

A CONTRIBUTION TO THE STUDY OF THE VEGETATION AND FLORA OF
KHEDBRAHMA REGION OF NORTH GUJARAT

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ABSTRACT

The vegetation and flora of Khedbrahma region of north Gujarat are discussed and the preliminary data based on two years survey are presented in this paper. 554 species have been enumerated which comprised 448 dicotyledons and 102 monocotyledons. Two new records for India namely, *Desmodium neo-mexicanum* A. Gray and *Dalechampia scandens* Linn. var. *cordifolia* (Hochst.) Muell.-Arg. have been reported from this area under study. Five species such as *Polycarpon tetraphyllum* Linn., *Melania futeyporensis* Munro ex Mast., *Indigofera angulosa* Edgew., *Pulicaria crispa* (Forsk.) Oliv. and *Operculina petaloidea* (Choisy) Van Oost., not mentioned in Cooke's flora of Presidency of Bombay (1901-1908) have been reported from the area.

INTRODUCTION

Though a modern flora of the Gujarat State does not exist, there have been a few major contributions to the study of the flora of this region. Saxton and Sedgwick (1918) published an account of the plants of northern Gujarat, which was subsequently supplemented by Saxton in 1922. These, in our opinion, are the only publications worth the name for the entire region of north Gujarat. Saxton and Sedgwick, for obvious reasons, surveyed the British territory and left major parts of northern Gujarat completely untouched. However, their remarks—"there is a rich haul awaiting any botanist who will explore as far north as Khedbrahma, the terminus of the Ahmedabad-Prantij Railway—rich in the sense that he will add to Bombay flora many Rajputana and North Indian species"—are extremely suggestive. These remarks coming as they were from two eminent systematists with a first hand knowledge of the floristics of northern Gujarat, prompted the authors to undertake a floristic and vegetational survey of Khedbrahma and the adjoining region. In the present paper two years' data have been presented. The work is continued with a view to compiling an exhaustive flora of the entire region in not too distant future.

LOCATION

The Sabarkantha District, of which the area surveyed here is a part, lies between $23^{\circ}16'$ to $24^{\circ}30'$ North latitude and $73^{\circ}39'$ to $72^{\circ}42'$ East longitude. The area is bounded by Rajasthan territory on the north and east, Panchmahal District on the south-east. Kaira District on the south,

Ahmedabad District on the south-west and Mehsana and Banaskantha Districts on the west.

GEOLOGY AND CLIMATE

The principal geological formation of the tract is due to underlying rocks, which are granite, quartzite, calc-gneiss, sandstone and schist derived from the Aravalli and Delhi systems. The major portion of the district is sandy, which becomes more pronounced as one proceeds towards the west. The terrain is nothing but a thick accumulation of fine silty or alluvial soil covering all underlying formations. The soils on most of the hills are shallow exposing the underlying geological formation at places. The soil in general is sandy with varying proportions of loam.

Climate in general is sub-tropical and which remains damp and humid during July and September and gradually becomes exceedingly dry from December onwards. The coldest months are December and January with average temperature receding to nearly 30°C . The hottest months are April and May with maximum temperature reaching upto 47.2°C . Monsoon starts in June and continues till September with occasional breaks. The rainfall on the whole is low, varying between 300 to 1000 mm.

LOCALITIES VISITED

The following localities were visited during 1967 and 1968 in all the seasons of the year.

Posina, Ganava, Dharoi, Danmahudi, Patadia, Dikthali, Matora, Agiya, Vartol, Radhiwad, Khedbrahma, Padhara, Galodja, Silver, Laxmipura, Pataria tank, Kalol, Damavas.

Vadali, Detroli, Thuravas.
 Idar and adjoining area.
 Himmatnagar and adjoining area.

VEGETATION

Forest vegetation: The area under study is more or less plain with scattered hillocks. The plains are mostly brought under the plough and hence the natural vegetation, though tampered with by biotic factors, exists on the hillocks. The forests are mostly of the thorn-scrub type with the predominance of *Acacia leucophloea*, *A. nilotica* var. *indica*, *Capparis decidua*, *Dichrostachys cinerea*, *Maytenus emarginata*, *Salvadora persica* and *Zizyphus mauritiana*. These forests are the climax formations in the drier parts of the area such as Khedbrahma, Posina, Matora, Agiya and Bawalia. These low forests have many open areas, which are completely occupied by *Calotropis procera*, *Cassia auriculata*, *Lepidagathis trinervis*, *Mimosa hamata* and *Zizyphus nummularia* and serve as indicators of excessive grazing. The hillocks of Damavas, Dan mahudi, Kalol, Padhara present scrub forests on the outskirts probably because of the various biotic factors such as grazing, felling of trees, clearing of land for cultivation etc., operating but in the interiors they support typical dry deciduous forests. *Lannea coromandelica* and *Butea monosperma* along with *Holarrhena antidysenterica*, *Nyctanthes arbor-tristis* and *Wrightia tinctoria* were noted as the dominants and co-dominants. *Butea monosperma* was observed in all stages of development mainly in the biotically disturbed parts of the area. In the least disturbed areas at Dikthali, certain parts of Damavas, Dharoi and Detroli, very rich forests mainly consisting of *Lannea coromandelica* and *Butea monosperma* were observed. However, *Anogeissus latifolia*, *A. pendula* (planted on large scale at Harad and Detroli), *Boswellia serrata*, *Dalbergia sissoo*, *Madhuca indica*, *Sterculia urens* and *Ternstroemia crenulata* were quite conspicuous. In addition to this upper storey of forest vegetation, there are a number of shrubs or low trees like *Carissa congesta*, *Grewia damine*, *G. tiliacifolia*, *Helicteres isora*, *Kirganelia reticulata*, *Kydia calycina* and *Securinega virosa* which form the lower storey. Climbers noted in these forests are *Ampelocissus latifolia*, *Dioscorea bulbifera*, *D. pentaphylla*, *Mucuna prurita*, *Operculina turpethum*, *Rivea hypocrateriformis* and *Tinospora cordifolia*. The tall trees, low shrubs or trees and the woody climbers enumerated above

