WILD OCCURRING SENNA (*CASSIA ANGUSTIFOLIA* VAHL.) FROM KUTCH, GUJARAT

SENNA has a restricted world distribution; it is reported to occur in Sudan, South Arabia and Sind (Pakistan). While the North African material is entirely collected from wild growing plants of *Cassia acutifolia* Del., the Indian material is all from cultivated crop of *Cassia angustifolia* Vahl., for which India is the largest supplier of leaves and pods to the world market, valued over Rs. 50 lakhs, annually[1]. Though botanists like Hooker in *Flora of British India* and Cooke[2], in *Flora of Bombay Presidency*, which also included Sind and Gujarat, have opined that this plant "has no claim to be considered indigenous in India", Santapau[4] has listed its occurrence in Saurashtra (Gujarat). Recently the author has also come across wild population of Senna in Mundra coastal tract and from Aijal near Bhuj in Kutch region, Gujarat. Its field study revealed that these populations show variation in growth and yield which could be exploited. A brief report on this finding is presented here.

The population was found to grow on loamy-sand soil, pH 8·5, with high calcium carbonate and organic matter as evident by estimates of organic carbon (0·9%), but low in phosphorus and potash contents. The plants are upto 1·4 m high, branching, in profuse flowers and fruits (November 1972). The tap root is long, tapering, upto 1 m in length. The leaves are compound, pinnate, with 4 to 8 pairs of leaflets. Each leaflet is narrow, lanceolate, tapering to a fine tip; it is 3 to 5 × 0·8 to 1·2 cm in dimension, breadth varying even on the same plant, greenish-yellow to green, and minutely veined. Flowers are in erect racemes, large, yellow with 7 stamens and 3 large protruding staminodes. The pods are flat, varying from 3 to 6 cm in length and 0·8 to 1·2 cm in breadth, green when young, turning brown on maturity.

The immature (fully grown but seeds were still soft and green) and mature pods were simultaneously collected from the same plant and assayed for sennoside content.* Since the seeds are inert, their weight *vis-a-vis* total weight of the pod were noted and the percentage seed weight so obtained is recorded to indicate the weight of the pod shell. It was thus found that the immature and mature pods collected from Mundra (Kutch) contained 10·2 and 24·0 mg of sennosides/gm and their seeds contributed 31·3 and 44·0% weight of the pods. The author also collected similar immature and mature pods from cultivation in Tirunelveli District (Tamil Nadu) which gave 29·0 and 19·8 mg of sennosides/gm while their seed content were 38·5 and 43·5%. A random market sample collected from a godown of an exporting agency at Tuticorin (Tamil Nadu) yielded, on analysis, 14·2 mg of sennosides while its seed weight was 15·4%; another market sample, reported to be from wild plants occurring in South Arabian region, imported by a Bombay firm gave 15·0% sennosides/gm.

The plant material (I.C. 19658 ex. Mundra) shows certain differences in habit and growth characters from the cultivated type material (cf. *Wealth of India*[5]) though the sennoside content fall within the range (15 to 25 mg/gm) given for the cultivated crop. The occurrence of the plant in large patches in wider, biotically less disturbed lands, support evidence to its extended natural distribution in the Kutch tract of Gujarat State in India. Further, in view of the economic utility of this material, it is interesting to record these luxuriously growing plants on this otherwise sparcely vegetated arid coastal tract of India.

The author expresses his thanks to Director, Botanical Survey of India, for loan of collection sheets from the Central National Herbarium, Calcutta, for comparison.

Plant Introduction Division, I.A.R.I., New Delhi, *December* 22, 1973. RAJENDRA GUPTA

* B.P.C. (1968) method of analysis was used.

1. Cooke, T., *Flora of Bombay Presidency*, 1903, Rep. 1958, p. 450.
2. Gupta Rajendra, *Indian Farg.*, 1971, 21 (4), 19.
3. Hooker, J. D., *Flora of British India*, 1879, 2, 264.
4. Santapau, H., *Plants of Saurashtra* (A preliminary list), 1953, p. 14.
5. *Wealth of India*, 1950, 2, 94.

PHYSIOLOGICAL CHANGES IN BHINDI [*ABELMOSCHUS ESCULENTUS* (L.) MOENCH] FRUIT AFFECTED BY YELLOW VEIN MOSAIC VIRUS

YELLOW vein mosaic of Bhindi [*Abelmoschus esculentus* (L.) Moench] is a serious problem wherever the crop is grown in India. In infected plants the quality of fruit is badly affected and fetches a very low price in the market. The fruits are dwarfed, malformed and yellowish green in colour. No studies have been made regarding the changes in contents in fruits of virus infected Bhindi plant. The present communication deals with the variation in different fractions of carbohydrate, protein and phosphorus of yellow vein mosaic virus infected Bhindi fruits.

plant parts they might have been produced in response to the stimulus by the insect.

