

ADDITIONS TO THE FLORA OF RAJPIPLA FOREST DIVISION, GUJARAT

G. L. SHAH, A. I. PATEL AND V. K. SINGH

Department of Botany, Sardar Patel University, Vallabh Vidyanagar, Gujarat

ABSTRACT

In this paper 202 more angiosperms are listed of which 118 are dicotyledons and 83 are monocotyledons, based on collections made between 1965 and 1971 from different areas of the Rajpipla forest division. Such additions are due to (1) intensive exploration in all seasons and (2) two distinct types of vegetations (a) the dry deciduous type in hilly regions and (b) the scrub forest type in the undulating plains.

INTRODUCTION

Cooke (1901-1908) has listed about 425 species occurring in Gujarat and most frequent localities cited for their distribution are Kathiawar, Rajkot, Veraval, Porbander etc. all now in Saurashtra, whereas casual ones are Ahmedabad, Panchmahals, Dakor, Godhra, Baroda, Broach collectorate, Surat, Dangs etc. It is, therefore, evident that Rajpipla locality is not cited even once in his flora indicating that Rajpipla Forest Ranges had not been touched at all by the botanists in the time of Cooke. It remained so even upto 1965 when one of us (Shah, 1967) gave a preliminary account of the flora of Rajpipla forests division based on plants collected from Dediapada, Kokam, Dumkhali and Ghantoli. Another paper was published on the flora of that forest division by Shah and Singh (1970) based on intensive study of the places mentioned above and Sagbara, Sajpur, Kakadpada, Selamba, Gora, Kevadia and Garudeshwar. Ahuja and Pataskar (1970) also published four species from this forest division. The total number of species listed for the forest division till that time was 572.

The authors have been studying the flora of Rajpipla forest division since 1965 in vicinity of the following areas (1) *Dediapada and Sagbara forest ranges*: Dediapada, Mosda, Kakadpada, Sagbara, Sajpur, Selamba ; (2) *Gora forest range*: Dumkhali, Piplod, Kokam, Surpeneshwar, Kevadia, Kothi, Dhavdi, Garudeshwar, Indravarna, Piparia, Gora and Thevadia ; (3) *Netrang range* : Jaghadia, Gumandev, Avidhya, Rajpardi, Netrang ; (4) *Rajpipla range*: Rajpipla, Juna Raj, Poicha, Bhadam. Bhatt *et al.* (1971) published a list of plants from Gora range. Of the 460 species listed by them 393 are dicotyledons, 64 monocotyledons and 3 pteridophytes, based on botanical excursions in 1962-1964 and 1968 in vicinity of Gora, Dhirkhadi, Zarvani, Chopdi, Sulpan,

Mokhadi, Piplod, Samot, Singlagabha, Dumkhali and Kokam. The families Alismaceae, Araceae, Balanitaceae, Cruciferae, Flacourtiaceae, Hypoxidaceae, Potamogetonaceae and Najadaceae are not represented in their list. Thus though a fairly large number of plants are now known for the Rajpipla Forest Division, there are several plants in our collections (Singh 1970; Patel 1971) which have yet to be added to these lists to make the flora of this forest division complete as far as possible. With this end in view, the present paper is prepared. The additions are obvious on two counts: (1) The unexplored areas and those cursorily explored areas have been intensively studied in all seasons. (2) There is a diversity in vegetational aspects varying from *Acacia* scrub forests in plains to dry deciduous forests in hilly regions.

GEOGRAPHY AND TOPOGRAPHY

Rajpipla district is situated $21^{\circ}23'$ and $21^{\circ}59'$ N and $73^{\circ}5'$ and $74^{\circ}0'$ E on the south-east border of the Gujarat State, with Rajpipla as a taluka capital. The areas explored by us fall within this range.

Rajpipla is the terminus of Rajpipla-Ankleshwar narrow gauge railway line, the latter in turn being a junction on Bombay-Ahmedabad main line about 352 km north of Bombay. Gumandev, Jaghadia, Avidhya, Rajpardi are small railway stations on this narrow gauge line. Regular State Transport buses ply between Ankleshwar and Rajpipla touching these stations. Similarly State Transport buses ply between Netrang and Jaghadia, which are also connected by a narrow gauge railway line. Garudeshwar, Kevadia, Gora, Poicha and Vavadi are also connected with Rajpipla by State Transport buses in all seasons. Kothi, Piparia, Dhavdi etc. are small villages near Kevadia whereas Thevedia is about 8 km from Gora, all only to be explored on foot or by private

conveyance ; so also is Junaraj, a place about 18 km from Rajpipla. For Surpaneshwar, State Transport buses are available up to Vadgam via Kevadia. From there, one has to walk about 5 km in the forest to catch a boat to cross river Narmada to reach Surpaneshwar. Regular State Transport buses ply from Ankleshwar and Rajpipla to Selamba and Dediapada, Sagbara, Kakadpada and Sajpur are on this route. Dumkhal, Kokam, Piplod, Ghatoli are much interior in the forests and are explored in fair season only by a private conveyance.

Topographically the entire explored area is a hilly region but for undulating plains between Kevadia-Garudeshwar and between Gora and Rajpipla extending Jaghadia-Gumandev-Netrang. The hills range in height from 233 m to 650 m. The entire hilly region of Rajpipla forest division is an extension of Satpura mountains. The areas explored are traversed by two rivers and their tributaries, Narmada in Gora range and Karjan in Dediapada range.