form the permanent aspect of the forest vegetation. During monsoon, a number of ephemerals make their appearance and continue to exist till the post-monsoon period. This temporary aspect mainly consists of erect or decumbent plants like *Achyranthes aspera* var. *porphyristachya*, *Andrographis echinoides*, *Barleria prionitis*, *Glossocardia bosvallea*, *Hibiscus ovalifolius*, *Indigofera cordifolia*, *Peristrophe bicalyculata*, *Polygala chinensis*, *P. erioptera* and *Sida cordata* and low herbaceous twiners like *Cantharospermum scarabaeoides*, *Cocculus hirsutus*, *Ipomoea indica*, *I. sinensis* and *Rhynchosia minima*. At few places, *Biophytum sensitivum*, *Commelina forskalaei*, *C. paludosa*, *Desmodium neomexicanum*, *Tylophora fasciculata* and *Zornia gibbosa*, were observed as undergrowth in hilly forest areas.

On steep, grassy slopes of hillocks or on bare hillocks, plants like *Chlorophytum tuberosum*, *Curculigo, orchinoides*, *Iphigenia indica* and *Urginea indica* were particularly noted.

Aquatic vegetation: There are a number of ponds and puddles which are filled with water during monsoon and which dry up completely or partially on the advent of Summer. The vegetation mainly consists of submerged hydrophytes like *Ceratopteris thalictroides*, *Hydrilla verticillata*, *Neha-mandra alternifolia*, *Ottelia alismoides*, *Potamogeton crispus*, *Utricularia inflexa* var. *stellaris*, *Vallisneria spiralis* and many others. The floating hydrophytes include *Azolla* sp., *Ipomoea aquatica*, *Nelumbo nucifera*, *Nymphaea nouchali*, *Nymphoides cristatum*, *N. indicum* and *Pistia stratiotes*. The emergent or amphibious hydrophytes like *Hydrolea zeylanica*, *Hygrophila auriculata*, *Limnophila indica*, *Limnophyton obtusifolium*, *Monochoria hastae-folia*, *Polygonum barbatum* var. *gracile* and *Sagittaria sagittifolia* are commonly met with.

The river Hathmati flows through the city of Himmatnagar. The riverbeds support plants like *Catharanthus pusillus*, *Perotis indica*, *Sachcharum spontaneum*, *Tamarix ericoides* etc. The riverbeds of Harnav were studied at Kalol and Khedbrahma. On the elevated banks of the river and its tributaries, *Vitex negundo* was very common. On the sandy riverbeds plants like *Ammannia auriculata*, *A. baccifera*, *A. multiflora*, *Jussiaea perrenis*, *Molugo cerviana*, *M. nudicaulis*, *M. pentaphylla*, *Rotala serpyllifolia* were particularly noted. The river Sabarmati forms the western boundary of the area and is one of the largest rivers in the State.

The river banks support a vegetation consisting of tree species *Phoenix sylvestris* and *Ailanthus excelsa* on the elevated banks and *Crinum pratense*, *Cyperus difformis*, *Indigofera cordifolia*, *Leptadenia pyrotechnica*, *Polycarpaea corymbosa* on the sandy beds.

Crop and Crop weeds: The major part of the plain area has been brought under cultivation. The chief crops are maize, wheat, sesame, groundnut, cotton and a number of pulses. The common agricultural weeds are *Ageratum conyzoides*, *Amaranthus lividus*, *Asphodelus tenuifolius*, *Blumea* sp., *Cassia tora*, *Celosia argentea*, *Cleome viscosa*, *Cressa cretica*, *Gomphrena celosioides*, *Leucas aspera*, *Merremia gangetica*, *Phyllanthus asperulatus*, *Polygala eriopetra*, *Solanum nigrum* and *Trianthema portulacastrum*.