A continuous ring of sclerosed parenchymatous tissue developed around the larval cavity in response to the stimulus by the developing insect larva in the gall. This tissue in a moderately large gall appeared to have broken up. The nature of such tissues was of great significance in the classification of insect galls (Mani, 1964) and accordingly the present material can be placed under dehiscent type of galls.

According to Mani (1964) the galls having cecidiozoa in the cortex did not possess more xylem and that if the larvae lie in the gall there was more of phloem tissue. In the present investigation usually a single larva lies in the larval chamber in the gall and the xylem was found dominating.

Nuclear hypertrophy is a common feature in the gall tissue and it is in conformity with the findings of earlier workers. Duncon (1962) observed multinucleate giant cells in *Pachypsylla* gall on *Celtis*. However, no such cell formation was observed in the present material. Varghese and Sharma (1971) observed the formation of schizogenously formed cavities in the leaf galls of *Prosopis spicigera* in which the larvae pass their developmental stages. In this material a schizogenously produced larval chamber was present in which the insect larva passed its developmental stages and not in the cavities resulted due to the enlargement of the pre-existing oil canals.

ACKNOWLEDGEMENTS

We are highly thankful to Professor S. K. Pillai for his keen interest and encouragement throughout the investigation and to Dr. M. S. Mani, Emeritus Professor of Entomology, St. John's College, Agra-2, for his help in identifying the gall maker.

REFERENCES

Aka, S. Studies on pathological anatomy of fungus galls of plants. *Mem. Coll. Agric. Kyoto Univ.*, 1951, 69, 1-80.

Duncon, T. R. Multinucleate giant cell formation in *Pachypsylla* gall on Celtis. *Amer. J. Bot.*, 1962, 49, 803.

Mani, M. S. *Ecology of Plant Galls*. Dr. Junk Publ. Hague, 1964.

Rao, C. G. P. Studies on abnormal growth caused by fungi in plants. Ph. D. Thesis, 1966, Univ. Rajasthan Jaipur, India.

Varghese, T. M. and Sharma, R. R. Studies on abnormal growth in plants I. Anatomy of insect induced tumors on the vegetative parts of *Prosopis spicigera* L. *Acta Agron. Acad. Sci. Hung.*, 1971, 20, 298-309.

GEOBIOS 3, 47-53, 1976

FLORA OF KAPRADA FOREST RANGE IN SOUTH GUJARAT

P. G. Mare, H. M. Vora and J. A. Inamdar

Department of Biology, B. K. M. Science College, Valsad, India

(Received September 16, 1975)

SUMMARY

The present paper enumerates 394 genera and 545 species belonging to 101 angiosperm families. Out of these are 440 dicotyledons and 105 monocotyledons. The first ten dominant families in order of preference are Leguminosae, Poaceae, Compositae, Acanthaceae, Convolvulaceae, Euphorbiaceae, Cucurbitaceae, Scrophulariaceae, Malvaceae and Rubiaceae.

INTRODUCTION

Dharampur forest has hilly tract on the western side of the Western Ghats and Kaprada forest area is situated 31 km from Dharampur town which was formerly known as "Kumbhghat Dunger". Geographically it is on latitude 20.5' and longitude 73.7'. It is bound on north by river Par and south by river Kolak. On its eastern side it is

up to Nasik district of present Maharashtra state and on western side there are Dharampur and Pardi talukas. The area is cut up by four rivers, Auranga (Tan Mari), Par, Kolak and Damanganga, all flowing from east to west.

The whole area is hilly and rugged in nature. Present rocky hills are geologically stable and are of Deccan trap lava. In the plains the trap is made up of Amygdaloids and Conglomerates. The soil of the hills is a mixture of clay and murrum with varying depths according to the strata of rock and mostly unsuitable for cultivation. The soil is of two types: (1) red shallow soil on the slopes; (2) dark brown deep soil on the plain areas and it is sandy and calcareous near rivers. The area was not intensively surveyed up till now, hence it is virgin. It is not easily accessible being hilly tract. Substantial information is available from our survey which adds to the existing flora of the Gujarat. Climate is consistent in adjacent areas in seasons with winter, summer and monsoon. Monsoon is south-west and starts from second half of June and lasts up to September.