DESCRIPTION OF THE FLORA

A short account of the floristic composition is given in earlier papers (Shah 1967; Shah and Singh 1970; Bhatt *et al.* 1971). However a note on the flora of scrub forests in plains and hydrophytes, not included earlier, is given here. The vegetation of the hilly regions is of dry deciduous type but in vicinity of Kevadia, Netrang, Rajpipla, Gumandev and Jaghadia it is typically of the scrub forest type, with exclusively *Acacia nilotica* var. *indica* Brenan as the dominant component or at some places mixed with *Acacia leucophloea* Willd. In addition, common trees are *Prosopis cineraria* Macbr., *Salvadora persica* L. and *Zizyphus mauritiana* Lamk.; occasional ones are *Ailanthus excelsa* Roxb., *Capparis grandis* Linn. f., *Holoptelea integrifolia* Planch., *Madhuca indica* Gmel. etc. Common shrubs of the area are *Calotropis procera* (Ait.) R. Br., *Capparis decidua* Edgew., *Cassia auriculata* Linn., *Dichrostachys cinerea* Wt. & Arn., *Indigofera oblongifolia* Forsk., *Maytenus emarginata* D. Hou, bushes of *Prosopis cineraria* Macbr. and *Zizyphus nummularia* Wt. & Arn., but *Balanites aegyptiaca* Del. and *Flacourtie indica* Merr. are extremely rare. *Capparis sepiaria* Linn., *Euphorbia nivulia* Buch.-Ham., *Kirganelia reticulata* Baill., *Lawsonia inermis* Linn. and *Maytenus emarginata* D. Hou form dense and often impenetrable hedges. On these hedges, a number of twiners belonging to the families Asclepiadaceae, Combretaceae, Convolvulaceae, Cucurbitaceae, Papi-

lionaceae, Menispermaceae, Mimosaceae, Sapindaceae etc. are noted.

HYDROPHYTE

In the areas explored there are several ditches but only a few temporary ponds which are mostly filled up during the monsoon. They harbour several hydrophytes. **Submerged** : *Hydrilla verticillata* Royle, *Potamogeton crispus* Linn., *P. nodosus* Poir., *P. pectinatus* Linn., *P. perfoliatus* Linn., *Najas marina* Linn., *Utricularia* sp. and *Vallisneria spiralis* Linn. **Floating** : *Lemna gibba* Linn., *Limnophyton obtusifolium* Miq., *Nelumbo nucifera* Gaertn., *Nymphaea pubescens* Willd., *Trapa natans* var. *bispinosa* Makino. **Amphibious** : *Alternanthera sessilis* R. Br., *Ammannia baccifera* Linn., *Caesulia axillaris* Roxb., *Commelina benghalensis* Linn., *C. forskalaei* Vahl, Cyperaceae (various species), *Echinochloa colonum* Linn., *Gnaphalium indicum* Linn. etc.

By about the end of November or so most of the ditches and ponds begin to dry up and most of these plants gradually disappear.

EFFECTS OF BIOTIC FACTORS ON THE FLORA

The indiscriminate cutting of trees and shrubs by local people for fuel has resulted in crooked or mutilated forms of many trees e.g., *Butea monosperma* Taub. and *Tectona grandis* Linn. f. Some of these trees at some places are seldom allowed to grow fully to reach their natural height. The clearing of forests for agriculture purposes has added to their further destruction. Grazing animals often destroy the seedlings of tree and/or shrub species and herbaceous vegetation. As a result, many herbaceous species and especially the rare ones may not be seen in all stages of development. Similarly summer fires would also destroy the undergrowth of forest vegetation including the seedlings of perennial species. The establishment of Kevadia Colony, urban development in vicinity of Rajpipla township, construction of the all-season roads connecting different areas through forests etc., have caused severe destruction of the forests. Where the destruction is more, only scrub forests rapidly regenerate and therefore, scrub forests are found to be common in the undulating plains from Kevadia to Garudeshwar and Gora to Rajpipla and as far as Jaghadia and Netrang.

However, one may find in the scrub forests scattered here and there, trees of *Tectona grandis* Linn. f. and *Butea monosperma* Taub., which otherwise are typical of dry deciduous forests. At some places

even scattered patches of *Tectona-Butea* vegetation, associated with *Holarrhena antidysenterica* Wall. ex Don, are also observed. Among these patches, trees like *Bombax ceiba* Linn., *Miliusa tomentosa* Sincl., *Elaeodendron roxburghii* Wt. & Arn., *Sterculia urens* Roxb. etc. are sparingly found. Such groups clearly represent "remnants of earlier dry deciduous forest", indicating the possible development of a representative dry deciduous forest type in such areas if well protected from biotic factors.

ENUMERATION

Note: The nomenclature is mostly that of Cooke but where the names have been changed in light of modern researches, such names are given first, followed by the names given in Cooke's flora in parenthesis. As far as possible, indication on flower colour, relative abundance, flowering and/or fruiting time and local name where available is given for each species. Our collection numbers prefixed by abbreviated letter/letters indicating localities of collections are given in parenthesis. The plants marked with an asterisk are not given in Cooke's Flora but they are by no means new records. The entire collection from Rajpipla Forest Division is housed in the Botany Department of S. P. University, Vallabh Vidyanagar. The abbreviations of localities and other terminology are given below:

D-Dediapada, M-Mosda, KK-Kakadpada, S-Sagbara, Sj-Sajpur, Se-Selambo, Du-Dumkhal, Po-Piplod, Ko-Kokam, Su-Surpaneshwar, K-Kevadia, Dh-Dhavadi, Ga-Garudeshwar, I-Indravarna, Pi-Piparia, Go-Gora, Th-Thevadia, J-Jaghadia, G-Gumandev, Av-Avidhya, Rj-Rajpardi, N-Netrang, R-Rajpipla, JR-Juna Raj, Po-Poicha, Bh-Bhadam ; rb-river beds, C-common, O-occasional, R-rare, F-frequent, Cu-cultivated, P-planted, E-escaped.