Vegetation of roadside and hedges: Because of the expanding agriculture and urbanization, this aspect of the vegetation assumes special importance. The roadsides are usually planted with ornamental or shade trees like *Azadirachta indica*, *Cassia siamea*, *Mangifera indica*, *Pongamia pinnata* and *Tamarindus indica*. The common annuals or perennials noted were *Acanthospermum hispidum*, *Boerhavia diffusa*, *Cassia auriculata*, *C. occidentale*, *C. tora*, *Tephrosia hamiltonii* and *Xanthium strumarium*. In hedges, plants like *Annona squamosa*, *Capparis sepiaria*, *Euphorbia nerifolia*, *E. tirucalli*, *Jatropha curcas*, *J. gossypifolia* and *Zizyphus mauritiana* are either planted or self-sown. The hedges support a number of climbers such as *Canavalia gladiata*, *Clitoria ternatea*, *Cocculus hirsutus*, *Ipomoea obscura*, *I. sepiaria*, *Mucuna pruriata*, *Operculina turpethum*, *Pergularia daemia*, *Rhynchosia minima*, *Telosma pallida* and *Tinospora cordifolia*.

ENUMERATION

*—Not mentioned in Saxton and Sedgwick's *Plants of Northern Gujarat*.

**—Not mentioned in Cooke's *Flora of the Presidency of Bombay*.

***—New Record for India.

ANNONACEAE

Annona squamosa Linn.

Polyalthia longifolia (Sonner.) Thw.

MENISPERMACEAE

Cissampelos pareira Linn. var. *hirsuta* (Buch. ex DC.) Forman

Cocculus hirsutus (Linn.) Diels

Tinospora cordifolia Miers

NELUMBONACEAE

Nelumbo nucifera Gaertn.

NYMPHAEACEAE

Nymphaea nouchali Burm. f.

PAPAVERACEAE

Argemone mexicana Linn.

CAPPARIDACEAE (CAPPARACEAE)

Capparis decidua (Forsk.) Edgew.

C. sepiaria Linn.

Cleome gynandra Linn.

C. monophylla Linn.

C. simplicifolia Hook. f. & Thoms.

C. viscosa Linn.

Crateva nurvala Buch.-Ham.

VIOLACEAE

Hybanthus enneaspermus (Linn.) F. Muell.

**Viola cinerea* Boiss var. *stocksii* Beck. f.

POLYGALACEAE

Polygala chinensis Linn.

P. eriopetra DC.

CARYOPHYLLACEAE

Polycarpaea corymbosa (Linn.) Lamk.

***Polycarpon tetraphyllum* Linn.

PORTULACACEAE

Portulaca oleracea Linn.

P. quadrifida Linn.

TAMARICACEAE

Tamarix dioica Roxb.

T. erioides Rottl.

ELATINACEAE

Bergia ammannioides Roxb.

B. odorata Edgew.

MALVACEAE

**Abelmoschus manihot* Medic.

**Abutilon glaucum* (Cav.) Sweet.

A. indicum (Linn.) Sweet.

A. ramosum Guill.

Gossypium herbaceum Linn.

Hibiscus caesioides Garcke

H. cannabinus Linn.

H. lobatus (Murr.) O. Kuntze

H. ovalifolius (Forsk.) Vahl

**H. vitifolius* Linn.

**Kydia calycina* Roxb.

**Pavonia patens* (Ander.) Chiov.

P. zeylanica Cav.

- **Sida acuta* Burm. f.
S. alba Linn.
S. cordifolia Linn.
 **S. rhombifolia* Linn. var. *rhomboidea* Masters
S. cordata (Burm. f.) Borss.
Urena lobata Linn.

BOMBACACEAE

- Bombax ceiba* Linn.

STERCULIACEAE

- Helicteres isora* Linn.
 ***Melhanian futeyporensis* Munro ex Mast.
Melochia corchorifolia Linn.
Sterculia urens Roxb.
Waltheria indica Linn.

TILIACEAE

- Corchorus aestuans* Linn.
C. fascicularis Lamk.
C. olitorius Linn.
C. tridens Linn.
C. trilobularis Linn.
 **Grewia damine* Gaertn.
G. hirsuta Vahl
G. subinequalis DC.
 **G. tiliacifolia* Vahl
Triumfetta rhomboidea Jacq.
T. rotundifolia Lamk.

ZYGOPHYLLACEAE

- Tribulus terrestris* Linn.

OXALIDACEAE

- **Biophytum sensitivum* (Linn.) DC.
Oxalis corniculata Linn.

BALSAMINACEAE

- **Impatiens balsamina* Linn. var. *coccinea* Hook. f.

RUTACEAE

- Aegle marmelos* (Linn.) Corr.
Limonia acidissima Linn.
 **Murraya paniculata* (Linn.) Jacq.

SIMARUBACEAE

- Ailanthus excelsa* Roxb.
Balanites aegyptiaca (Linn.) Del.

BURSERACEAE

- Boswellia serrata* Roxb.
 **Garuga pinnata* Roxb.

MELIACEAE

- Azadirachta indica* A. Juss.
Melia azedarach Linn.

CELASTRACEAE

- Celastrus paniculata* Willd.
Maytenus emarginata (Willd.) Ding Hou

RHAMNACEAE

- Zizyphus glabrata* Heyne ex Roth
Z. mauritiana Lamk.
Z. nummularia (Burm. f.) Wt. & Arn.
Z. oenoplia Mill.
Z. xylopyra (Retz.) Willd.

