

SURVEY OF SOME OIL-YIELDING PLANTS OF WESTERN INDIA

G. S. PURI

Regional Botanist, Western Circle, Poona.¹

S. K. JAIN

Systematic Botanist, Western Circle, Poona.²

ABSTRACT

The paper describes the distribution of 19 oil-yielding plants namely—*Balanites aegyptiaca* Delile., *Boswellia serrata* Roxb., *Calophyllum inophyllum* Linn., *Cinnamomum zeylanicum* Breyn., *Cymbopogon martini* Wats., *Cyperus rotundus* Linn., *Garcinia indica* Choisy., *Madhuca indica* Gmel., *Mesua ferrea* Linn., *Michelia champaca* Linn., *Mimusops elengi* Linn., *Mammea longifolia* Planch. and Triana, *Pongamia pinnata* Pierre, *Salmalia malabarica* Schott. & Endl., *Schleichera oleosa* Oken., *Semecarpus anacardium* Linn., *Terminalia belerica* Roxb., *Vateria Indica* Linn., & *Vetiveria zizanioides* Stapf.

The information is based on actual collections of the authors and plant specimens lodged in Poona herbarium.

The oil-yielding plants engaged our attention from the very start of our botanical explorations of western India. Notes on distribution and occurrence of important oil-yielding plants have been included in the various floras prepared by us; viz. Flora of Deccan Trap (Puri & Jain, 1959), Flora of Kutch (Puri, Jain & Deshpande, 1959), *Cymbopogon martini* the grass yielding Rosha Oil was observed by us to be growing wild on large tracts of the Deccan Trap and a note on this was submitted to the State and Central Government and was also published in popular journals for the benefit of public.

Some oil-yielding plants of Western India have been briefly described below and data on their uses and occurrence has been given. This data is original as it has been derived from the materials and notes of our own collections from Western India and from the collections of Cooke and Talbot lodged in our herbarium. The description of exact localities, we hope, will greatly facilitate in collection of genuine material and proper exploitation of this natural wealth of the country.

Short descriptions, uses and distribution of some important oil-yielding plants of Western India:—

Balanites aegyptiaca (Linn.) Delile. syn. *B. roxburghii* Planch. Hook. f. Fl. Br. Ind. III, 522 p., 1882; Talbot, I, 241 p., t. 128, 1909 (Simarubaceae).

A small thorny tree growing in drier parts of India, leaves short stalked 2-foliate, fruit a drupe.

A fixed oil called 'Zachun' is extracted from seeds (Dastur, 40 p., 1951.)

RAJASTHAN: Dungarpur, *Vasavada* 29366; Kota-Shahabad, *Jain* 28834.

MADHYA PRADESH: Ratlam-Salakhedi, *Vasavada* 27592; Bhopal, *Wadhwa* 48216.

GUJERAT: Nadiad, *Toor* 14305; Sudasana Hill, *Jain* 11410; Ahmedabad, *Cooke*.

BOMBAY: Hivre garden, *Puri* 2583; Purandhar, *Mahajan* 26976; Sholapur-Vahagaon, *Bhagwat* 18979; Padmalaya, *Mahajan* 6327; Chopda, *Jain* 11237; Haripur, *Mahajan* 13500; Manjari Forest, *Javlekar*; Shrigonda, *Shevade*; Pimpri, *Shevade*; Champaner, *Chibber*.

MYSORE: Huli, *Puri* 19894 B; Dharwar, *Cooke*; Dharwar, *Talbot*; Saundatti, *Talbot*; Belgaum, *Talbot*.

Boswellia serrata Roxb. Hook. f. Fl. Br. Ind. I, 528 p., 1875; Talbot, I, 216 p., t. 130, 1909 (Burseraceae).

A moderate sized tree growing in moist forests of U.P., Panjab, Central India, Western India, Deccan, Orissa and on western coast.

The essential oil can serve as a substitute for pine turpentine and is used in preparation of quick drying varnishes and paints (Dastur, 51 p., 1951).

RAJASTHAN: Dungarpur, *Vasavada* 29351; Panchkund, *Vasavada* 29587 A; Sawaimadhopur, *Jain* 18839; Kota-Shahabad, *Jain* 28930.

MADHYA PRADESH: Mandu, *Puri* 26433.

BOMBAY: Nandurbar-Ashta, *Jain* 11006; Padmalaya, *Mahajan* 6338; Chalisgaon-Outram-Ghat, *Mahajan* 20410; Apison Hill, *Mahajan* 20232; Haripur, *Mahajan* 13176; Laling-Takya Hill, *Mahajan* 4348, 20476; Taranga Hill, *Jain* 11353; Katraj, *Puri* 2364, 2374; Ambevani, *Gangurde* 18312; Kolhapur, *Puri* 20032; Bawdhan, *Jain* 8891; Poona, *Khisti* 9788; Talegaon, *Puri* 8391; Poona District, G. M. W.; Katraj Ghat, *Bhide*; Bhusaval, *Gammie*; Chatarsinghi, Poona, *Javlekar*; Poona Science College, *Talbot*.

Calophyllum inophyllum Linn. Hook. f. Fl. Br. Ind. I; 273 p., 1874; Wt. Ill. I, 128, Ic. t. 77 (Guttiferae).

