

THE FLORA OF KUTCH—FLORISTICS AND PHYTOCHEMISTRY

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INTRODUCTION

Kutch, a district of Gujarat State lies at the western extremity of India. The district is mostly a plain country with a few low hillocks here and there. The area is surrounded on the west by the Arabian Sea, on the south by the Gulf of Kutch, on the north by the Great Rann of Kutch and on the east by the Little Rann of Kutch. The Ranns are devoid of any type of vegetation. The rainfall is very scanty and the average annual rainfall comes to about 350 mm and a very long dry season of 8-10 months is characteristic of the area. The soil of Kutch is mostly sandy or rocky and all low lying country has saline soil. The peculiar geographical position, extreme climatic conditions and the corresponding xerophytic plant life makes the flora of this region an interesting study.

Palin (1880) and Blatter (1908) published lists of plants of this area without giving localities. A detailed account of the economically important plants of this region was written in Gujarati by Indrajit Thakar (1928). This work was followed by the works of Puri *et al.* (1959), Jain (1960), Jain & Kanodia (1960), Jain & Deshpande (1960), Bhandari (1965), Kanodia & Nanda (1966), Rao (1970) and Rao & Sabnis (1977). Recently Shah (1980) has compiled the available information on Kutch Plants.

VEGETATION

The vegetation of Kutch region is dominated by thorny scrub forests. It can conveniently be classified into the following types. (a)

Coastal vegetation (b) inland forest vegetation (c) aquatic vegetation (d) vegetation of roadsides and wastelands (e) agricultural crops, plantation and weed flora and (f) hedge flora.

(a) *Coastal vegetation* : This is divided into two types, coastal sandy strands and salt marsh and Mangroves. *Lotus garcini* DC., *Indigofera argentea* Roxb., *Cyperus arenarius* Wight, *Sericostoma pauciflorum* Stocks, *Leptadenia pyrotechnica* DCne., *Heliotropium bacciferum* var. *suberosa* Forsk., *Asparagus dumosus* Baker and *Halopyrum mucronatum* Stapf are some of the species dominating the former type. The mangrove vegetation chiefly consists of *Avicennia marina* var. *acutissima* Stapf & Mold., which forms extensive forests along the coasts of Kandla and Mundra. The halophytic vegetation includes *Salicornia brachiata* Roxb., *Sesuvium portulacastrum* L., *Suaeda fruticosa* Forsk., *Trianthema triquetra* Rottl., *Sesuvium sesuvioides* (Fenz.) Verdc., and *Juncus maritimus* Lamk., which dominate the salt marshes.

(b) *Inland forest vegetation* : Though dominated by thorny scrub forests, there are some protected areas in the district where many of the tree species attain good growth and also support a good undergrowth. The tree species are *Acacia nilotica* ssp. *indica* (Benth.) Brenan, *A. leucopholea* Willd., *A. senegal* Willd., *Prosopis cineraria* (L.) Macbr., *P. chilensis* (Molina) Stuntze., and *Balanites aegyptiaca* Wall. The low hillocks forming the natural landscape of the region, support some of the above tree components. The soils on these hillocks are shallow, gravelly and red-

dish brown. Other plant species are *Euphorbia caducifolia* Haines, *Commiphora wightii* (Arn.) Bhandari, *Lycium barbarum* Linn. *Premna resinosa* Schau., *Grewia tenax* (Forsk.) Flori., *G. villosa* Willd., *Periploca aphylla* Dcne., *Haloxylon recurvum* Bunge., *Fagonia cretica* L., *Pluchea arguta* Boiss., *Dipteracanthus patulus* var. *alba* Roxb., *Seddora latifolia* Hochst., *Abutilon fruticosum* Guill. & Pers., *Pavonia ceratocarpa* Dalz., *Campylanthus ramosissimus* Wight, *Helichrysum cutchicum* (Cl.) Rolla Rao et Desh., *Inula grantioides* Boiss., *Blepharis sindica* Stocks, *Cleome vahliana* Fres., and *Zygophyllum simplex* L.

Rakhals : In addition to the natural protected forests, there are man-made forests maintained by the Forest Department. These are either monocultures or mixed cultures consisting of *Prosopis chilensis* (Molina) Stunze, *P. cineraria* (L.), Macbr., *Acacia nilotica* ssp. *indica* (Benth.) Brenan, *Salvadora oleoides* Dcne., and *Tamarix articulata* Vahl. During the short monsoon period a sparse undergrowth mainly of *Indigofera cordifolia* Heyne, *Peristrophe bicalyculata* Nees, *Tephrosia purpurea* Pers., *Pupalia lappacea* Moq., *Leucas* spp., *Justicia heterocarpa* T. Anders., *Sida glutinosa* Roxb., and *Eragrostis tremula* Hochst., is noticed. The parasite *Cistanche tubulosa* Wight was noticed in thick shade on the roots of *Salvadora*.