VITACEAE

- Ampelocissus latifolia* (Roxb.) Planch.
Cayratia carnosa (Lamk.) Gagnep

SAPINDACEAE

- Cardiospermum halicacabum* Linn.

ANACARDIACEAE

- Lannea coromandelica* (Houtt.) Merr.
Mangifera indica Linn.

MORINGACEAE

- Moringa oleifera* Lamk.

PAPILIONACEAE

- Abrus precatorius* Linn.
Aeschynomene indica Linn.
Alysicarpus bupleurifolius (Linn.) DC.
A. glumaceus (Wall.) DC.
A. longifolius Wt. & Arn.
A. monilifer (Linn.) DC.
A. procumbens (Roxb.) Schindler
A. tetragonolobus Edgew.
A. vaginalis DC.
Arachis hypogaea Linn.
Butea monosperma (Lamk.) Taub.
Canavalia gladiata (Jacq.) DC.
 **Cantharospermum scarabaeoides* (Linn.) Baill.
 **Clitoria biflora* Dalz.
C. ternatea Linn.
 **Crotalaria hirsuta* Willd.
C. linifolia Linn. f.
C. medicaginea Lamk.
C. mysorensis Roth
C. orixensis Willd.
 **Dalbergia lanceolaria* Linn. f.
D. sissoo Roxb.
 **Desmodium diffusum* DC.
D. gangeticum (L.) DC.
D. laxiflorum DC.
 ****D. neo-mexicanum* A. Gray
D. triflorum (L.) DC.
Eleiotis monophylla (Burm. f.) DC.

Erythrina suberosa Roxb.
 **Glycine javanica* Linn.
Goniogyna hirta (Willd.) Ali
 ***Indigofera angulosa* Edgew.
I. astragalina DC.
I. cordifolia Heyne ex Roth
I. hochstetteri Baker
I. linifolia (Linn. f.) Retz.
I. linnaei Ali.
I. oblongifolia Forsk.
I. tinctoria Linn.
I. trita Linn. f.
Medicago sativa Linn.
Mucuna prurita Hook.
 **Phaseolus radiatus* Linn.
P. trilobus Ait.
P. vulgaris Linn.
Pongamia pinnata (L.) Pierre
 **Rhynchosia capitata* DC.
R. minima (Linn.) DC.
 **R. minima* DC. var. *laxiflora* Baker
Sesbania bispinosa (Jacq.) W. F. Wight
 **S. sesban* (Linn.) Merr. var. *picta* (Prain) Santapau
 **Smithia conferta* Sm.
T. hamiltonii J. R. Drumm.
T. hirta Ham.
T. strigosa (Dalz.) Sant. & Mahesh.
 **T. senticosa* Pers.
Teramnus labialis (Linn. f.) Spreng.
Uraria picta Desv.
Zornia gibbosa Span.

CAESALPINIACEAE

Bauhinia racemosa Lamk.
Caesalpinia crista Linn.
Cassia absus Linn.
C. auriculata Linn.
C. occidentalis Linn.
C. pumila Lamk.
 **C. siamea* Lamk.
C. tora Linn.
Tamarindus indica Linn.

MIMOSACEAE

Acacia chundra (Roxb.) Willd.
A. leucophloea (Roxb.) Willd.
A. nilotica (Linn.) Del. var. *indica* Brenan.
A. pennata Willd.
A. senegal Willd.
Albizia lebbeck (Linn.) Benth.
Dichrostachys cinerea (Linn.) Wt. & Arn.
Mimosa hamata Willd.

Prosopis spicigera Linn.

VAHLIACEAE

Vahlia dichotoma (Murr.) O. Kuntze

COMBRETACEAE

**Anogeissus latifolia* Watt. ex Beddome
A. pendula Edgew.
Terminalia arjuna (Roxb. ex DC.) Wt. & Arn.
T. crenulata Roth

MYRTACEAE

**Eucalyptus globulus* Labill.
Psidium guajava Linn.
Syzygium cumini (L.) Skeels.

LYTHRACEAE

Ammannia auriculata Willd.
A. baccifera Linn.
A. multiflora Roxb.
Lawsonia alba Lamk.
Rotala serpyllifolia (Roth) Bremek.
Woodfordia fruticosa (L.) Kurz.

PUNICACEAE

Punica granatum Linn.

ONAGRACEAE

Jussiaea perennis (L.) Brenan
Trapa natans Linn. var. *bispinosa* (Roxb.) Makino

PASSIFLORACEAE

Passiflora foetida Linn.

CUCURBITACEAE

Blastania fimbristipula (Fenzl.) Kots. & Peyr.
Coccinia cordifolia (L.) Cogn.
Colocynthis vulgaris Schr.
Corallocarpus epigaeus (Rottl. et Willd.) Clarke
Cucumis callosus (Rottl.) Cogn.
C. melo Linn. var. *agrestis* Naud.
Diplocyclos palmatus (L.) Jeffrey
Luffa acutangula (L.) Roxb. var. *amara* (Roxb.) Cl.
L. cylindrica (L.) Roem.
Melothria maderaspatana (Linn.) Cogn.
Momordica balsamina Linn.
M. charantia Linn.
 **M. cochinchinensis* Spr.
M. dioica Roxb.
Trichosanthes bracteata Voigr.
T. cucumerina Linn.