RANUNCULACEAE

Ranunculus sceleratus Linn.

R. Fls. bright yellow. FLS and FRS: Jan.-Apr. [K(rb)3436 ; I(rb)2669].

NYMPHAEACEAE

Nelumbo nucifera Gaertn. (*Nelumbium speciosum* Willd.)

R. (J 2779).

Loc. name: Kamal.

Nymphaea pubescens Willd. (*N. lotus* var. *pubescens* Hk. f. & Th.)

R. Fls. white or creamy white. FLS: Aug. (J 2387). Loc. name: Poina.

BRASSICACEAE (CRUCIFERAE)

***Cochlearia cochlearioides** (Roth) Sant. & Mahesh.

O. Fls. yellow. FLS and FRS: Jan.-Feb. [K(rb)1162, 2610].

Lepidium sativum Linn.

R. Fls. white. FLS and FRS: Feb. (R 2712). Loc. name: Asario.

CAPPARACEAE

Capparis decidua (Forsk.) Edgew. (*C. aphylla* Roth)

C. Fls. scarlet. FLS and FRS: Mar.-July (G 3469). Loc. name: Kerdo.

Cleome chelidonii Linn. f.

O. Fls. bright rosy-pink. FLS: July-Sept. FRS: Sept.-Oct. (D 13074).

Maerua oblongifolia A. Rich. (*M. ovalifolia* Camb.)

R. Fls. greenish-white. FLS and FRS: Dec.-Mar. (R 960 ; Rj 2818).

COCHLOSPERMACEAE

Cochlospermum religiosum (Linn.) Alst. (*C. gossypifolium* DC.)

F. Fls. bright yellow. FLS: Feb. FRS: Mar.-Apr. (JR 2205, 2751, 2752, 3485).

FLACOURTIACEAE

Flacourzia indica (Burm. f.) Merr. (*F. latifolia* Cooke)

O. Fls. greenish-yellow. FLS and FRS: Feb.-Apr. (K 2621, 2919 ; R 2763 ; JR 3437 ; J 2782 ; D 1378 ; S 14026).

POLYGALACEAE

Polygala chinensis Linn.

O. Fls. yellow. FLS and FRS: July-Sept. (R 1610, 1681 ; S 2434).

CARYOPHYLLACEAE

Polycarpaea corymbosa (Linn.) Lam.

C. Fls. bright pink, at length silvery white. FLS and FRS: Oct.-Dec. (K 2652 ; R 983).

Vaccaria pyramidata Medik. (*Saponaria vaccaria* Linn.)

R. Fls. bright rosy-purple. FLS and FRS: Feb.-Apr. (K 3441 ; R 2734).

MALVACEAE

Abelmoschus ficulneus (Linn.) Wt. & Arn. (*Hibiscus ficulneus* Linn.)

R. Fls. pale creamy-yellow. FLS and FRS: Sept.-Nov. (K 780, 2386 ; D 1097, 1227 ; S 2224).

A. moschatus Medic. (*H. abelmoschus* Linn.)

O. Fls. bright sulphur-yellow. (D 309, 2966).

Abutilon glaucum (Cav.) Sw. (*A. muticum* Don)
R. Fls. bright yellow to orange coloured. FLS and FRS: Oct. (Bh 2319, 2748).

Gossypium barbadense Linn.

Cu. Fls. yellow. FLS and FRS: Nov.-Dec. (R 261; 869).

Hibiscus caesius Garcke

R. Fls. yellow. FLS and FRS: Oct. (R 300).

H. panduraeformis Burm. f.

R. Fls. yellow. FLS and FRS: Oct.-Feb. (K 803; G noted).

Pavonia zeylanica Cav.

C. Fls. bright pink. FLS and FRS: July-Oct. (K 2125; R 2304; J 2364; Pb noted).

Sida cordata (Burm. f.) Borss. (*S. veronicaefolia* Lam.)

C. Fls. yellow. FLS and FRS: Oct.-Feb. (K 1976; R 2788; Gr 2996; D 1195; S 2533).

S. ovata Forsk. (*S. grewioides* Guill. et Perr.)

R. Fls. white. FLS and FRS: Nov. (Go 643).

Thespesia populnea (Linn.) Soland. ex Corr.

R. FRS: Oct.-Mar. (J 999, 1793).

Loc. name: Paraspiplo.

TILIACEAE

Grewia villosa Willd.

R. (Go 650).

Triumfetta pentandra A. Rich.

C. Fls. yellow. FLS and FRS: Oct.-Jan. (K 1101; R 157, 2206).

BALSAMINACEAE

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

O. Fls. bright rose coloured. FLS: Oct.-Dec. (R 2352; JR 3185; D 2158; S 2535).

VITACEAE

Cissus quadrangularis Linn. (*V. quadrangularis* Wall.)

R. FRS: Dec. (R 948).

Loc. name: Hadsankal.

SAPINDACEAE

Dodonaea viscosa (Linn.) Jacq.

Cu. (R 583).

Sapindus laurifolius Vahl

P. Fls. white. FLS and FRS: Dec. (J 1067).

FABACEAE (PAPILIONACEAE)

Alhagi pseudalhagi (M. Bieb.) Desv. (*A. camelorum* Fisch.)