(c) **Aquatic vegetation :** Kutch has many ponds and tanks at various places. Rivers are not perennial and flow only during the short monsoon period. Submerged aquatics such as *Najas minor* Allioni, *Ceratophyllum demersum* L., *Hydrilla verticillata* Casp., *Potamogeton pectinatus* L. and *Vallisneria spiralis* L., occur in fresh waters while *Najas marina* var. *muri-cata* (Del.) A. Br. ex K. Schum and *Ruppia maritima* Griff., occur in brackish water.

(d) **Vegetation of roadsides and wastelands :** All over the district *Prosopis chilensis* (Molina) Stuntze., is fast spreading in the

wastelands and along the roadsides. There are also plants like *Calotropis procera* Br., *Capparis decidua* (Forsk.) Edgew., *Cassia auriculata* L., *C. angustifolia* Vahl., *C. italica* Lam. ex Steud., *C. holosericea* Fresen., and *Aerva persica* (Brum. f.) Merr. On the rocky ground *Lepidagathis trinervis* Nees and *Echinops echinatus* DC., are common. The wastelands form the largest part of Kutch, next only to Ranns and are not suitable for normal agricultural practices due to the high salinity of the soil. *Fagonia cretica* L., *Solanum indicum* L., *Indigofera oblongifolia* Forsk., *Sida grewioides* Guill & Pers., *Crotalaria burhia* Ham., etc. are found in such areas.

(e) **Agricultural crops, plantations and weed flora :** The main cereal crops are Bajra, Jowar and Wheat. Pulses include *Vigna radiatus* (L.) Wilezek, *V. mungo* (L.) Happer, *V. aconitifolius* (Jacq.) Marechal., and *V. catjung* Endl. The oil seeds grown in the district are Groundnut, Sesame and Mustard. Cotton is the most important cash crop of Kutch. In addition to these crops, there are *Phoenix* (date palm) plantations on saline soils near Mundra.

The main weeds in these plantations and cultivated fields are *Flavaria trinervia* (Spr.) C. Mohr., *Vaccaria pyramidata* Medic., *Solanum nigrum* L., *Chenopodium album* L., *Portulaca oleracea* L., *Zygophyllum simplex* L., *Anticharis senegalensis* (Walp.) Bhandari, *Cressa cretica* L., *Phyllanthus maderaspatensis* L., *Celosia argentea* L., and *Melilotus indica* All.

(f) **Hedge flora :** Plants used for hedges are *Euphorbia tirucalli* L., *E. neriifolia* L., *Prosopis chilensis* (Molina) Stuntze, *Lantana*, *Ziziphus* etc.

The main climbers on these hedges are *Cocculus hirsutus* Diels., *Cardiospermum halicacabum* L., *Mukia maderaspatana* Kurz, *Rhynchosia minima* DC., *R. pulverulenta* Stocks, *Momordica dioica* Roxb., and *Corallocarpus epigens* Hook. f.

FLORISTIC ACCOUNT

So far, about 700 species covering 95 families have been reported from Kutch. The first 3 dominant families are Poaceae (81 species), Leguminosae (76 species) and Asteraceae (35 species).

The following are some more plants from the Kutch region which, to the best of our knowledge, were not recorded by the earlier workers.

Abutilon ramosum (Cav.) Guill. & Perr. (Malvaceae)

Along hedges. Bhuj. KSR 564.

Acanthospermum hispidum DC. (Asteraceae)

Along roadsides during monsoon. Bhuj—Mandvi Road, KSR 1016.

Aerva javanica (Burm. f.) Juss. ex Schultes var. **bovei** Webb. (Amaranthaceae)

Alternanthera pungens H. B. K. (Amaranthaceae)

Prostrate weed along railway line. Kandla. KSR 495.

Anticharis senegalensis (Walp.) Bhandari (Scrophulariaceae)

On gravelly soils of cotton field. Anjar, KSR 663.

Bouchea marrubifolia Schouer (Verbenaceae)

On rocky ground. Anjar, KSR 980.

Cassia obtusifolia L. (Caesalpiniaceae)

In waste places. Kandla KSR 1019.

Convolvulus rhyniospermus Hochst. ex Choisy (Convolvulaceae)

In a cotton field, Anjar, KSR 451.

Croton bonplandianum Baill. (Euphorbiaceae)

Along roadsides. Kandla port, KSR 1014.