The order followed in the enumeration of plants is the same as that of Cooke in his Flora of Bombay Presidency, but in some cases alterations have been made according to Hutchinson (Families of Flowering Plants, 1959). Nomenclature has been brought up-to-date in light of recent researches.

Total number of species recorded are 645. There are 384 genera spread over 101 families. The ratio between Dicotyledonous and Monocotyledonous families

Statistical data :

Group	No. of families	No. of genera	No. of species	% species collected
Dicotyledonae				
Polypetalae	45	148	214	39,25
Gamopetalae	25	135	174	32.01
Apetalae				
(Monochlamydeae)	14	39	52	9.63
Monocotyledonae	17	72	105	19.21

is nearly 4 : 1. Monocotyledonae are represented by 105 species out of which 63 of Poaceae (Gramineae) and Cyperaceae are dominant. Out of 645 species 440 species are of dicotyledons and 105 species are of monocotyledons; hence the dicotyledons dominate the vegetations of the area. The first ten dominant families in order of preference are Leguminosae, Poaceae (Gramineae), Compositae (Asteraceae), Acanthaceae, Convolvulaceae, Euphorbiaceae, Cucurbitaceae, Scrophulariaceae, Malvaceae, and Rubiaceae.

ENUMERATION OF PLANTS

RANUNCULACEAE

Clematis hedysarifolia DC.

ANNONACEAE

Annona reticulata Linn., *A. squamosa* Linn., *Artabotrys hexapetalus* (L.f.) Bhandari

MENISPERMACEAE

Cissampelos pareira Linn., *Cocculus hirsutus* (L.) Diels, *Tinospora cordifolia* (Willd.) Miers.

PAPAVERACEAE

Argemone mexicana Linn.

BRASSICACEAE (CRUCIFERAE)

Brassica juncea H. f. & Th., *Lepidium sativum* Linn., *Raphanus sativus* Linn., *Rorippa indica* (L.) Hiern.

CAPPARIDACEAE

Cadaba fruticosa (L.) DC., *Capparis sepiaria* Linn., *C. zeylanica* Linn., *Cleome chelidonii* Linn. f., *C. viscosa* Linn., *Crateava religiosa* Buch.-Ham.

VIOLACEAE

Hybanthus enneaspermus (L.) F. Muell.

FLACOURTIACEAE

Flacourtia indica Merr.

POLYGALACEAE

Polygala chinensis Linn., *P. erioptera* DC.

TAMARICACEAE

Tamarix ericoides Rottl.

ELATINEAE

Bergia ammannioides Roxb.

MALVACEAE

Abelmoschus esculentus W. & A., *A. manihot* (L.) Medik., *Abutilon indicum* (L.) Sw., *Azanza lampas* (Cav.) Alef., *Gossypium arboreum* Linn., *G. herbaceum* Linn; *Hibiscus cannabinus* Linn., *H. hirtus* Linn., *H. lobatus* (Murr.) Willd., *H. trionum* Linn., *H. vitifolius* Linn., *Malachra capitata* Linn., *Sida acuta* Burm., *S. alba*

Linn., *S. candifolia* Lind., *S. veronicifolia* Lamk., *Thespesia populnia* (L.) Soland. ex Corr. *Urena lobata* Linn.

BOMBACACEAE

Bombax ceiba Linn.

STERCULIACEAE

Helicteres isora Linn., *Pterospermum acerifolium* Willd., *Sterculia urens* Roxb., *Waltheria indica* Linn.,

TILIACEAE

Corchorus aestuans Linn., *C. capsularis* Linn., *C. fascicularis* Lamk., *C. olitorius* Linn., *Grewia asiatica* L., *G. asiatica* DC., *G. tiliaefolia* Vahl., *Triumfetta rhomboidea* Jacq., *T. rotundifolia* Lamk.

BALSAMINACEAE

Impatiens balsamina Linn. var. *rosea* Hk. f.

OXALIDACEAE

Averrhoa carambola Linn., *Biophytum sensitivum* (L.) DC., *Oxalis corniculata* Linn.,

RUTACEAE

Aegle marmelos (L.) Corr., *Citrus limon* (L.) Burm. f., *Feronia limonia* (L.) Sw., *Murraya koenigii* Jack.

BURSERACEAE

Garuga pinnata Roxb.

MELIACEAE

Azadirachta indica Juss.

OPILIACEAE

Cansjera rheedii Gmel.

CELASTRACEAE

Celastrus paniculata Willd., *Maytenus emarginata* (Willd.) Ding., *Elaeodendron roxburghii* W. & A.