R. Fls. red. FLS and FRS: Dec.-Apr. (Bh 985; J 1792).

Alysicarpus heyneanus Wt. & Arn. (*A. rugosus* var. *heyneanus* Baker).

R. Fls. reddish. FLS and FRS: Dec. (J 936).

Atylosia platycarpa Bth.

R. Fls. yellow. FLS and FRS: Sept. (K 1946).

Clitoria ternatea Linn.

O. Fls. blue. FLS and FRS: Throughout the year. (K 2129; Go 3186, 13023; J 1847; S 2663).

***Desmodium neomexicanum** A. Gray

R. Fls. bright purple. FLS and FRS: Oct. (JR 2402, 2413; S 2487).

Eleotis monophylla (Burm. f.) DC. (*E. sororia* DC.)

R. Fls. yellow. FLS: Aug. (Go 2111).

***Indigofera angulosa** Edgew.

O. Fls. red. FLS and FRS: Oct. (Go 3351; JR 2447, 2452).

I. colutea (Burm. f.) Merr. (*I. viscosa* Lam.)

R. Fls. red. FLS and FRS: Oct. (Kothi, without number).

I. oblongifolia Forsk. (*I. paucifolia* Del.)

R. Fls. red. FLS and FRS: July-Dec. (Bh 1661; J 1787).

Medicago sativa Linn.

R. Fls. bluish-purple. FLS: Mar.-May (KB 89 3449; Bh 2743).

Melilotus indica All.

R. Fls. yellow. FLS and FRS: Mar. (V 1302).

Pterocarpus marsupium Roxb. var. *acuminatus* Prain

R. FRS: Dec.-Apr. (Go 3374).

Rhynchosia bracteata Bth. ex Baker

R. Fls. yellow. FLS and FRS: Oct.-Nov. (K 461, 2459).

***Rothia indica** (Linn. f.) Druce (*R. trifoliata* Pers.)

R. Fls. creamy-white. FLS and FRS: Aug. (Go 1946).

***Sesbania cannabina** (Retz.) Pers.

R. Fls. pure yellow. FLS: Aug.

Tephrosia pauciflora Grah.

R. Fls. bright purple. FLS and FRS: Oct. (K 2999).

T. tinctoria (Linn.) Pers.

R. FRS: Oct.-Nov. (Dh 485).

Vigna dalzellii (O. Ktze.) Verdc. (*Phaseolus dalzellii* Cooke)

R. Fls. yellow. FLS and FRS: Dec. (S 855).

CAESALPINIACEAE

Cassia alata Linn.

Cu. Fls. orange yellow. FLS and FRS: Dec. (K 824, 2932).

C. roxburghii DC.

P. Fls. bright rosy-pink to red. FLS and FRS: July-Oct. (R 1621).

Cassia siamea Lam.

Pl. Fls. lemon-yellow. FLS and FRS: Throughout the year (K 1393; J 2548).

C. sophera Linn.

R. Fls. yellow. FLS and FRS: Nov. (K 805).

Delonix elata (Linn.) Gamble (*Poinciana elata* Linn.)

R. Fls. at first creamy-white, at length turning yellow or golden yellow. FLS and FRS: Nov.-Mar. (P 574; G 2502; R 1275).

Parkinsonia aculeata Linn.

E. Fls. yellow. FLS and FRS: Jan. (R. without number; P 2656; Se 2691).

MIMOSACEAE

Albizia odoratissima (Linn. f.) Benth.

R. Fls. greenish-white. FLS: Apr. FRS: Sept.-Nov. (JR 3473; D 1652).

MYRTACEAE

Syzygium heyneanum Wall. ex Wt. & Arn. (*Eugenia heyneana* Duthie)

F. (K 3432).

TRAPACEAE

Trapa natans Linn. var. **bispinosa** (Roxb.) Makino (*T. bispinosa* Roxb.)

Cu. FRS: Jan. (R 828).

Loc. name: Shinghoda.

PASSIFLORACEAE

Passiflora foetida Linn.

R. Fls. white. FLS and FRS: Aug.-Dec. (K 382, 768; Go 1962).

CUCURBITACEAE

Ctenolepis garcinii (Linn.) Clke. (*Blastania garcinii* Cogn.)

C. Fls. creamy to pale yellow. FLS and FRS: Oct.-Dec. (Su 684; K 3000; Go 1960; R 173; V 1614).

Luffa echinata Roxb.

R. Fls. white. FLS and FRS: Oct. (G 15327).

Momordica dioica Roxb. ex Willd.

C. Fls. yellow. FLS and FRS: July-Nov. (K 1961; R 1516; Bh 1682).

Loc. name: Kakoda.

Solena heterophylla Lour. (*Melothria heterophylla* Cogn.)

R. Fls. creamy-white. FLS and FRS: Oct. (JR 2446; S 2424).

MOLLUGINACEAE

Mollugo cerviana (Linn.) Ser.

C. Fls. white. FLS and FRS: July-Nov. (Su 7337; K 2663; J 2397).

RUBIACEAE

Kohautia aspera (Roth) Bremek. [*Oldenlandia aspera* (Heyne ex Roth) DC.]

R. Fls. white. FLS and FRS: Dec. [K (1b) 3282A].

Spermadycyon suaveolens Roxb. (*Hamiltonia suaveolens* Roxb.)

R. Fls. pure white or pale blue. FLS: Nov. (G 2590).

ASTERACEAE (COMPOSITAE)

Blumea lacera (Burm. f.) DC.