Dipcadi erythraeum Webb. & Berth. (Liliaceae)

Bulbous, scapigerous herb. Leaves nar-

rowly linear. Flowers greenish in a lax raceme. Perianth cylindric, 6-lobed. Fruit a capsule. Flowers appear immediately after the first few showers. On rocky hillocks, earlier the plant was reported from North-West Rajasthan only. This is a new record for Gujarat State. Bhuj, KSR 818.

Indigofera argentea Burm. f. (Fabaceae)

Common, along sandy coast. Mandvi, KSR 886.

I. linifolia (L. f.) Retz. var. **campbellii** Wight (Fabaceae)

In fallow fields. Kandla, KSR 1012.

I. sessiliflora DC. (Fabaceae)

In sandy, fallow fields, Bhuj, KSR 531, 629, 1023.

Launaea resedifolia (L.) O. Kuntze (Asteraceae)

On sandy sea coast. Mandvi, KSR 578.

Leucas nutans (Roth) Spreng. (Lamiaceae)

Under the shade of *Prosopis*. Mandvi, KSR 883.

Najas marina L. var. **muricata** (Del.) A. Br. ex K. Schum. (Najadaceae)

Anjar, KSR 775.

Portulaca meridiana L. f. (Portulacaceae)

Weed in cultivated fields. Anjar, KSR 937.

Rhynchosia pulverulenta Stocks (Fabaceae)

Common, on hedges. Mundra, KSR 997.

Ruppia maritima L. var. **rostrata** Agardh. (Najadaceae)

In brackish waters at Kandla. KSR 503.

Sida tiagii Bhandari (Malvaceae)

Similar to *S. ovata* Forsk. Calyx much larger, loosely but completely enclosing the mericarps. Mericarps 2-awned, with 2 glands and 2 spiny outgrowths just below the awns.

New record for Gujarat State. Common, on rocky ground, along roadsides. Bhuj, KSR 660, 770.

Tribulus rajasthanensis Bhandari & Sharma (Zygophyllaceae)

Similar to *T. terrestris* L. but differing from it in having only two median spines and numerous secondary spines. The secondary spines are tipped with long white bristles. A new record for Gujarat State. On rocky ground. Bhuj, KSR 434, 523.

Triumferra pentandra A. Rich. (Tiliaceae)

Common, along roadsides during monsoon. Bhuj, KSR 78, 796.

Vaccaria pyramidata Medik. (Caryophyllaceae)

Weed in cultivated fields. Bhuj, KSR 437.

It is interesting to observe that more and more plants reported from Sind and North-West Rajasthan are now being found in the South-Eastern Kutch and many of them are not found eastwards of Kutch.

PHYTOCHEMICAL SURVEY

Kutch is an industrially and agriculturally backward area. But for a little development of mineral resources, the district does not boast of any other type of development. A phytochemical survey of this entire arid region is being planned solely with the idea of locating promising sources of pharmacologically active chemical compounds like alkaloids and industrially important tannins and saponins. It is hoped that screening data will be useful for the development of small scale industries engaged in extraction of crude drugs.

Standard test procedures have been employed, following the works of Arthur and Chan (1962), Raffauf (1962), Amarsingham (1964) and Persinos (1964) and testing was done on qualitative and semiquantitative basis.

Till today 125 plants have been chemically

screened, out of which some 45 show the presence of Alkaloids, 25 of Saponins and 10 of Tannins.

The following are the characteristic, desert plants which are found to be promising sources of alkaloids, saponins and tannins.

Alkaloids : *Cocculus pendulus* (Forst.) Diels., *Capparis decidua* (Forsk.) Edgew., *Crotalaria burhia* Buch.-Ham. ex Benth., *Citrullus colocynthis* (L.) Soland., *Leptadenia pyrotechnica* (Forsk.) Decne., *Periploca aphylla* Decne., *Heliotropium bacciferum* Forsk., *H. marifolium* Koen. ex Retz., *Lycium barbarum* L., *Solanum incanum* L., *S. indicum* L., *Anticharis senegalensis* (Walp.) Bhandari and *Barleria acanthoides* Vahl.

Saponins : *Capparis decidua* (Forsk.) Edgew., *Fagonia cretica* L., *Balanites aegyptiaca* (L.) Delile, *Sesuvium portulacastrum* L., *Leptadenia pyrotechnica* (Forsk.) Decne., *Lycium barbarum* L., *Aerva javanica* (Burm. f.) Juss. ex Schult. var. *bovei* Webb. and *Pupalia lappacea* (L.) Juss.

Tannins : *Tamarix aphylla* (L.) Karst., *T. ericoides* Rottl., *Cassia auriculata* L., *Acacia leucophloea* (Roxb.) Willd., and *A. senegal* (L.) Willd.

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