CACTACEAE

Opuntia elatior Mill.

MOLLUGINACEAE

- Glinus lotoides* Linn.
G. oppositifolius (L.) DC.
Mollugo cerviana Seringe
M. nudicaulis Lamk.
 **M. pentaphylla* Linn.

AIZOACEAE

- Gisekia pharnaceoides* Linn.
Trianthema govindia Buch.-Ham.
T. portulacastrum Linn.
T. triquetra Rottl. & Willd.

ALANGIACEAE

- Alangium salvifolium* (Linn. f.) Wang.

APIACEAE (UMBELLIFERAE)

- Centella asiatica* (L.) Urban
Foeniculum vulgare Mill.
 **Pimpinella heyneana* Wall.
 **Trachyspermum stictocarpum* (Cl.) Wolff.

RUBIACEAE

- Borreria articularis* (Linn. f.) F. N. Will
B. stricta (Linn. f.) K. Schum.
 **Dentella repens* Forsk.
Mitragyna parviflora (Roxb.) Korth.
Morinda tomentosa Heyne ex Roth
 **Oldenlandia aspera* DC.
O. corymbosa Linn.
Xeromphis spinosa (Thunb.) Keay

ASTERACEAE (COMPOSITAE)

- **Acanthospermum hispidum* DC.
Ageratum conyzoides Linn.
Amberboa ramosa (Roxb.) Jafri.
Bidens biternata (Lour.) Merr. et Sherff.
Blainvillea acmella (Linn.) Philipson.
Blumea fistulosa (Roxb.) Kurz.
B. lacera (Burm. f.) DC.
B. membranacea (Wall.) DC.
B. mollis (D. Don) Merr.
B. obliqua (Linn.) Druce.
Caesulia axillaris Roxb.
 **Centratherum anthelminticum* (Willd.) Kuntze
Cyathocline purpurea (Don.) O. Kuntze.
Echinops echinatus Roxb.
Eclipta prostrata (Linn.) Linn.
Emilia sonchifolia (Linn.) DC.
Glossocardia bosvallea (Linn. f.) DC.
Gnaphalium indicum Linn.
G. pulvinatum Delile
 **Goniocaulon indicum* (Klein ex Willd.) C. B. Clarke
Grangea maderaspatana Poir,

- Launaea nudicaulis* (Linn.) Hook. f.
Pulicaria angustifolia DC.
 ***P. crispa* (Forsk.) Oliv.
P. wightiana C. B. Cl.
Sclerocarpus africanus Jacq.
Sphaeranthus indicus Linn.
Tridax procumbens Linn.
Vernonia cinerea (Linn.) Less.
Vicoa indica (Willd.) DC.
Xanthium strumarium Linn.

SPHENOCLEACEAE

- Sphenoclea zeylanica* Gaertn.

PLUMBAGINACEAE

- Plumbago zeylanica* Linn.

SAPOTACEAE

- Madhuca indica* Gmel.
Manilkara hexandra (Roxb.) Dubard
Mimusops elengi Linn.

EBENACEAE

- Diospyros melanoxylon* Roxb.

OLEACEAE

- Jasminum sambac* (Linn.) Ait.

SALVADORACEAE

- **Azima tetracantha* Lamk.
Salvadora persica Linn.

APOCYNACEAE

- Carissa congesta* Wt.
Catharanthus pusillus (Murr.) G. Don
C. roseus (Linn.) G. Don
Holarrhena antidysenterica (Linn.) Wall.
Nerium indicum Mill.
Tabernaemontana divaricata (Linn.) R. Br.
Thevetia peruviana (Pers.) Merr.
Wrightia tinctoria R. Br.

ASCLEPIADACEAE

- Calotropis gigantea* (Linn.) R. Br.
C. procera (Ait) R. Br.
Hemidesmus indicus (Linn.) Schult.
 **Holostemma annulare* (Roxb.) K. Schum.
Leptadenia pyrotechnica (Forsk.) Decne
L. reticulata Wt. & Arn.
Marsdenia tenacissima (Roxb.) Moon
Oxystelma secamone (Linn.) Karst.
Pergularia daemia (Forsk.) Chiov.
Telosma pallida (Roxb.) Craib.
 **Tylophora fasciculata* Ham.

GENTIANACEAE

- Canscora diffusa* R. Br.