R. Fls. yellow. FLS and FRS: Nov.-Jan. (D 1204).

***Eupatorium odoratum** Linn. forma *squarrosum* Koster. f.

E. Fls. bluish. FLS and FRS: Nov.-Mar. (K 564, 2829).

Gnaphalium luteo-album Linn.

R. Fls. yellow. FLS and FRS: Mar.-Apr. [K (rb) 3448; Go (rb) 2861, 2888].

Goniocaulon indicum (Klein ex Willd.) Clke. (*G. glabrum* Cass.)

R. Fls. light to bright purple. FLS and FRS: Dec. (Go 3250).

Laggera aurita (Linn. f.) Sch.-Bip.

R. Fls. pink to light purple. FLS and FRS: Dec.-Mar. (K 578; J 2812; G Noted).

***Parthenium hysterophorus** Linn.

R. Fls. white. FLS and FRS: Feb.-Mar. (N 2928).

Sonchus asper (Linn.) Hill.

R. Fls. yellow. FLS and FRS: May (K 1433).

PLUMBAGINACEAE

Dyerophytum indicum (Gib. ex Wt.) O. Ktze.

(*Vogelia indica* Gib. ex Wt.)

R. FLS and FRS: Jan. (K 2620).

EBENACEAE

Diospyros chloroxylon Roxb.

C. FRS: Feb. (G 2824).

Loc. name: Thamni.

SALVADORACEAE

Salvadora persica Linn.

C. Fls. greenish-yellow. FLS and FRS: Dec.-Feb. (J 1229; G 1009, 3397).

ASCLEPIADACEAE

Pentstropis spiralis (Forsk.) Decne. (*P. cynanchoides*

R. Br.)

R. Fls. yellowish-green. FLS: July (R 1564, 1573; Bh 1667).

GENTIANACEAE

Exacum pedunculatum Linn.

R. Fls. blue. FLS and FRS: Sept.-Apr. (K 3441; D 210).

EHRETIACEAE

Ehretia laevis Roxb.

R. Fls. white to pale blue. FLS and FRS: Dec.-May (K 1359, 2875; Go 1459; Ga 2669; R 1308).

CONVOLVULACEAE

Convolvulus arvensis Linn.

R. Fls. pale-to-bright pink. FLS and FRS: Nov. (J 991).

Hewittia sublobata (Linn. f.) O. Ktze. (*H. bicolor* Wt. & Arn.)

R. Fls. yellow. FLS and FRS: Nov. (K 392).

Ipomoea aitonii Lindl. (*I. pilosa* auct. non Houtt.)

R. Fls. bright purple. FLS and FRS: Sept.-Nov. (K 486; Go 3150; R 2256; Bh 1629; D 2847; S 2655).

I. sindica Stapf

R. Fls. white. FLS and FRS: Oct. (K 2985; R 2356).

Jacquemontia paniculata (Burm. f.) Hall. f.

F. Fls. white. FLS and FRS: Oct.-Mar. (K 2483; Bh 2320).

Merremia rhynchorhiza (Dalz.) Hall. f.

R. FRS: Oct. (R 143).

SOLANACEAE

Nicotiana plumbaginifolia Velv.

R. Fls. pale pink or blue. FLS and FRS: Nov.-Jan. [K (rb) 493; Ga (rb) 1054; N 2935].

Withania somnifera (Linn.) Dunal

C. Fls. greenish-yellow. FLS and FRS: Apr.-Dec. (R 831, 1731, 2749).

SCROPHULARIACEAE

***Lindernia multiflora** (Roxb.) Mukerjee

R. Fls. white. FLS and FRS: Sept. (Se 2319)

***Mecardonia procumbens** (Mill.) Small

F. Fls. yellow. FLS and FRS: Nov.-May [K (rb) 1983, 1169, 1425; Kothi 2645; Ga (rb) 2824, 2845].

Scoparia dulcis Linn.

R. Fls. white. FLS and FRS: Jan. (Ga 1056).

Striga densiflora (Bth.) Benth.

R. Fls. white. FLS and FRS: Oct. (Bh 2325).

Sutera dissecta (Del.) Walp. (*S. glandulosa* Roth)

O. Fls. white. FLS and FRS: Dec.-Feb. [Su 12087; K (rb) 2879; Go (rb) 11920; Kothi (rb) 2642; Ga (rb) 12010].

BIGNONIACEAE

Tecomella undulata (Sm.) Seem

R. Fls. orange-yellow. FLS: Feb. (R 1130).

ACANTHACEAE

Adhatoda vasica (Linn.) Nees

R. Fls. white. FLS and FRS: Dec.

Asystasia gangetica (Linn.) T. Anders. (*A. coromandeliana* Wt.)

R. Fls. pale bluish-purple. FLS: December.

Blepharis repens (Vahl) Roth (*B. molluginifolia* Pers.)

R. FLS and FRS: Sept.-Dec. (Go without number; Ko 11557; S 2551).

***Dipliptera roxburghiana** Nees

C. Fls. bright rosy-purple. FLS and FRS: Sept.-Mar. (D 728, 2893; Du 11491, 11584).

Dipteracanthus patulus (Jacq.) Nees (*Ruellia patula* Jacq.)

R. Fls. pale-purple or almost white. FLS and FRS: Aug.-Nov. (Su 739; Go 1968; G 3467).

Dyschoriste dalzellii (T. Anders.) O. Ktze.

R. Fls. pale white or lilac. FLS and FRS: Mar. (D 1620).

Haplanthus neilgherryensis Wt. (*H. tentaculatus* Nees p.p.).