RHAMNACEAE

Ventilago denticulata Willd., *Zizyphus nummularia* (Burm. f.) W. & A., *Z. oenoplia* (L.) Mill., *Z. rugosa* Lamk; *Z. xylocarpa* (Retz.) Willd.

VITACEAE

Cayratia carnosa Gagnep., *Cissus quadrangularis* Linn.

LEEACEAE

Leea crispa Linn., *L. edgerworthii* (Edgew.) Sant., *L. macrophylla* Roxb.

SAPINDACEAE

Cardiospermum halicacabum Linn., *Sapindus emarginatus* Vahl.

ANACARDIACEAE

Anacardium occidentale Linn., *Lannea coromandelica* (Houtt.) Merrill., *Mangifera indica* Linn., *Semecarpus anacardium* Linn. f., *Spondias pinnata* (L. f.) Kurz.

MORINGACEAE

Moringa oleifera Lamk.

PAPILIONACEAE (FABACEAE)

Abrus precatorius Linn., *Aeschynomene indica* Linn., *Alysicarpus bupleurifolius* DC., *A. glumaceus* (Willd.) DC., *A. longifolius* W. & A., *A. procumbens* (Roxb.) Schindler, *A. rugosus* DC., *A. vaginalis* DC., *Arachis hypogaea* Linn., *Butea monosperma* (Lamk.) Taub., *Cajanus cajan* (L.) Mill., *Canavalia gladiata* DC., *Cicer arietinum* Linn., *Clitoria biflora* Dalz., *C. ternatea* Linn., *Crotalaria elliotii* Heyne ex Roth, *C. filipes* Benth., *C. juncea* Linn., *C. linifolia* Linn. f., *C. medicaginea* Lamk., *C. retusa* Linn., *C. triquetra* Dalz., *Cyamopsis tetragonoloba* (L.) Taub., *Desmodium gangeticum* DC., *D. triflorum* DC., *D. triquetrum* DC., *Dolichos lablab* Linn., *Erythrina indica* Lamk., *Gerrardspis crotata* W. & A., *Goniogyne hirta* (Willd.) Ali., *Indigofera astragalina* DC., *I. cordifolia* Heyne ex. Roth, *I. glandulosa* (Roxb.) Willd., *I. linifolia* (L. f.) Retz., *I. tinctoria* Linn., *Melilotus alba* Lamk., *M. indica* All., *Moghania strobilifera* (L.) St. Hil., *Mucuna pruriens* Hk. f., *Oxigonia oojensis* (Roxb.) Hochreut., *Pongamia pinnata* (L.) Pierre, *Psoralea corylifolia* Linn., *Pterocarpus marsupium* Roxb. var. *acuminatus* Prain, *Pueraria tuberosa* DC., *Rhynchosia minima* DC., *R. rothii* Benth., *Sesbania grandiflora* Pers., *Smithia conferta* Sm., *S. sensitiva* Ait., *Tephrosia pumila* Pers., *T. purpurea* Pers; *Teramnus labialis* (L. f.) Spreng., *Trigonella foenum-graecum* Linn., *T. occulta* Dell., *Vigna acontifolia* (Jacq.) Marechal., *Vigna angularis* (Willd.) Ohwi & Ohesi., *V. radiata* (L.) Wilczek var. *radiata* Verdcourt, *V. radiata* (Linn.) Wilczek var. *sublobata* (Roxb.) Verdcourt, *V. trilobata* (Linn.) Verdcourt, *V. unguiculata* (L.) Walp., *Zornia gibbosa* Span.

CAESALPINIACEAE

Bauhinia purpurea Linn., *B. racemosa* Lamk., *Caesalpinia bonduc* (L.) Roxb., *Cassia absus* Linn., *C. pumila* Lamk., *C. sophera* Linn., *C. tora* Linn. *Delonix regia* (Boj.) Raf., *Tamarindus indica* Linn.

MIMOSACEAE

Acacia chundra (Roxb.) Willd., *A. leucophloea* Willd., *A. silotica* (L.) Del. var. *indica* Brenan, *Leucaena*

leucophloea (Lamk.) Dewit., *Mimosa pudica* Linn., *Neptunia triquetra* Benth., *Pithecolobium dulce* Benth., *Prosopis cineraria* (L.) Druce

SAXIFRAGACEAE

Vahlia digyna (Retz.) O. Kuntze

COMBRETACEAE

Anogeissus latifolia Wall., *Combretum ovalifolium* Roxb., *Terminalia arjuna* W. & A., *T. crenulata* Roth.

MYRTACEAE

Eucalyptus sp., *Psidium guajava* Linn., *Syzygium cumini* (L.) Skeels.

