-	1 (0.3)	34 (5.6)	30 (3.1)	-	28 (2.70)
2. Endemic element	59 (10.8)	6 (2.3)	1 (0.2)	23 (2.3)	-	-
3. Indian element	80 (14.6)	29 (10.9)	11 (1.8)	227 (23.4)	198 (31.9)	263 (25.11)
4. Eastern element	29 (5.3)	16 (6.0)	190 (31.3)	109 (11.2)	47 (7.5)	159 (15.11)
5. Western element	249 (45.3)	118 (44.5)	93 (15.3)	259 (26.7)	92 (14.8)	168 (16.05)
Arid Zone	-	97 (36.6)	25 (4.1)	142 (14.6)	-	-
Tropical african-Indian	-	13 (4.9)	40 (6.6)	48 (5.0)	-	-
Mediterranean oriental and European	-	8 (3.0)	28 (4.6)	69 (7.1)	-	-

Table 2. Percentage comparison of elements.

Sl. No.	Locality/Region	Western	Eastern (Indo Malayan)	Indian	Eastern + Indian	General	Ratio of Eastern to Western elements
1.	INDIAN DESERT : (Bhandari 1978) ⁶	45.3	5.3	14.6	19.9	24	1 : 8.5
2.	MT. ABU Alluvial plain (Gupta & Saxena 1968) ²⁴	41	10	21	31	26	1 : 4
3.	MT. ABU Lower Piedmont Slopes (Gupta and Saxena 1968) ²⁴	42	14	28	42	14	1 : 3
4.	MT. ABU (Jain 1967) ¹⁷	16.37	17.7	32.5	50.2	33.4	1 : 1
5.	BANSWARA DISTRICT	14.8	7.5	31.9	39.4	45.4	1 : 2
6.	HADOTI PLATAEU (South east Rajasthan Present Work)	16.05	15.1	25.0	40.1	43.72	1 : 1
7.	N. E. RAJASTHAN (Sharma & Tiagi 1979) ¹⁶	15.3	31.3	1.8	33	51.4	2 : 1
8.	ARAVALLIS (Fide Meher - Homji 1970) ²¹	25	17	37	54	16	1 : 1.5
9.	DELHI (Maheshwari 1963) ¹⁹	22.8	6.9	16.95	23.8	43.5	1 : 3

conclusion and suggested that the flora of Hadoti plateau (Kota division S. E. Rajasthan) may be regarded as an extension of the Mt. Abu's flora.

Interestingly the general elements predominates here also in the flora of Mt. Abu¹⁷ and flora of Delhi¹⁹ along with Banswara distt.¹² and north east Rajasthan¹⁶ and in the area under present study. Maheshwari²⁰ attributed the dominance of general elements to the degradation of forests, faulty pasturage, cultivation and harvesting methods, the introduction of impure seeds, construction of roads and railway lines. Similarly higher percentage of western elements in eastern Rajasthan and Mt. Abu is perhaps due to increasing biotic pressure¹⁷. The extent of deterioration of

forests has resulted in the dominance of western elements in the flora of Banswara district¹² where the ratio of Eastern to Western elements comes to 1 : 2. It is important to note that the above region is located on Aravallis and according to Meher-Homji²¹ in the dry deciduous forests of *Tectona grandis* mixed with *Anogeissus pendula* in the hilly regions of Southern Rajasthan, should depict the ratio of Eastern to Western elements should be 2 : 1 each contributing 26% and 12% respectively.

When the percentage of Indian element added to Indo-Malayan element, the ratio of western element (16.05%) to the Indo-Malayan (15.1%) plus Indian elements (31.9) comes to 1 : 2.9 which is in conformity to the Meher - Homji's²¹ observation for the

vegetation type - *Anogeissus pendula* series. Similar type of vegetation is found in the area under study.

It is evident from the Table - 2 that there is a constant decrease in the western element from western Rajasthan (Indian desert), where it constitutes about 45.3% of the flora to the east on Mt. Abu and to extreme South-Eastern corner of the state i.e. in Hadoti plateau the western element is represented by 16 percent (approx.) species.

These observations are in conformity with the views of Blatter, Mc Cann & Sabnis²², Saxton and Sedgwick⁴, Maheshwari¹⁹ and Meher-Homji²¹, that the line of demarcation between eastern (Indo-Malayan) and western elements runs northwards from Gulf of Cambay along the Aravallis in the state of Rajasthan.

Therefore, a general conclusion can be drawn that phytogeographically, the present area of study is more allied to Banswara district and North-East Rajasthan but for the ratio of western and eastern elements which is 1 : 1 in present course of study.

The possibilities for the similarities between these areas may be due to :-

1. Rainfall pattern is similar i.e. about 90% of total rainfall is observed from mid-June to mid-September.
2. Temperature efficiency and precipitation effectiveness is not much different.

Hence, it may be concluded that the factors mentioned above play a great role in distribution and migration of plants in the concerned area.

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