

An Analysis of the Flora of North Rajasthan

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Abstract

North Rajasthan includes Ganganagar, Hanumangark Bikaner and Churu districts. It constitute a part of the Great Indian desert and is under intensive irrigation by a network of canals drawing water from Punjab rivers. The flora of north Rajasthan comprises 680 species belonging to 433 genera distributed among 105 families of flowering plants. out of which 85 belongs to dicots and 20 to monocots. Most dominating families among dicots are Papilionaceae with 64 species and Asteraceae with 54 species, among monocots it is Poaceae with 86 species. The ratio of monocots to dicots is 1: 4.25 of families, 1: 4.22 of genera and 1: 4.04 of species. Due to protracted irrigation 87 extralimital species are introduced and 153 species which belongs to Indian Desert have disappeared from irrigated regions but are still present in non-irrigated regions of North Rajasthan.

INTRODUCTION

North Rajasthan constitute a part of the Great Indian desert and is under intensive irrigation by a network of canals. The region is being irrigated by Gang Canal, Bhakra Canal, and Indira Gandhi Canal which has greatly affected the natural flora of area in many ways. The Gang Canal, that draws water from Sutlej in Punjab was launched in 1927 and irrigates Ganganagar and Hanumangarh districts. The Rajasthan canal, now named Indira Gandhi canal introduced in 1957, has a distinction of being longest canal system of the World which starts at Hari-ka-Pattan in Punjab. At present this canal system irrigates Ganganagar, Hanumangarh and Bikaner districts. However, the work of reaching this canal right upto Jaisalmer district is almost complete. In Churu district agriculture is dependent on rain water as at present it have a very less facility of canal irrigation. In Churu district canal water is pumped to water works at Sahwa town for drinking purpose. The irrigation water which draws water from rivers of Punjab have been bringing seeds and other propagules of a number of extra-limital species year after year and many of these have successfully established in the area as crop weeds or along the bank of canals. The most wonderful example of this naturalization of Himalayan plants in the Great Indian Desert are species of *Riccia*, *Marchantia* and *Ophioglossum vulgatum* L. (Singh and Brar, 1980) which are found frequently in the canal irrigated areas showing how the plants from Himalayas have become naturalised in irrigated region of the Desert.

There are no rocks to soil in the district. In the irrigated tract soil under irrigation by Gang Canal and Bhakra Canal is sandy loam. In the non-command areas sandy plains with stabilised and shifting sand dunes are a common sight in the Churu and Bikaner districts of North Rajasthan. There is a seasonal river called Ghaggar which enters from Haryana drawing flood water of Punjab and Himachal and flows to Pakistan. The soil in the bed of this river is heavy clay. The annual rain fall in this region of Rajasthan is 300 mm (June to September) with maximum rain fall in July-August. The summers are extremely hot and Winters are severely cold. The Churu having maximum temperature in summers (48°C) and Minimum temperature in winters (0°-1°C). The maximum average temperatures recorded are 45°C and 4°C respectively.

STATISTICAL ANALYSIS OF THE FLORA

The present observations are based on extensive floristic exploration of the irrigated and non-irrigated parts of North Rajasthan (Dawre, 1979; Singh, 1982, 1989, 1995; Singh and Brar, 1980, 1984; Singh and Dhillon, 1989; Singh and Sidhu, 1990; Singh and Singh 1990; Singh and Arora 1994). A comparison of vegetation of the irrigated and non-irrigated region of the North Rajasthan, shows that irrigation has brought about remarkable changes in the composition of original flora, both by way of introduction of extra-limital species as well as elimination of many of the original species. The irrigation by a network of canal system over the last 76 years in Ganganagar and Hanumangarh districts has apparently changed about 21% of the species of the natural flora (Dhillon and Bajwa, 1969; Singh and Dhillon, 1989), whereas in Bikaner the change is mere 12% (Singh and Sidhu, 1990).

The natural flora has been modified in another manner also. Many of the common species of the Indian desert which originally belong to this area have disappeared, obviously, due to protracted irrigation and extensive cultivation. Most probably this has happened as a result of losing competition with the new extrants. With the availability of irrigation large tracts are now under cultivation and waste lands have become scarce. The reduction in the realm of wild plants has obviously contributed substantially to the reduction in the number of wild species.