LECYTHIDACEAE

Careya arborea Roxb.

LYTHRACEAE

Ammannia baccifera Linn., *A. multiflora* Roxb., *A. peploides* Sprang., *Rotala serpyllifolia* (Roth.) Bremek., *Woodfordia fruticosa* (L.) O. Kuntze.

ONAGRACEAE

Ludwigia octovalvis subsp. *sessiliflora* (Mich.) Raven, *L. perennis* Linn.

CUCURBITACEAE

Citrullus lanatus (Thunb.) Mast. & Nakai, *Coccinia cordifolia* (L.) Cogn., *Cucumis callosus* (Rottl.) Cogn., *C. melo* Linn. var. *momordica* Duthie & Full., *C. sativus* Linn., *Cucurbita maxima* Duch., *Diplocyclos palmatus* (L.) Jeffrey, *Lagenaria leucantha* (Duch.) Rusby, *Luffa acutangula* (L.) Roxb., *L. acutangula* (L.) Roxb. var. *amara* (Roxb.) Clarke, *L. cylindrica* (L.) Roem., *Melothria heterophylla* Cogn., *M. perpusilla* Cogn., *Momordica charantia* Linn., *M. dioica* Roxb., *Mukia maderaspatana* (L.) Roem., *Trichosanthes cucumerina* Linn.

CARICACEAE

Carica papaya Linn.

CACTACEAE

Opuntia elatior Mill.

MOLLUGINACEAE

Glinus lotoides Linn., *G. oppositifolius* (L.) DC.

AIZOACEAE

Trianthema portulacastrum Linn.

UMBELLIFERAE (APIACEAE)

Anethum graveolens Linn., *Carum copticum* Benth., *Centella asiatica* (L.) Urban., *Coriandrum sativum* Linn., *Cuminum cyminum* Linn., *Foeniculum vulgare* Gaertn., *Pimpinella adscendens* Dalz., *P. heyneana* Wall.

ALANGIACEAE

Alangium salvifolium (L. f.) Wang.

RUBIACEAE

Adina cordifolia (Roxb.) Hk. f. ex Brandis, *Anotis rheedei* Hk. f., *Borreria articulata* (L. f.) Will., *B. stricta* (L. f.) Schum., *Dentella repens* (L.) Forst., *Ixora arborea* Roxb. ex Sm., *Mitragyna parvifolia* (Roxb.) Korth., *Morinda tomentosa* Heyne ex Roth, *Oldenlandia affinis* DC., *O. corymbosa* Linn., *O. pumila* DC., *Vangueria spinosa* Roxb., *Xeromphis spinosa* (Thunb.) Keay.

COMPOSITAE (ASTERACEAE)

Acanthospermum hispidum DC., *Ageratum conyzoides* Linn., *Bidens biternata* (Lour.) Merr. & Sherff., *Blainvillea acmella* (L.) Philip., *Blumea eriantha* DC., *B. lacera* (Burm. f.) DC., *Caesulia axillaris* Roxb., *Centratherum phyllolaenum* Benth., *Cyathocline purpurea* (Don) O. Kuntze, *Echinops echinatus* Roxb., *Eclipta prostrata* Linn., *Elephantopus scaber* Linn., *Glossocardia bosvallea* DC., *Gnaphalium luteo-album* Linn., *Grangea maderaspatana* Poir., *Guizotia abyssinica* Cass., *Laggera falcata* (D. Don.) O. Kuntze., *Launaea fallax* (J. & S.) O. Kuntze., *L. sarmentosa* (Willd.) Alst., *Sclerocarpus africanus* Jacq., *Sonchus oleraceus* Linn., *Sphaeranthus indicus* Linn., *Spilanthes acmella* Murr., *Tagetes erecta* Linn., *Tricholepis glaberrima* DC., *Tridax procumbens* Linn., *Vernonia anthelmintica* (Willd.) *V. cinerea* Less., *Vicoa indica* (Willd.) DC., *Xanthium strumarium* Linn.

LOBELIACEAE

Lobelia trigona Roxb.

PLUMBAGINACEAE

Plumbago zeylanica Linn.

PRIMULACEAE

Anagallis arvensis Linn.

MYRSINACEAE

Embelia robusta Roxb.

SAPOTACEAE

Madhuca indica Gmel., *Manilkara hexandra* (Roxb.) Dubb., *Mimusops elengi* Linn.

EBENACEAE

Diospyros melanoxylon (L.) Roxb.

OLEACEAE

Jasminum multiflorum Vit.

APOCYNACEAE

Carissa congesta Wt., *Holarrhena antidysenterica* Wall., *Wrightia tinctoria* R. Br.

