

## PHYTOGEOGRAPHICAL DOMAINS IN RAJASTHAN

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This paper explores the variation in strength of floristic elements in Rajasthan. The floristic elements are related to the geographical conditions and six regions with characteristic phytogeographical composition have been identified.

**Keywords :** Phytogeographical regions; Rajasthan; Floristic elements.

The State of Rajasthan is located between the parallels 23°3'N and 30°12'N and 69°30'E and 78°17'E meridians. The region is included in the Palaeotropical Floristic Kingdom<sup>1</sup> extending into two of its regions viz., African-Indian Desert region (of African Subkingdom) and Indian region (of Indo-Malaysian Subkingdom). The region stands at the meeting point of African, South West Asian, Mediterranean, Boreal, Palaeotemperate, Indian and Malayan floras. The variety of habitats available in this region enable plants with different ecological requirements to establish themselves successfully and to evolve by speciation.

The variation of vegetation with climo-edaphic conditions in Rajasthan has been studied by a number of workers.<sup>2-11</sup> The present study is aimed at identifying phytogeographical regions, if any, in Rajasthan.

### Terminology and Methodology

The unit of study in the present investigation is the 'species'. The species have been grouped into floristic ele-

ments. The term 'floristic element' defines species grouped according to their geographical distribution. This unit has been named 'geographical element'<sup>5,12</sup>, 'types'<sup>13</sup>, 'components'<sup>14</sup> and 'areal type'<sup>15</sup>. The area under study has been divided into six geographical regions viz., Marusthali, Bagar, Aravalli ranges, Eastern Rajasthan Uplands, Madhya Plateau and Malwa Plateau (Fig.1). To ascertain whether these regions are phytogeographical regions, the floristic elements of each region were studied separately and observations tabulated (Table 1).

The data presented in Table 1 was analysed statistically using ANOVA table for two way classification (Table 2). The calculated value F for Factor 2 is less than the table value, therefore, the six geographical regions differ significantly on the basis of floristic elements. The cosmopolitan and boreal elements appear to be evenly distributed in the different regions. The element of old world (temperate and tropical parts of the old world only) is represented by species too few to merit a generalisation. The discontinuously distributed

**Table 1. Variations of floristic elements in the geographical regions of Rajasthan.**

S.No.	Floristic elements (Factor-1)	Geographical Regions (Factor - 2)					
		Marusthali	Bagar	Aravallis	Eastern Rajasthan Uplands	Madhya Bharat Plateau	Malwa Plateau
1.	Cosmopolitan	28	27	30	28	23	27
2.	Pantropical	99	120	136	128	126	126
3.	Boreal	15	16	14	16	14	14
4.	Palaeotemperate	20	32	26	23	17	18
5.	Himalayan	5	9	20	7	11	5
6.	Palaeotropical	179	195	237	199	193	191
7.	Indo-Malaya	76	96	184	135	144	153
8.	Indian	176	158	333	189	220	225
9.	African	65	63	53	53	34	40
10.	South West Asian	33	35	27	29	15	16
11.	Mediterranean	28	36	23	28	17	16
12.	Old world	2	2	1	3	2	2
13.	*Neotropical	1	1	3	3	1	2
14.	*South African	0	0	1	1	0	0
15.	*Burma	2	1	0	1	2	0
16.	*Ceylon	1	0	0	0	0	0

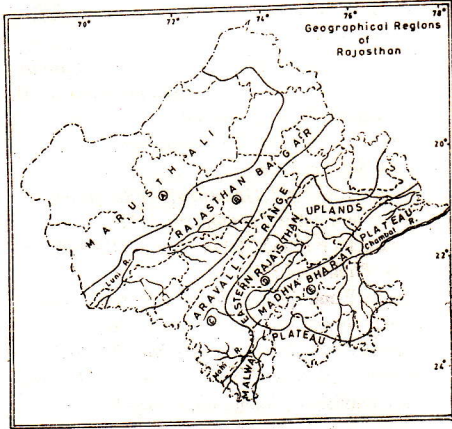
\* Discontinuously distributed.

**Table 2. Using ANOVA Table for two way classification with one observation per cell**

Source of variation	S.S.	D.F.	M.S.S	F
Factor - 1	474547.96	15	31636.53	87.91
Factor - 2	4734.63	5	946.92	2.63
Error	26992.04	75	359.89	
Total	506274.63	95		

elements (marked with an asterik in Table 1) also do not appear to fall into any comprehensive pattern.

The remaining nine floristic elements, however, contribute to the development of distinct floristic features



in the different zones. These distinguishing features, as evident from Table 1, can be summarised as follows :-

#### 1. Marusthali

This zone records the highest proportion of the African element, and the lowest proportion of the humid element of the Indo-Malayan region. The location of Marusthali at the periphery of the Indian botanical region explains the lowest number of taxa of Indian flora (in Table 1 Marusthali is showing a higher number of species of Indian element because of the large number of endemic elements restricted to this region). The desertic conditions appear to be comparatively less suitable for the pantropical element too.

#### 2. Bagar

The largest number of taxa of the palaeotemperate element is recorded from this region. Both the West Asian

and Mediterranean elements have a greater representation in Bagar as compared to the two adjoining regions.

#### 3. Aravalli ranges

This region harbours the largest number of plant species in Rajasthan. This is also the zone of greatest concentration of Pantropical, Palaeotropical, Indian, Indo-Malayan and Himalayan elements. The western elements — African, West Asian and Mediterranean, show a sharp decline in numbers in this zone.

#### 4. Eastern Rajasthan Uplands

The western element of the Mediterranean region shows a rise in this region. The Indian and Indo-Malayan elements show a decline in spite of the proximity of this region to the Aravallis which have the highest proportion of these elements in Rajasthan.

#### 5. Madhya Bharat Plateau

As one passes from west to east in Rajasthan, the western elements show a sharp decline in this region for the second time. On the other hand the Indian and Indo-Malayan elements begin to rise again.

#### 6. Malwa Plateau

This region is distinguished by its high proportion of Indian and Indo-Malayan elements which are second only to those in the Aravallis.

The Indian and Indo-Malayan elements decrease in numbers from east to west in Rajasthan but both these elements have their highest concentrations in the

Aravallis. This can be explained by the spread of part of the Indian peninsular elements directly into the Aravallis (and not through east Rajasthan) as exemplified by *Aerides maculosum*, *Centratherum ritchiei*, *Ceropegia hirsuta*, *Cryptocoryne retrospiralis*, *Eulophia ochreatea*, *Hemigraphis crenata*, *Senecio lavandulaefolius*, *S. wightii*, *Smithia bigemia*, *S. capitata* and *Swertia minor*. A few species of the Indo-Malayan element are also recorded in Rajasthan from the Aravallis only - *Canthium dicoccum* and *Paederia foetida* occur in India in eastern Himalayas and Aravallis; *Anaphalis adnata* and *Blumea flava* occur all along the Himalayas and in Aravallis; *Anisomeles indica* reaches Aravallis through the peninsular region. The floristic elements vary in strength in the six geographical regions so that each region may be said to have a characteristic floristic composition. Since these regions are not distinguished by specific endemism, they cannot be termed phytogeographical provinces and may be called phytogeographical domains. There are thus at least six phytogeographical domains in Rajasthan which extend into two of the biogeographical zones of India<sup>16</sup> viz., the Indian Desert and the Semi-arid Zone, or two of the botanical regions<sup>17,18</sup> viz., Western Dry Region and Gangetic plain.

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