Enicostema hyssopifolium (Willd.) Verd.
 **Nymphoides cristatum* (Roxb.) O. Kuntze
 **N. indicum* (Linn.) O. Kuntze

HYDROPHYLLACEAE

Hydrolea zeylanica Vahl

BORAGINACEAE

Coldenia procumbens Linn.
Cordia dichotoma Forst. f.
Heliotropium ovalifolium Forsk.
H. marifolium Retz.
H. subulatum Hochst.
Trichodesma indicum R. Br.
T. sedgwickianum Banerji

CONVOLVULACEAE

Convolvulus microphyllus Sieb. ex Spreng.
Cressa cretica Linn.
Cuscuta chinensis Lamk.
C. reflexa Roxb.
Evolvulus alsinoides (Linn.) Linn.
Ipomoea aquatica Forsk.
 **I. cairica* (L.) Sweet
I. coptica (L.) Roth
I. dichroa (Roem. & Schult.) Choisy
I. muricata (Linn.) Jacq.
I. nil (L.) Roth
I. obscura (L.) Ker.-Gawl.
 **I. quamoclit* Linn.
I. sepiaria Koenig ex Roxb.
I. pes-tigridis Linn.
I. sindica Stapf
I. sinensis (Dcsr.) Choisy
Merremia aegyptia (Linn.) Urb.
M. tridentata (Linn.) Hall. f.
M. gangetica (Linn.) Cufodontis
 ***Operculina petaloidea* (Choisy) Van Oost.
O. turpethum Silva Manso
Rivea hypocrateriformis Choisy

SOLANACEAE

Datura metel Linn.
Physalis minima Linn.
 **Solanum indicum* Linn.
 **S. melongena* Linn.
S. nigrum Linn.
S. surattense Burm. f.
Withania somnifera (L.) Dunal.

SCROPHULARIACEAE

Bacopa monnieri (L.) Pennell.
Dopatrium junceum (Roxb.) Buch.-Ham.
Kickxia incana (Wall.) Pennell,

Limnophila indica (Linn.) F. Druce
Lindernia ciliata (Colsmn.) Pennell.
L. crustacea (Linn.) F. Muell.
L. oppositifolia (Retz.) Mukerjee
Lindenbergia indica (Linn.) O. Kuntze
 **Peplidium maritimum* (L. f.) Wettst.
Sopubia delphinifolia (Roxb.) G. Don
Stemodia viscosa Roxb.
Striga angustifolia (Don.) Saldanha
Verbascum chinense (Linn.) Santapau

LENTIBULARIACEAE

Utricularia inflexa Forsk. var. *stellaris* (L. f.) Taylor

GESNERIACEAE

**Didymocarpus pygmaea* Clarke

BIGNONIACEAE

**Oroxylum indicum* Vent.

PEDALIACEAE

Pedaliium murex Linn.
Sesamum indicum Linn.

MARTYNIACEAE

Martynia annua Linn.

ACANTHACEAE

Adhatoda vasica Nees
Andrographis echinoides (Linn.) Nees
 **Barleria cristata* Linn.
 **B. prattensis* Santapau
B. prionitis Linn.
 **Blepharis asperrima* Nees
B. maderaspatensis (Linn.) Heyne ex Roth
Dipteracanthus patulus (Jacq.) Nees
D. prostratus (Poir.) Nees
Elytraria acaulis (Linn. f.) Lindau.
 **Gantelbua urens* (Heyne ex Roth) Brem.
Hemiadelphus palyspermus Nees
 **Hemigraphis latebrosa* (Heyne ex. Roth) Nees
 var. *heyneana* Bremk.
Hygrophila auriculata (Schumach.) Heine.
Justicia diffusa Willd.
 **J. heterocarpa* T. Anders.
 **J. peploides* T. Anders.
 **Lepidagathis cristata* Willd.
 **L. cuspidata* (Wall.) Nees
L. trinervis Wall. ex Nees
Neuracanthus sphaerostachys (Nees) Dalz.
Peristrophe bicalyculata (Retz.) Nees
Rungia elegans Dalz. et. Gibs.
 **R. pectinata* (Linn.) Nees
R. repens (Linn.) Nees

VERBENACEAE

- Clerodendrum multiflorum* (Burm. f.) Ktze.
Lantana camara Linn. var. *aculeata* Moldenke
Nyctanthes arbor-tristis Linn.
Phyla nodiflora (Linn.) Greene
Tectona grandis Linn. f.
Vitex negundo Linn.

LABIATAE

- **Anisochilus carnosus* Wall.
Anisomeles indica (Linn.) O. Kuntze
Leucas aspera (Willd.) Spreng.
L. biflora R. Br.
L. cephalotes Spreng.
L. nutans Spreng.
L. stricta Benth.
L. urticaefolia R. Br.
 **L. zeylanica* R. Br.
Moschosma polystachyum Benth.
Ocimum canum Sims.
O. basilicum Linn. var. *thyrsiflora* Benth.
O. gratissimum Linn.
O. sanctum Linn.
 **Orthosiphon pallidus* Royle
Salvia santolinaefolia Boiss.

NYCTAGINACEAE

- Boerhavia diffusa* Linn.
B. verticillata Poir.
Bougainvillea spectabilis Willd.
Mirabilis jalapa Linn.

AMARANTACEAE

- **Achyranthes aspera* Linn. var. *porphyristachya* Hook. f.
Aerva tomentosa Forsk.
 **A. sanguinolenta* (Linn.) Blume
Alternanthera sessilis (Linn.) DC.
 **Amaranthus gangeticus* var. *tristis* Prain
A. spinosus Linn.
A. tricolor Linn.
 **A. lividus* Linn.
Celosia argentea Linn.
Digera muricata (Linn.) Mart.
Gomphrena celosioides Mart.
Nothosaerva brachiata (Linn.) Wight
Pupalia lappacea (Linn.) Juss.