ASCLEPIADACEAE

Calotropis gigantea R. Br., *Cryptolepis buchanani* R. & S., *Dregea volubilis* (L.f.) Benth. ex Hk. f., *Hemidesmus indicus* (L.) R. Br., *Leptadenia reticulata* W. & A., *Oxystelma secamone* (L.) Karst., *Pentatropis capensis* (L.f.) Bull., *Pergularia daemia* (Forsk.) Chiov., *Tylosma pallida* (Roxb.) Calib.

GENTIANACEAE

Canscora diffusa R. Br., *Enicostemma verticillatum* (Willd.) Engl., *Erythraea roxburghii* G. Don, *Exacum bicolor* Roxb., *E. pedunculatum* Linn., *E. pumilum* Griesb., *Hoppea dichotoma* Willd.

HYDROPHYLLACEAE

Hydrolea zeylanica Vahl.

BORAGINACEAE

Coldenia procumbens Linn., *Cordia gharaf* (Forsk.) Ehrenb. & Asch., *C. dichotoma* Forst., *Ehretia laevis* Roxb., *Heliotropium indicum* Linn., *H. ovalifolium* Forsk., *H. strigosum* Retz., *H. supinum* Linn., *Rotula aquatica* Lour., *Trichodesma zeylanica* (Burm.f.) R. Br.

CONVOLVULACEAE

Argyreia nervosa (Burm. f.) Boj., *Convolvulus arvensis* Linn., *Cuscuta chinensis* Lamk., *C. reflexa* Roxb., *Evolvulus alsinoides* Linn., *E. pumilatus* L. fil., *Ipomoea aquatica* Forsk., *I. batatas* (L.) Lamk., *I. carnea* (L.) Sw., *I. digitata* Linn., *I. eriocarpa* R. Br., *I. muricata* (L.) Jacq., *I. nil* (L.) Roth, *I. pes-tigridis* Linn., *I. sepiaria* Koen., *I. sindica* Stapf., *Merremia aegyptia* (L.) Urban, *M. gangetica* (L.) Cufodontis., *M. vitifolia* (Burm.f.) Hall. *Operculina turpethum* (L.) Silva, *Rivea hypocrateriformis* Choisy.

SOLANACEAE

Capsicum annuum Linn. var. *acuminata* Fing., *Datura innoxia* Mill., *Lycopersicon lycopersicum* (L.) Airy, *Nicotiana tabacum* Linn., *Physalis minima* Linn., *Solanum indicum* Linn., *S. melongena* Linn., *S. nigrum* Linn., *S. surattense* Burm. f.

SCROPHULARIACEAE

Bacopa monnieri (L.) Pennell, *Buchnera hispida* Buch.-Ham., *Centranthera indica* (L.) Gamble, *Dopatrium junceum* (Roxb.) Buch.-Ham., *Limnophila indica* (L.) Druce, *Lindernia anagallis* Linn., *L. ciliata* (Colsm.) Pennell, *L. crustacea* (Retz.) Muk., *L. parviflora* (Roxb.) Haines, *Pedicularis humifusum* Del., *Rhamphicarpa longiflora* Benth., *Scoparia dulcis* Linn., *Stemodia viscosa* Roxb., *Striga angustifolia* (Don.) Saldhana, *S. asiatica* (L.) O. Kuntz, *Torenia dissecta* (Del.) Wall., *Verbascum chinense* (L.) Sant.

OROBANCHACEAE

Aeginetia indica Linn.

LENTIBULARIACEAE

Utricularia coerulea Linn.

BIGNONIACEAE

Heterophragma roxburghii DC., *Oroxylum indicum* Vent.

PEDALIACEAE

Sesamum indicum Linn.

MARTYNIACEAE

Martynia annua Linn.

ACANTHACEAE

Adhatoda vassica Nees, *Barleria gibsoni* Dalz., *B. prattensis* Sant., *B. prionitis* Linn., *Blepharis maderaspatensis* (L.) Roth, *Celosiphanes vagans* Wt., *Dicliptera verticillata* (Forsk.) Christ., *Dipteracanthus prostratus* (Poir.) Nees, *Eranthemum roseum* (Vahl) R. Br., *Gentellua urens* (Heyne ex Roth) Bremek., *Haplanthus tentaculatus* Nees, *Hemigraphis hirta* Anders., *Hygrophila auriculata* (Schum.) Heyne, *H. serpyllum* (Nees) Anders., *Justicia procumbens* Linn., *J. quinqueangularis* Koen., *Lepidagathis trinervis* Wall., *Neuracanthus sphaerostachys* (Nees) Dalz., *Peristrophe bicalyculata* (Retz.) Nees, *Petalidium barlerioides* Nees, *Ruellia tuberosa* (Linn.), *Rungia pectinata* (L.) Nees, *R. repens* (L.) Nees.

