

## THE PHYTOGEOGRAPHY OF RAJASTHAN-ITS PRESENT STATUS

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The present study deals with the phytogeography of Rajasthan as presently understood. The variation in floristic elements in different parts of the State, and in different vegetation types of the region has been studied. A perusal of literature shows that some facts about the phytogeography of the region have been consistently confirmed, while others have been contested. An attempt has been made to present all the facts and figures, together with diverging opinions on the phytogeography of Rajasthan.

**Keywords :** Phytogeography; Vegetation.

Rajasthan lies between 23°3' and 30° 12'N lat., and 69° 30' and 78° 7' E long., the total area being about 3,42,274 sq.km. i.e. about 11% of the total area of India. In Rajasthan the two phytogeographical sub-kingdoms African and Indo-Malayan of the Palaeotropical Kingdom<sup>1</sup> blend. By virtue of its location, the State receives tropical elements from Africa and Arabia, steppe elements from the Mediterranean region, temperate elements from the north temperate zone, humid tropical asiatic elements from south and south-east Asia and Australia.

The western entrants from Africa and Arabia, termed as the Afro-Arabian elements, are characterised by their xeric nature and can be distinguished from the North African (Mediterranean) species by their ability to grow and flower mainly during the monsoon rains. The Afro-Arabian elements is generally continuously distributed through the Saharo-Thar zone. The Afro-Arabian element is predominant in west Rajasthan and Kutch, it migrates through the passes in Aravallis to eastern Rajasthan, mingles with the peninsular flora

and ends up in Ceylon, differentiating into endemic elements all along the way. Some of the African components in the flora of Rajasthan are *Acacia*, *Carthamus*, *Pedaliium*, *Salvadora*, *Sesamum*, *Vicoa*, *Dicoma tomentosa*, *Peristrophe paniculata*.

The Mediterranean elements comprise the south European and north African plants. The west Asia or "Oriental" elements are included in the same category as Mediterranean.<sup>2</sup> As pointed out by Mani<sup>3</sup>, some north African plants have been termed the Sudano-Rajasthani elements by Meher-Homji.<sup>4</sup> The Mediterranean elements are derived from a mixture of tropical and temperate plants<sup>5</sup> and are maintained by a distinct type of climatic regime called the Mediterranean climate. This type of climatic has rainfall during the months of October to April; temperature of coldest months is 4-10°C; mean temperature during summer is 21°C and rises to 30°C in north Africa. The cool "mistral" and "bora" winds blowing from central Europe, the hot "sirocco" from the Sahara, and the "monsoon" of south Asia effectively limit the extension of Mediterranean plants. This region has a

climax stage of evergreen forests, which under biotic influence passes through maquis, garrigue and steppe stages. Mediterranean plants in Indian flora comprise of steppe elements (annuals and herbaceous perennials). This element passes over north-west Himalayas, through the plains of Sind, Punjab and Rajasthan, and very few plants of this element penetrate into the peninsular region. The Mediterranean species appear as winter weeds. They flower from October to early spring, while some species belonging to Lamiaceae (*nom alt* Labiatae) may be seen flowering upto June. These are, however, absent or in perennating stages during the monsoon period. Some of the Mediterranean elements in the flora of Rajasthan are *Brassica tournefortii*, *Erodium cicutarium*, *Hypocotyle procumbens* and species of *Cleome*, *Farsetia*, *Medicago*, *Melilotus* and *Trigonella*.

The temperate element is a composite category, comprising of circumboreal, palaeartic and Himalayan elements. These are exemplified by species of *Berberis*, *Capsella*, *Cardamine*, *Fumaria*, *Potentilla*, *Primula* and *Ranunculus* etc. They occur in hilly regions during summer, and appear as weeds during winter in the plains. In India, the temperate element has a markedly discontinuous distribution, it occurs on Himalaya, Khasi hills, parts of Eastern Ghats, Aravallis and southern part of Western Ghats. These are pleistocene relicts which had spread southwards during the pleistocene glaciations. With the retreat of glaciers in the post-pleistocene they became isolated in Aravallis and elevated regions in peninsular India.

While studying the phytogeography of Mt. Abu, Jain<sup>6</sup> has opined that this hill is the

northernmost limit for certain plants of the peninsular element, and the southernmost limit for certain plants of the northern mountain element. The general Indian mountain element is also represented in the flora of Mt. Abu.

The peninsular element in Rajasthan is concentrated in southern Aravallis and the southern districts of Bundi, Banswara and Jhalawar, though some taxa have been reported from northern districts like Jhunjhunu. The peninsular element in Rajasthan is exemplified by *Adhatoda beddomei*, *Cyperus leucocephalus*, *C. metzii*, *Eulophia bracteata*, *Moullava spicata*, *Senecio grahamii*, *S. saxatilis*, *Smithia bigemina* and *S. capitata*.