CHENOPODIACEAE

- **Basella alba* Linn.
Chenopodium album Linn.

POLYGONACEAE

- Polygonum barbatum* Linn. var. *gracile* Stew.

P. plebeium R. Br.

ARISTOLOCHIACEAE

- **Aristolochia bracteolata* Lamk.

LORANTHACEAE

- Dendrophthoe falcata* (Linn. f.) Ettings.

EUPHORBIACEAE

- Acalypha ciliata* Forsk.
A. indica Linn.
 **A. malabarica* Muell.
 **Baliospermum montanum* (Willd.) Muell.-Arg.
Chrozophora prostrata Dalz.
C. rottleri (Geis.) Juss.
 **Croton bonplandianum* Baill.
 ****Dalechampia scandens* Linn. var. *cordofana* (Hochst.) Muell.-Arg.
Embllica officinalis Gaertn.
Euphorbia orbiculata H. B. K.
E. hirta Linn.
E. neriifolia Linn.
E. parviflora Linn.
E. thymifolia Linn.
E. tirucalli Linn.
 **Jatropha curcas* Linn.
J. gossypifolia Linn.
Kirganelia reticulata (Poir.) Baill.
 **Mallotus philippensis* Muell.-Arg.
Phyllanthus asperulatus Hutch.
P. maderaspatensis Linn.
P. simplex Retz.
 **P. urinaria* Linn.
Ricinus communis Linn.
Securinega virosa (Roxb. ex Willd.) Pax & Hoffm.

URTICACEAE

- Ficus asperrima* Roxb.
F. benghalensis Linn.
F. glomerata Roxb.
F. hispida Linn. f.
F. infectoria Roxb. var. *lambertiana* King
F. religiosa Linn.
 **Pouzolzia zeylanica* (Linn.) Benn.
Strebilus asper Lour.

HYDROCHARITACEAE

- Hydrilla verticillata* (Linn. f.) Royle
 **Nechamandra alternifolia* (Roxb.) Thw.
 **Ottelia alismoides* (Linn.) Pers.
Vallisneria spiralis Linn.

AMARYLLIDACEAE

- **Curculigo orchiioides* Gaertn.
 **Crinum pratense* Herbert

DIOSCOREACEAE

Dioscorea bulbifera Linn.**D. hispida* Dennest.**D. pentaphylla* Linn.

LILIACEAE

Aloe barbadensis Mill.**Agave ingens* Berger*Asparagus racemosus* Willd. var. *javanica* Baker*Asphodelus tenuifolius* Cav.**Chlorophytum tuberosum* Baker*Gloriosa superba* Linn.**Iphigenia indica* A. Gray**Urginea indica* Kunth

PONTEDERIACEAE

**Monochoria hastaeifolia* Presl.

COMMELINACEAE

Commelina benghalensis Linn.**C. forskalii* Vahl*C. diffusa* Burm. f.**C. undulata* R. Br.*Cyanotis cristata* Schultes*Murdannia nudiflora* (Linn.) Brenan

PALMACEAE

Borassus flabellifer Linn.*Phoenix sylvestris* (Linn.) Roxb.

PANDANACEAE

Pandanus odoratissimus Linn. f.

TYPHACEAE

Typha angustata Bory and Chaub.

ARACEAE

Colocasia esculenta* (Linn.) Schott.Pistia stratiotes* Linn.

LEMNACEAE

Spirodela polyrhiza (Linn.) Schleid.

ALISMACEAE

Limnophyton obtusifolium (Linn.) Miq.**Sagittaria sagittifolia* Linn.

NAIADACEAE

Najas minor Ali.*Potamogeton crispus* Linn.

CYPERACEAE

Bulbostylis barbata (Rottb.) Cl.*Cyperus alopecuroides* Rottb.*C. bulbosus* Vahl*C. compressus* Linn.*C. cyperioides* (Linn.) O. Kuntze*C. difformis* Linn.*C. eleusinoides* Kunth*C. esculentus* Linn.*C. exaltatus* Retz.*C. iria* Linn.*C. laevigatus* Linn.*C. leucocephalus* Retz.*C. michelianus* (Linn.) Link sub. sp. *pygmaeus* (Rottb.) Asch. et. Graeb.*C. pumilus* Linn.*C. rotundus* Linn.*C. squarrossus* Linn. (non C. B. Clarke)*C. triceps* (Rottb.) Endl.*Eleocharis atropurpurea* Kunth*E. geniculata* (Linn.) Roem. & Schult.*Fimbristylis aestivalis* Vahl*F. argentea* Vahl*F. dichotoma* (Linn.) Vahl*F. ferruginea* (Linn.) Vahl*F. miliacea* (Linn.) Vahl*F. tenera* Roem. & Schult.*Fuirena ciliaris* (Linn.) Roxb.*Scirpus articulatus* Linn.*S. maritimus* Linn.*S. supinus* Linn.

GRAMINEAE (POACEAE).