VERBENACEAE

Gmelina arborea Roxb., *Lantana camara* Linn. var. *aculeata* (L.) Moldenke, *Phyla nodiflora* (L.) Greene, *Tectona grandis* Linn. f., *Vitex negundo* Linn.

LABIATAE

Anisomeles indica (L.) O. Kuntze, *Hyptis suaveolens* Poit., *Leucas aspera* Spreng., *L. biflora* R. Br., *Ocimum americanum* Linn., *O. basilicum* Linn., *O. sanctum* Linn., *Plectanthus mollis* (Ait.) Spreng., *Pogostemon parviflorus* Benth., *Salvia plebeia* R. Br.

NYCTAGINACEAE

Boerhavia chinensis (L.) Druce. *B. diffusa* Linn.

AMARANTHACEAE

Achyranthes aspera Linn., *Aerua lanata* (L.) Juss., *Alternanthera sessilis* (L.) DC., *Amaranthus spinosus* Linn., *A. tenuifolius* Vahl., *A. viridis* Linn., *Celosia argentea* Linn., *Digera muricata* (L.) Mart., *Guilleminea celosioides* Mart., *Nothosaerua brachiata* Wt.

CHENOPODIACEAE

Chenopodium album Linn.

BASELIACEAE

Basella alba Linn.

POLYGONACEAE

Polygonum barbatum (Woodr.) var. *gracile* Steward. *P. glabrum* Willd., *P. plebejum* R. Br.

PIPERACEAE

Peperomia pellucida (L.) H. B. & K.

LAURACEAE

Cassytha filiformis Linn.

LORANTHACEAE

Dendrophthoe falcata (L. f.) Ettng. *Viscum neerlandicum* Sprang.

SANTALACEAE

Santalum album Linn.

EUPHORBIACEAE

Acalypha ciliata Forsk., *Antidesma ghaesembilla* Gaertn., *Bellosparmum montanum* Muell., *Bridelia squamosa* Gr., *Chrozophora prostrata* Delz., *Euphorbia geniculata* Ort., *E. hirta* Linn., *E. neriifolia* Linn., *E. parviflora* Linn., *E. rothiana* Soreng., *Homonoia riparia* Lour., *Jatropha curcas* Linn., *Kirganelia reticulata* (Poir) Baill., *Mallotus philippensis* (Lamk.) Muell.-Arg., *Phyllanthus asperulatus* Hutch., *P. maderaspatensis* Linn., *P. simplex* Retz., *Ricinus communis* Linn., *Securinega virosa* (Roxb.) Pax. and Hoffm., *Tragia cannabina* Linn., *Trewia polycarpa* Benth.

URTICACEAE

Fleurya interrupta (L.) Gaud., *Holoptelea integrifolia* (Roxb.) Planch., *Pouzolzia zeylanica* (L.) Benn.

MORACEAE

Ficus hispida Linn., *F. microcarpa* Linn. f., *F. racemosa* Linn., *Streblus asper* Lour.

ULMACEAE

Trema orientalis (L.) Blume.

CASUARINACEAE

Casuarina equisetifolia Linn.

HYDROCHARITACEAE

Ottelia alismoides Pers.

ORCHIDACEAE

Aerides crassum Lindl., *Habenaria marginata* Colebr., *Peristylus plantagineus* Lindl., *Vanda testacea* (Lindl.) Reichb.

ZINGIBERACEAE

Costus speciosus Sm., *Curcuma inodora* Blatt. *Zingiber cassumar* Roxb.

MUSACEAE

Musa paradisiaca Linn.

AMARYLIDACEAE

Crinum protense Herbert. *C. latifolium* Linn.

HYPOXIDACEAE

Curculigo orchioides Gaertn.

TACCACEAE

Tacca leontopetaloides (L.) O. Kuntze.

DIOSCOREACEAE

Dioscorea alata (L.) Gr., *D. bulbifera* Linn., *D. daemona* Roxb., *D. pentaphylla* Linn.

LILIACEAE

Allium cepa Linn., *A. sativum* Linn., *Aloe barbadensis* Mill., *Asparagus racemosus* Willd. var. *javanica* (Kunth.) Becker. *Arthodelus tenuifolious* Cav. *Chlorophytum tuberosum* Baker. *Gloriosa superba* Linn., *Iphigenia indica* Grev. *Urginea indica* Kunth.