C. Fls. dirty white with blue mouth. FLS and FRS: Oct.-Mar. (S 1288; D 11511).

H. verticillatus (Roxb.) Nees

C. Fls. gentian-violet. FLS and FRS: Oct.-Dec. (D 528, 11532; S 1028).

***Ruellia tuberosa** Linn.

R. Fls. bluish-purple. FLS and FRS: July (R 1512, 1734, 1767).

VERBENACEAE

Clerodendrum inerme (Linn.f.) Gaertn.

Cu. Fls. white. FLS: Throughout the year.

Lantana salvilifolia Jacq. (*L. indica* Roxb.)

C. Fls. lilac. FLS and FRS: More or less throughout the year (K 1417; Ga 12017; Go 2697; J 1789).

LAMIACEAE (LABIATAE)

Leucas nutans Spr.

C. Fls. white. FLS and FRS: Nov.-Jan. (K 1085; Go 2613; R 979).

L. urticaefolia R. Br.

R. Fls. white. FLS and FRS: Oct. (R 223; Th 3097).

Salvia santolinaefolia Boiss. (*S. aegyptiaca* var. *pumila* Hk. f.)

R. Fls. white. FLS and FRS: Aug. (K 2165).

AMARANTHACEAE

Amaranthus tricolor Linn. (*A. gangeticus* Linn.)

O. FLS and FRS: Sept.-Jan. (K 2650; Go 1123; Th 3096; Po 2187; JR 3172; S 2625).

A. tricolor Linn. var. **tristis** (Prain) Nayar et al.

(*A. gangeticus* var. *tristis* Prain)

R. FLS and FRS: Jan. (K 2650).

CHENOPODIACEAE

Chenopodium murale Linn.
R. FLS and FRS: Feb. (R 2736).

BASELLACEAE

Basella rubra Linn.
E. Fls. bright pink. FLS: Oct. (R 79).

EUPHORBIACEAE

***Euphorbia prostrata** Linn.
C. FLS and FRS: July-Jan. [R 2249; Ga (rb) 1959].

E. heterophylla Linn.
P. FLS and FRS: Throughout the year. (J 2936).

E. hirta Linn. (*E. pilulifera* Linn. p.p.)
C. FLS and FRS: Throughout the year. [K 2608;
Ga(rb) 1052; Go 1882; R 2209; V 1300; D 1215;
Sj 2988; S 2162; Se 1471].

E. milii ch. des Moulins (*E. splendens* Boj.).
Cu. FLS: Throughout the year. (K 2627; J 2966).

E. nivulia Buch.-Ham.
Cu. FLS: Mar.-May. FRS: Apr.-June (Go 2708).

E. tirucalli Linn.
Cu. (K 3035; Ga 2182; R 2297; Bh 1282).
Loc. name: Kharsani.

Homonoia retusa Muell.-Arg.
C. Fls. red. FLS and FRS: Nov.-Apr. (K 3444;
Go 1219).

Phyllanthus asperulatus Hutch. (*P. niruri* auct. non
Linn.)
Common. FLS and FRS: Throughout the year.
(K 1401; Ga 1050; S 2337).

P. debilis Herb.
R. FLS and FRS: Aug. (Go 1979).

Sebastiania chamaelea (Linn.) Muell.-Arg.
R. FRS: Oct. (Th 3106).

SALICACEAE

Salix tetrasperma Roxb.
R. FLS and FRS: not seen. (R 291).

ORCHIDACEAE

Vanda tessellata (Roxb.) Hk.f. ex G. Don (*V. roxburghii* R. Br.)
O. FRS: Sept.-Jan. (D 1921, 1975; G 11509; 1548).

ZINGIBERACEAE

Costus speciosus (Koenig) Sm.
R. Fls. white. FLS: Sept. (S 1996, 2103)

AMARYLLIDACEAE

Crinum pratense Herb.
O. FLS white. FLS: Aug.-Sept. (D 1171, 2862).

LILIACEAE

Asparagus dumosus Baker
R. Fls. white. FLS and FRS: May-June.
[K(rb) 1474, L 466].

A. **gonoclados** Baker

A. Fls. white. FLS: Dec. (G 1845).

Loc. name: Satavari.

Urginea indica (Roxb.) Kunth

O. Fls. brown. FLS and FRS: Apr. (S 2076, 2506).

COMMELINACEAE

***Amischophacelus cucullata** (Roth) Rolla & Kam.
(*Cyanotis cucullata* Kunth)

O. Fls. bright-violet. FLS and FRS: Aug.-Dec.
(K 473; Go 1874; Bh 2307).

Commelina diffusa Burm. f. (*C. nudiflora* auct. non
Linn.)

C. Fls. blue. FLS and FRS: Aug.-Sept. (S 2366,
2682, 2720).

C. forskalaei Vahl

C. Fls. blue. FLS and FRS: July-Nov. (K 2162;
Go 1928; 3048; Bh 2359; Rj 2380).

ARACEAE

***Amorphophallus sylvaticus** Kunth

R. (D 1889).

Sauromatum venosum (Ait.) Kunth (*S. guttatum*
Schult.)
R. (S 2003).

LEMNACEAE

Lemna gibba Linn.

C. (R pickled material).

ALISMACEAE

Limnophyton obtusifolium (Linn.) Miq.

R. Fls. pale blue or nearly white. FLS and FRS:
Oct. (AV 2384, 2398).

POTAMOGETONACEAE

Potamogeton crispus Linn.

R. [G (rb) 2705].

P. nodosus Poir. (*P. indicus* Roxb.)

R. (Rj 2806).

P. perfoliatus Linn.

O. [K(rb) 2887; I(rb) 2679].

NAJADACEAE

Najas marina Linn.