The eastern or Indo-Malayan element is believed to enter the Indian region through the Assam gateway, it passes westwards along the Himalayas, another stream of plants migrates from Assam and through Eastern Ghats reaches the Western Ghats. In Rajasthan, the proportion of Indo-Malayan element in the flora declines from east to west. According to Singh<sup>7</sup> the percentage of Indo-Malayan element is 17.6 in Mt. Abu, 10.4 in Kota division and 8.7 in Ganganagar district. In the Indian Desert, the proportion of eastern element is reported to be about 2.4%.<sup>8</sup> More moist sites in western Rajasthan are colonised by the Indo-Malayan element, whereas, the sandy tracts predominantly harbour the Afro-Arabian elements. Some of the taxa of the Indo-Malayan element are *Knoxia sumatrensis*, *Leea indica*, *Lannea coromandelica*, *Oenanthe javanica*, *Terminalia catappa* and species of *Adina*, *Anthocephalus*, *Blumea*, *Hedyotis* and *Rorippa*.

The Indian biogeographical region extends in the north-west to Pakistan and

parts of Afghanistan<sup>3</sup>, but previous workers had placed western Rajasthan outside the Indian region. As pointed out by Singh<sup>7</sup>, out of the 134 dicot genera listed<sup>9</sup> as endemic to India only few like *Bremekampia*, *Butea*, *Caesulia*, *Glossocardia*, *Ougenia*, and *Petalidium* occur in Rajasthan.

The variations in western, eastern and Indian element in different vegetation types of Rajasthan are tabulated in table 1.

The general element comprises of pantropical, pleuriregional species, species of warm countries and exotics. This element occupies the third position in the flora of Rajasthan. Cultivated and naturalised plants in the flora of the State have been studied by Maheshwari.<sup>11</sup> He has pointed out that certain plants have been introduced in connection with soil conservation and afforestation, some are cultivated as ornamentals, still others have been introduced accidentally. The common escapes from cultivation are *Corchorus*

*capillaris*, *Dodonaea viscosa*, *Ipomoea hederifolia*, *Ixora arborea*, *Nicotiana plumbaginifolia*, *Thunbergia alata* etc. Some exotic plants like *Cryptostegia grandiflora* and *Lantana camara* var. *aculeata* are well established part of the flora.

The heterogeneity of the terrain compounded with the varying climatic conditions, has resulted in the influx of floristic elements from all the four directions. Rajasthan is not a geographically uniform and unique region, and as expected, endemism in this region is very low. Twenty-eight taxa have been reported to be endemic to Rajasthan<sup>7</sup>. This amounts to about 1.4% of the flora. Nayar<sup>12</sup>, however, has considered Aravallis to be one of the twenty-six endemic centres in India.

One still debatable aspect of the phytogeography of Rajasthan, after a century of phytogeographical studies, is the location of the demarcation line between Indo-

**Table 1** Variation of floristic elements in different vegetation types.

S. No.	Vegetation type	Western element	Eastern element	Indian element
1.	<i>Calligonum</i> type	64	5	5
2.	<i>Prosopis-Acacia-Capparis-Ziziphus-Salvadora</i> type	53	9	11
3.	<i>Anogeissus pendula-Acacia</i> series	27	18	46
4.	Dry mixed deciduous forests in hills in east Rajasthan	17	29	29
5.	Dry mixed deciduous forests at Mt. Abu	4	32	64
6.	Dry deciduous teak forests in south Rajasthan	3	22	69

Source : after Meher-Homji<sup>10</sup>

Malayan and Afro-Arabian (eastern and western) floras. Drude<sup>13-14</sup>, Hooker<sup>15</sup>, Chatterjee<sup>9</sup>, Razi<sup>16</sup>, Jai<sup>17</sup>), and Rodgers and Panwar<sup>18</sup> have separated western and eastern Rajasthan into two different floristic regions. Sharma<sup>19</sup> has opined that Rajasthan is a place of confluence of Indo-Malayan and northeast African element. Among studies conducted on the flora of the State, Drude's line has been confirmed by Biswas and Rao<sup>20</sup>, Blatter and Hallberg<sup>21</sup>, Blatter and Sabnis<sup>22</sup>, Meher-Homji<sup>10-23</sup> and Bhandari and Sharma.<sup>24</sup> On the other hand, Nair and Nathawat<sup>25</sup>, Nair and Kanodia<sup>26</sup>, Mulay<sup>27</sup>, Vyas<sup>28</sup>, Ramdeo<sup>29</sup>, and Singh<sup>7</sup> believe that Drude's line should be shifted eastwards beyond the boundary of Rajasthan. They reason out that the proportion of western elements exceeds that of eastern element even in east Rajasthan, and increasing desertification in the whole of Rajasthan are stated as proof of their statement.

Hooker<sup>30</sup>, however, presented yet another view stating that

"Nor is it possible to draw an absolute boundary line between the floras of the Indus and of the Ganga Plains."

Burkill's<sup>31</sup> remark that Hooker's Malayan and Patanas of Ceylon suggest that it did, it has retreated as well as advanced, further complicates the situation.

Can it be thus summed up that the line restricting the Malayan element has been shifting with climatic changes in the past?

The phytogeographical status of the region can be summed up by an observation made in one of the oldest records on the flora of Rajasthan by King<sup>32</sup>- the flora of

Rajputana does not possess a flora peculiar to itself, but rather presents a field on which the adjacent floras of dry India and the deserts of Western Asia and Northern Africa interoscultate.

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