COMMELINACEAE

Commelina benghalensis Linn., *C. diffusa* Burm. f., *C. forskaleai* Vahl. *C. paludosa* Bail., *Murdannia nudiflora* (L.) Brenan. *M. spirata* (L.) Bruck.

PALMAE

Phoenix sylvestris (L.) Roxb.

TYPHACEAE

Typha angustata Bory.

ARACEAE

Amorphophallus commutatus Engl., *Arisaema murrayi* Hk. f., *A. tortuosum* Schott. *Colocasia esculenta* (L.) Schott. *Cryptocoryne retrospiralis* Kunth., *Sauromatum venosum* (Ait.) Kunth.

ERIOCAULACEAE

Eriocaulon sfeciosum Fyson.

CYPERACEAE

Cyperus bevifolius (Rottb.) Hask., *C. compressus* Linn., *C. difformis* Linn., *C. haspan* Linn., *C. iria* Linn., *C. rotundus* Linn., *C. sqarrosus* Linn., *C. triceps* Endl., *Eleocharis atropurpurea* Kunth., *Fimbristylis microcarpa* Mull., *F. miliacea* (L.) Vahl, *Rhynchospora wightiana* Steud.

POACEAE (GRAMINEAE)

Andropogon pumilus Roxb., *Aplida motica* Linn., *Aristida hystrix* Linn. f., *Arundinella holcoides* Kunth., *A. leveli* Hk. f., *Bambusa arundinacea* Willd., *Chloris barbata* (L.) Sw., *C. polyquesetica* Bhide, *Coix lachrima-jobi* Linn., *Cymbopogon martini* Watts., *Dactyloctenium aegyptium* Boiss., *Dendrocalamus strictus* Nees, *Dichanthium caricosum* (L.) Camus, *Digitaria adscendens* (H.B.K.) Henr., *Dimeria retroflexa* (Vahl) Pant., *Echinochloa colonum* (L.) Link., *Eleusine coracana* (L.) Gaertn., *Elytrophorus spicatus* (Willd.) Camus, *Eragrostis diarrhena* Steud., *E. poaeoides* Beauv., *E. tenella* (L.) Beauv., *E. unioloides* (Retz.) Nees, *Hackelochloa granularis* O. Kuntze, *Heteropogon contortus* Beauv., *Imperata cylindrica* (L.) Beauv., *Iseilema globosa* (Thunb.) O. Kuntze, *Ischaemum indicum* Merr., *I. pilosum* Wt., *Melanocenchrus jacquemontii* J. & S., *Ophiurus exaltatus* Linn., *Oplismenus burmanii* (Retz.) Beauv., *O. compositus* (L.) Beauv., *Oryza rufipogon* Griff., *O. sativa* Linn., *Panicum repens* Linn., *Paspalum scrobiculatum* Linn., *Pennisetum typhoides* Hubb., *Perotis indica* (L.) O. Kuntze, *Pseudanthistiria heteroclita* (Roxb.) Hk. f., *Sachiazum officinarom* Linn., *Saccolepis interupta* Stapf, *Setaria glauca* (L.) Beauv., *S. pallidifusca* (Schum.) Stapf, *S. tomentosa* (Roxb.) Kunth., *S. verticillata* Beauv., *Sorghum halepensis* (L.) Pers., *S. vulgare* Pers., *Themeda quadrivalvis* (Roxb.) O. Kuntz., *Triticum aestivum* Linn., *Vetiveria zizanoides* (L.) Nash., *Zea mays* Linn.

ACKNOWLEDGEMENTS

Our sincere thanks are due to Dr. B.G. Naik, Principal, B.K.M. Science College, Valsad, for encouragement, interest and facilities.

Authors contributing papers for

GEOBIOS

are requested to keep in mind the following points for the speedy publication of their papers:

1. Manuscript should be in correct language, neatly typed and sent in duplicate.
2. Before final typing of their papers, a latest issue of the GEOBIOS should be consulted for correct style.
3. Papers should be carefully revised for the references, year and other relevent data and should be in the final form for printing.
4. It is difficult to publish long paper due to heavy pressure on space and piling up of a number of papers with the Editors. It is thus advised that the papers should be concise and numbers of tables and figures reduced to a minimum.
5. Papers meant for revision should be returned within a month of despatch, otherwise they would be removed from the printing schedule.
6. All materials should be invariably addressed in the name of Dr. D.N. Sen, Post Box No. 14, Botany Department, University of Jodhpur, Jodhpur-342001

EXECUTIVE EDITOR