Alloteropsis cimicina (Linn.) Stapf*Apluda mutica* Linn.*Aristida adscensionis* Linn.*Cenchrus biflorus* Roxb.*C. setigerus* Vahl*Chloris barbata* Sw.*Coix lacryma-jobi* Linn.*Cymbopogon martinii* (Roxb.) Wats.*Cynodon dactylon* (Linn.) Pers.*Dendrocalamus strictus* Nees*Desmostachya bipinnata* (Linn.) Stapf*Dichanthium annulatum* (Forsk.) Stapf.*Digitaria stricta* Roth. ex Roem. & Schult.*Echinocloa colonum* (Linn.) Link*Eleusine coracana* (Linn.) Gaertn.*E. indica* (Linn.) Gaertn.*Elytrophorus spicatus* (Willd.) A. Camus*Eragrostis tremula* Hochst. ex Steud.*Hackelochloa granularis* (Linn.) O. Kuntze*Heteropogon contortus* (Linn.) Beauv.*Ischaemum rugosum* Salisb.

Oplismenus burmanni (Retz.) Beauv.
Oryza sativa Linn.
Paspalidium flavidum (Retz.) A. Camus
Paspalum scrobiculatum Linn.
Pennisetum typhoides (Burm.) Stapf & Hubb.
Perotis indica (Linn.) O. Kuntze
Phragmites karka (Retz.) Trin.
Saccharum spontaneum Linn.
Setaria glauca (Linn.) Beauv.
S. tomentosa (Roxb.) Kunth
Sorghum halepense (Linn.) Pers.
Vetiveria zizanioides (Linn.) Nash.
Zea mays Linn.

PTERIDOPHYTES

Marsilea quadrifolia Linn.
Actiniopteris australis (L. f.) Link
Adiantum lunulatum Burm.
Ceratopteris thalictroides Linn.

STATISTICAL SYNOPSIS

In the present paper 554 plants have been listed. Of these 448 belong to the dicotyledons and 102 to the monocotyledons. The dicotyledons are distributed within 75 families and 186 genera. The monocotyledons are distributed within 15 families and 67 genera.

DISCUSSION

Of the total number of plants listed in this paper 103 plants are not mentioned by Saxton and Sedgwick in their 'Plants of Northern Gujarat' or by Saxton in his additional notes. This number includes 5 new records such as *Polycarpon tetraphyllum* Linn., *Melhamia futteyporensis* Munro ex Mast., *Indigofera angulosa* Edgew., *Pulicaria crispa* (Forsk.) Oliv. and *Operculina petaloidea* (Choisy) Van Oost., which are not mentioned in the Cooke's Flora of the Presidency of Bombay or in other major publications. *Polycarpon tetraphyllum*, an introduced weed, was earlier collected by one of us (SJB) from the plains on the northern parts of Ratanmahal hills. It was noted on the muddy banks of a tank near Khedbrahma. *Melhamia futteyporensis* Munro ex Mast, was collected on the rocky hillocks in the vicinity of Idar and has probably migrated from the Upper Gangetic Plains, where it is abundantly found. *Indigofera angulosa* Edgew., like the preceding one, has been previously

recorded from Bundelkhand in the Upper Gangetic Plains. It was found growing on gravelly soils of the escarpments of the hills at Derol Jagir near Khedbrahma. This one is also an introduction from north India. *Pulicaria crispa* (Forsk.) Oliv., was earlier recorded as a new record for Bombay State from village Bhadarwa in Savli taluka of Baroda District. We have collected the same from Derol near Khedbrahma. *Operculina petaloidea* (Choisy) Van Oost., is a large scandent glabrous shrub, earlier collected as an undergrowth of a dry, deciduous teak forest near the bank of a stream on the border of Kanjeta and Mehandri village in Panchmahal District of Gujarat State. It was observed on the river banks near Khedbrahma. The plant is very rare and has a localised distribution in the Indo-Malayan region.

The two new records for India viz. *Desmodium neo-mexicanum* A. Gray and *Dalechampi scandens* Linn. var. *cordofana* (Hochst.) Muell.-Arg. were earlier collected from Bhimrej hill and Derol Jagir near Khedbrahma in North Gujarat and ravines of river Mahi at Vasad near Baroda respectively. The former has now been collected from various dry deciduous forests of Gujarat viz. Ratanmahal, Rajpipla, Chhota-Udepur, Ambadunger and Kolal, while the latter was noted on spiny shrubs as Vadali near Idar.

Amongst the other noteworthy plants which deserve particular mention are *Pavonia patens* (Ander.) Chiov., *Crotalaria hirsuta* Willd., *Azima tetracantha* Lamk., *Tylophora fasciculata* Ham., *Peplidium maritimum* (Linn. f.) Wettst., *Didymocarpus pygmaea* Clarke, *Justicia heterocarpa* T. Anders., *Orthosiphon pallidus* Royle, *Dioscorea pentaphylla* Linn. Most of these plants have been reported as rare or very rare in the Cooke's flora.

Families like Gesneriaceae, Araceae, Amaryllidaceae and Liliaceae reported in this paper are conspicuous by their absence in the earlier works on the flora of North Gujarat possibly because of the fact that so far the collections have been restricted to dry plains and the rich forest areas or the areas bordering Rajasthan were not visited.

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