R. K(rb) 2895.

CYPERACEAE

Cyperus arenarius Retz.

R. [K(rb) 2663].

C. niveus Retz.

C. Spikelets: Aug. (Go 2105).

C. Pseudokyllingioides Kukenth. (*Courtoisia cyperioides* Nees)

R. Spikelets: Sept. (D 727).

***C. flavidus** var. **strictus** (Roxb.) Korla.

R. Spikelets: Nov. [Go(rb) 2527].

- Cyperus tenuispica** Steud. (*C. flavidus* non Retz.)
R. Spikelets: Oct. (R 50).
Fimbristylis complanata (Retz.) Link.
C. Spikelets: Dec.-Feb. (Go 1117, 12008; G 1234; N 1246).
F. falcatia (Vahl) Kunth (*F. junciformis* Kunth)
C. Spikelets: Aug. [G(rb) 1838].
F. ferruginea (Linn.) Vahl
R. Spikelets: Dec. [G(rb) 2375].
***F. sieberiana** Kunth
R. Spikelets: Dec. [Ga(rb), without number; G(rb) 3405].
Scirpus affinis Roth
R. Spikelets: Dec. (G without number).
S. littoralis Schrad. var. *subulatus* (Vahl) Chiov. (*S. littoralis* sensu Clke.)
C. Spikelets: July-Feb. (K 781; Th 857; R 1137; Rj 2368; J 1231; G 1018).
S. roylei (Nees) Parker (*S. quinquefarius* Buch.-Ham.)
R. Spikelets: Oct. (Bh 2313).
S. tuberosus Desf. (*S. maritimus* Linn. p.p.)
C. Spikelets: Dec.-Feb. [K 2511; I(rb) 2677; Kothi 2644; Go(rb) 1410].

POACEAE (GRAMINEAE)

- *Achrachne racemosa** (Heyne ex Roem. & Schult.) Ohwi
C. Spikelets: July-Sept. (Go 2109; R 1749).
Andropogon pumilus Roxb.
C. Spikelets: Oct.-Nov. (K 3066).
***Aristida cyanantha** Nees ex Steud.
R. Spikelets: Aug. (K 2168).
***Arthraxon prionodes** (Steud.) Dandy (*A. lanceolatus* auct.)
C. Spikelets: Sept. (D 278; S 2580).
Bothriochloa pertusa (Linn.) A. Camus (*Andropogon pertusus* Willd.)
O. Spikelets: July-Jan. (Go 1871; Bh 1642; S 2584).
Bracharia eruciformis (J. & E. Sm.) Griseb. (*Panicum isachne* Roth)
O. Spikelets: Aug.-Feb. (K 1163, 2159).
B. reptans (Linn.) Gard. & C. E. Hubb. (*Panicum prostratum* Lam.)
O. Spikelets: Oct. (R 31).
Capillipedium filiculme (Hk. f.) Stapf (*Andropogon filiculmis* Stapf)
O. Spikelets: Sept. (S 2467, 2488).
Cenchrus biflorus Linn. (*C. catharticus* Del.)
R. Spikelets: Oct.-Mar. (K 697; Kothi 2523; Go 2106).

- *C. ciliaris** Linn. (*Pennisetum cenchroides* Rich.)
R. Spikelets: July-Oct. (Bh 2306; Rj 2394).
***Chloris virgata** Sw.
C. Spikelets: July-Dec. (K 1913; R 2207; V 1620; D 3064; S 2586, 14080).
Chrysopogon fulvus (Spr.) Chiov. (*Andropogon monticola* R. & S.)
C. Spikelets: Oct.-Jan. (K 1090, 2611).
***Cleistachne sorghoides** Bth.
R. Spikelets: July-Aug. (D 13071).
Dichanthium aristatum (Poir.) C.E.Hubb.
R. Spikelets: July-Aug. (D 1284, 13077, 14035).
***D. caricosum** (Linn.) A. Camus
R. Spikelets: Aug.-Sept. (S 2590).
Digitaria biformis Willd.
R. Spikelets: July (D 40).
***Echinochloa crus-galli** (Linn.) P. Beauv.
R. Spikelets: Oct. (R 268).
Eragrostis ciliaris (All.) Vignolo-Lutati (*E. major* Hochst.)
O. Spikelets: Oct.-Nov. (R 60; Go 2572).
***E. ciliaris** (Linn.) R. Br. var. *ciliaris*
C. Spikelets: Oct.-Jan. (R 60; Bh 2328; Go 3219; Kothi 3071; K 376; Ga 611).
E. diplachnoides Steud. (*E. interrupta* auct. non P. Beauv.)
C. Spikelets: Aug.-Oct. (K 507; Go 1472; R 307).
E. japonica (Thunb.) Trin. (*E. interrupta* auct. non P. Beauv.)
C. Spikelets: Sept.-Feb. (Ga 1146; Kothi 1190; D 746; S 2326).
E. poaeoides P. Beauv. (*E. minor* Hochst.)
R. Spikelets: Nov.-Dec. (K 387; R 975).
E. pilosa (Linn.) P. Beauv.
O. Spikelets: July-Nov. (Bh 1631; D 1291).
Eremopogon foveolatus (Del.) Stapf (*Andropogon foveolatus* Del.)
C. Spikelets: July-Nov. (K 1875; G 600; R 1529; Bh 1688; G 1837).
Hackelochloa granularis (Linn.) O. Ktze. (*Manisuris granularis* Linn. f.).
O. Spikelets: Aug.-Oct. (K 2146; Kothi 2076; R 232).
Hemarthria compressa (Linn. f.) R. Br. (*Rottboellia compressa* Linn. f.)
C. Spikelets: Nov.-Dec. (K 559).
Ischaemum indicum (Houtt.) Merr. var. *indicum* sub. var. *villosum* Hack. (*I. aristatum* auct. non Linn.)
C. Spikelets: Sept. (S 246, 14082; D 1283, 14037).