When compared with the original flora of the Indian Desert (Blatt. & Hallb., 1918-21; Puri et al., 1964; Shetty & Singh 1987; Bhandari, 1990), 153 species have been observed to be disappeared from irrigated region of the North Rajasthan. These species still survive in the non-irrigated areas of Bikaner and Churu districts.

In present work flora of North Rajasthan has been studied, a statistical synopsis of the flora and its comparison with those of other regions of India is given.

Table – 1 : Ten largest families with no. of Species and Genera

S.No.	Name of Family	No. of Species	Name of Family	No. of Genera
1	Poaceae	86	Poaceae	51
2	Papilionaceae	65	Asteraceae	41
3	Asteraceae	54	Papilionaceae	30
4	Malvaceae	24	Brassicaceae	11
5	Euphorbiaceae	22	Verbenaceae	11
6	Convolvulaceae	20	Caryophyllaceae	10
7	Amaranthaceae	19	Malvaceae	09
8	Cyperaceae	19	Apiaceae	09
9	Brassicaceae	16	Cucurbitaceae	09
10	Cucurbitaceae	16	Solanaceae	09
			Scrophulariaceae	09
			Bignoniaceae	09
			Amaranthaceae	09

A perusal of above table shows Poaceae, Papilionaceae and Asteraceae are number 1, 2, and 3, respectively; all other families appear at different positions in the table. Poaceae and Papilionaceae are the largest families among the monocotyledons and dicotyledons respectively. Except Poaceae and Cyperaceae, the monocotyledons, are poorly represented. Of the 135 of monocotyledons 86 belongs to Poaceae and 19 to Cyperaceae and remaining 30 species belongs to 18 families, none of which has more than 4 species, except Liliaceae with 7 species.

The ratio of monocotyledons to dicotyledons is 1 : 4.25 of families, 1 : 4.22

ofgenera and 1 : 4.04 ofspecies. The ratio of the total number ofgenera to species is 1 : 1.57 which is rather low in comparison to a corresponding ratio for the whole of India which is 1 : 7 but it is more or less similar so the ratio of Indian Desert (1 : 1.9) as reported by Bhandari (1988), the upper gangetic plain (1. 2.2) and equal to Delhi (1 : 1.6), as reported by Maheshawari (1963). The proportion of monocotyledons to dicotyledons when compared to a corresponding ratio ofthe Indian Desert (Bhandari, 1988), is low of families (1 : 7) and almost equal in respect ofgenera and species (1 : 3). The relative proportion ofdicot and monocot taxa, families, genera and species is shown in table -2.

Table – 2

S.No.	Taxa	Dicots		Monocots		Total	Ratio		
		No.	%	No.	%		Monocot	:	Dicot
1	Families	85	81	20	19	105	1	:	4.25
2	Genera	350	80.83	83	19.17	433	1	:	4.22
3	Species	545	80.15	135	19.85	680	1	:	4.04

Thirty nine families are represented by single species in this region out of which 27 families belong to dicotyledons and 12 families belong to monocotyledons (Table-3). Thirty three families have the number of species between 2-4 out of which 28 families belong to dicotyledons and remaining 5 to monocotyledons. There are 14 families with 5-9 species these are Capparaaceae (8), Tiliaceae (9), Zygophyllaceae (6), Rutaceae (6), Lythraceae (5), Molluginaceae (6), Aizoaceae (5), Apiaceae (9), Asclepiadaceae (5), Bignoniaceae (9). Lemniaceae (7), Polygonaceae (8), Moraceae (6), and Liliaceae (7). There are 14 families with 10-20 species. These are Brassicaceae (16), Caryophyllaceae (10), Mimosaceae (12), Caesalpinaceae (15), Cucurbitaceae (16), Boraginaceae (11), Convolvulaceae (20), Solanaceae (14), Scrophulariaceae (13), Acanthaceae (11), Verbenaceae (15), Amaranthaceae (19), Chenopodiaceae (10) and Cyperaceae (19). Thirty nine families are represented by a single species only, while 14 families are monogeneric, but comprise more than one species. Twenty five families are having 2-4 genera, twenty one families with 5-9 genera and six families have got 10 or more genera. (table-4). Thus the reason for large no. of families (105) represented in area with such a small no. of species (680) is canal irrigation.