- Ischaemum pilosum** (Klein ex Willd.) Wt.
C. Spikelets: Sept.-Oct. (K 3030; Go 1872; Bh 1684; V 1601).
- I. rugosum** Salisb.
O. Spikelets: Sept. (Se 2322).
- Iseilema laxum** Hack.
O. Spikelets: Sept. (S 2592).
- I. prostratum** (Linn.) Anderss. (*I. wightii* Anderss.)
F. Spikelets: Nov. (K 758).
- Ophiuros exaltatus** (Linn.) O. Ktze.
O. Spikelets: July-Dec. (K 559; V 1594; G 3416; S 314; D 14056).
- Panicum antidotale** Retz.
C. Spikelets: Aug. (Go 2101, 2118).
- P. psilopodium** Trin.
R. Spikelets: Aug.-Dec. (Go 1891; S 2718).
- Paspalidium geminatum** (Forsk.) Stapf (*P. fluitans* Retz.)
R. Spikelets: Nov. (Go 623).
- Pennisetum hohenackeri** Hochst. ex Steud. (*P. alopecurus* auct. non Jacq.)
O. Spikelets: Sept.-Oct. (K 2977; Th 3107; R without no. Bh 2336).
- Perotis indica** (Linn.) O. Ktze. (*P. latifolia* Ait.)
R. Spikelets: Aug. (Go 2107).
- Saccharum officinarum** Linn.
Cu. Spikelets: Feb. (D 788).
- Setaria glauca** (Linn.) P. Beauv.
C. Spikelets: Aug.-Nov. (Po 2180; J 2570; K 692; D 2522).
- ***S. pallide-fusca** (Schum.) Stapf & C. E. Hubb.
C. Spikelets: Aug.-Sept. (R 2233; D 53; S 1350, 14087).
- S. tomentosa** (Roxb.) Kunth
O. Spikelets: Sept. (D 2861; S 2533).
- ***Sorghum miliaceum** (Roxb.) Snowden
O. Spikelets: Sept. (S 2607).
- Sporobolus marginatus** Hochst. ex A. Rich (*S. arabis* Boiss.)
R. (J 1774).
- S. tremulus** (Willd.) Kunth
R. Spikelets: July (R 1716).
- Tetrapogon villosus** Desf. [*Chloris villosa* (Desf.) Pers.]
R. Spikelets: Aug.-Oct. (Go 1920; Bh 2329).

- ***Themedia laxa** (Anderss.) A. Camus
R. Spikelets: Oct. (R 2242).
- T. tremula** (Nees ex Steud.) Hack.
O. Spikelets: Sept.-Oct. (D 14050; S 407).
- Thysanoleana maxima** (Roxb.) O. Ktze. (*T. agrostis* Nees).
R. Spikelets: Mar. (Gh 1554; D 14086).
- Tragus biflorus** (Roxb.) Schult. (*T. racemosus* Hk. f.)
R. Spikelets: July-Aug. (Go 1863; 1669).
- Tripogon lisboae** Stapf
C. Spikelets: Oct. (K 2471).
- ***Urochloa panicoides** Beauv. var. **panicoides**
C. Spikelets: July-Sept. (J 1809, D 424A).
- ***U. panicoides** Beauv. var. **pubescens** Bor
C. Spikelets: July-Aug. (J 2177; R 1749).
- Zea mays** Linn.
Cu. Spikelets: Aug.-Sept. (K 593; Ga 1070; Go 2547).

ACKNOWLEDGEMENTS

The authors wish to express their sincere thanks to Principal M. B. Raizada, Dehra Dun for the identification of some grasses, to the authorities of Central National Herbarium, Calcutta and the Regional Botanist, Botanical Survey of India, Western Circle, Poona for confirming the identification of some plants. Thanks are also due to Prof. P. V. Bole for extending facilities to work in the Blatter Herbarium, Bombay. The Junior authors are grateful to C.S.I.R. and Sardar Patel University for providing fellowships to carry out the present project.

REFERENCES

- AHUJA, K. K. AND R. D. PATASKAR. Additions to the Flora of Gujarat. *Indian For.* 96(8) : 628-629. 1970.
- BHATT, R. P., S. J. BEDI AND S. D. SABNIS. Botanical explorations of the Gora range of the Rajpipla Forests, Gujarat State. *Ibid.* 97(8) : 477-486. 1971.
- COOKE, T. *The Flora of the Presidency of Bombay*. London. Vol. I, 1901-1903; Vol. II, 1904-1908.
- PATEL, A. I. *A contribution to the flora of Rajpipla Forest*. (Rajpipla, Gora and Netrang ranges) Ph.D. Thesis. Unpublished. 1972.
- SHAH, G. L. A preliminary contribution to the flora of Rajpipla Forests in Gujarat. *Indian For.* 93 : 672-676. 1967.
- AND V. K. SINGH. Further contribution to the flora of Rajpipla forests, Gujarat. *Ibid.* 96 : 120-126. 1970.
- SINGH, V. K. *Taxonomical studies on the flora of Rajpipla forests, Gujarat*. Ph. D. Thesis, unpublished. 1970.