Table - 3

S.No.	Families with 2-4 Species	Families with 5-9 Species	Families with 10-20 Species	Families with more than 20 species
1	Ranunculaceae	Capparaceae	Brassicaceae	Malvaceae
2	Menispermaceae	Tiliaceae	Caryophyllaceae	Papilionaceae
3	Nympheaceae	Zygophyllaceae	Mimosaceae	Asteraceae
4	Papaveraceae	Rutaceae	Cesalpiniaceae	Euphorbiaceae
5	Polygalaceae	Lythraceae	Cucurbitaceae	Poaceae
6	Portulacaceae	Molluginaceae	Boraginaceae	
7	Tamaricaceae	Aizoaceae	Convolvulaceae	
8	Elatinaceae	Apiaceae	Solanaceae	
9	Oxalidaceae	Asclepiadaceae	Scrophulariaceae	
10	Simaroubiaceae	Bignoniaceae	Acanthaceae	
11	Meliaceae	Lamiaceae	Verbenaceae	
12	Rhamnaceae	Polygonaceae	Amaranthaceae	
13	Sapindaceae	Moraceae	Chenopodiaceae	
14	Rosaceae	Liliaceae	Cyperaceae	
15	Combretaceae			
16	Myrtaceae			
17	Cactaceae			
18	Rubiaceae			
19	Salvadoraceae			
20	Apocynaceae			
21	Ehretiaceae			
22	Cuscutaceae			
23	Orobanchaceae			
24	Pedaliaceae			
25	Rostellulariaceae			
26	Plantaginaaceae			
27	Nyctaginaceae			
28	Aristolochiaceae			
29	Amaryllidaceae			
30	Commelinaceae			
31	Arecaceae			
32	Lemnaceae			

Table - 4

S.No.	Families with 1 Genus and 1 Species	Families with 1 Genus and more than one Species	Families with 2-4 Genera	Families with 5-9 Genera	Families with 10 or more than 10 Genera
1	Fumariaceae	Polygalaceae	Ranunculaceae	Capparaceae	Brassicaceae
2	Hypecoaceae	Portulacaceae	Menispermaceae	Zygophyllaceae	Papilionaceae
3	Resedaceae	Tamaricaceae	Nympheaceae	Malvaceae	Caryophyllaceae
4	violaceae	Elatinaceae	Papaveraceae	Mimosaceae	Asteraceae
5	Bombacaceae	Oxalidaceae	Tiliaceae	Caesalpiaceae	Verbenaceae
6	Linaceae	Rhamnaceae	Rutaceae	Molluginaceae	Poaceae
7	Malpighiaceae	Cactaceae	Simaroubiaceae	Apiaceae	
8	Geraniaceae	Salvadoraceae	Meliaceae	Cucurbitaceae	
9	Tropaeolaceae	Cuscutaceae	Sapindaceae	Asclepiadaceae	
10	Burseraceae	Rostellulariaceae	Rosaceae	Boraginaceae	
11	Celastraceae	Plantaginaceae	Combretaceae	Convolvulaceae	
12	Anacardiaceae	Aristolochiaceae	Myrtales	Solanaceae	
13	Moringaceae	Arecaceae	Lythraceae	Scrophulariaceae	
14	Crassulaceae	Potamogetonaceae	Aizoaceae	Bignoniaceae	
15	Vahliaceae		Rubiaceae	Acanthaceae	
16	Onagraceae		Apocynaceae	Euphorbiaceae	
17	Trapaceae		Ehretiaceae	Amaranthaceae	
18	Sphenocleaceae		Orobanchaceae	Chenopodiaceae	
19	Primulaceae		Pedaliaceae	Polygonaceae	
20	Sapotaceae		Lamiaceae	Liliaceae	
21	Periplocaceae		Nyctaginaceae	Cyperaceae	
22	Gentianaceae		Moraceae		
23	Lentibulariaceae		Amaryllidaceae		
24	Martyniaceae		Commelinaceae		
25	Proteaceae		Lemnaceae		
26	Urticaceae				
27	Cannabinaceae				
28	Cannaceae				
29	Ceratophyllaceae				
30	Musaceae				
31	Hydrocharitaceae				
32	Orchidaceae				
33	Potenderiaceae				
34	Juncaceae				
35	Pandanaceae				
36	Typhaceae				
37	Alismataceae				
38	Araceae				
39	Najadaceae				

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