A moderate sized evergreen tree with leathery leaves, occurring in Deccan along coasts.

The oil extracted from seed is used for soap making

¹ Director, Central Botanical Laboratory, Allahabad.

² Economic Botanist, Central Botanical Laboratory, Allahabad.

and burning in lamps. Mixed with the oil of *Vateria indica*, it is used for caulking boats (Dastur, 59 p., 1951).

BOMBAY: Madh island, *Jain* 9744; Bombay, Ratnagiri, *Cooke*; Thana, *Paranjpye*.

MYSORE: Karwar-Ankola Road, *Jain* 16495; Kumta sea-beach, *Puri* 1715; Kumta-Sirsi Road, *Mokim*; Castle Rock, *Bhide*; Balekeri coast, North Kanara, *Talbot*.

LACCADIVES ISLANDS: Kavarathy island, *Wadhwa* 45432.

AMENIDIVES ISLANDS: Kadmat island, *Wadhwa* 49104.

Cinnamomum zeylanicum Breyn. Hook. f. Fl. Br. Ind. V, 131 p., 1886; *Talbot*, II, 388 p., t. 463, 1911 (Lauraceae).

A moderate sized or tall tree with glabrous, lanceolate leaves occurring in the rain forests of Western Ghats and southern India.

The bark yields an essential oil, which is aromatic and sweet, used in perfumes. The leaves give an oil used in perfumery, confectionery and pharmacy. The oil obtained from roots has odour of camphor. All oils are medicinal (Dastur, 80 p., 1951).

BOMBAY: Lonavala, *Burns*; Amboli Ghat, *P.S.K.*; Bilad Thana District, *Ryan*; Radhanagari, *Ahuja* 47324.

MYSORE: Dajipur above Londa Ghat, *Bhide*; Bisle forest, *Mahajan* 19858; Aldur, *Mahajan* 19762; Agumbe, *Mahajan* 19390; Menibile, *Puri* 19185; Mercara, *Puri* 31967; Kalgar Kan, *Jain* 29858; Sirsi-Kumta Road, *Puri* 1630, 2171; Balicop forest-Siddapur, *Jain* 12996 A; Yekambi forest, *Puri* 1006; Sirsi, *Puri* 1421; Yellapur forest, *Puri* 18127; Garsappa, *Jain* 24569 A; *Chibber*, *Talbot*; Mattikeri, *Puri* 1312; Yellapur, *Jain* 16350; Arora 33538; Koynad range, *Wadhwa* 48871; Castle Rock, *Gammie*; Londa, *Burns*; Radhanagari, *Ahuja* 47324; Samkhund, *Talbot*; Ainshi, *Talbot*; Kolanadi Supa, *Talbot*; Above Sispara, *Gamble*.

KERALA: Deviar, *Puri* 15663, 15659; Poringal, *Puri* 1584; Sadanandapuram, *Puri* 15225.

MADRAS: Ootacamund, *Torne*.

Cymbopogon martini Wats. Syn. *Andropogon schoenanthus* Linn. var. *martini* Hook. f. Fl. Br. Ind., VII. 204 p., 1896; *Bor*, t. XXI, 1940 (Gramineae).

A tall perennial sweet-scented grass growing in several parts of India, also planted for its valuable oil. The Rosha oil obtained from Motia and Sofia varieties is used in perfumery and medicine (With India, II, 416 p., 1950).

GUJERAT: Vasad, *Jain* 24187.

BOMBAY: Paud, *Jain* 8816, 8245; Mahableshwar-Lingmala Falls, *Mahajan* 13081; Poona District, *Jain* 7563; Shivneri, *Puri* 2617; Shera, *Jain* 7654;

Bawdhan, *Jain* 7688, 8857; Poona—N.D.A. Road, *Jain* 7593; Kolwan, *Jain* 9296; Laling Kurans, *Mahajan* 20481; Haripur, *Mahajan* 13380; Kolwan Range, East Nasik, *Silviculturist*, Poona; Talegaon, *Puri* 8973.

MYSORE: North Kanara, *Puri*.

Cyperus rotundus Linn. Hook. f. Fl. Br. Ind. VI, 614 p., 1893; *Kirt. & Basu*, Plate, 1011, 1935 (Cyperaceae).

A perennial sedge with reddish brown branched unbelliform spikes, growing all over India.

The spongy rhizome yields an essential oil, used in perfumery and soap making, and as insect repellent (Dastur, 91 p., 1951).

RAJASTHAN: Gajaner, *Bhagwat* 23508.

GUJERAT: Ankaleshwar, *Toor* 25732.

MADHYA PRADESH: Parora, *Puri* 27409.

BOMBAY: Ghodnadi, *Rajgurav* 7722; Katraj, *Patil* 5661; Poona, *Puri* 6204, 492; Laling Fort, *Puri* 20496; Jalgaon, *Mahajan* 20282; Mandipada, *Puri* 4512; Panvel, *Puri* 22713; Dehu Road, *Puri* 22706; Lonavala, *Puri* 26492; Khandbara, *Puri* 4507; Pardi, *Puri* 22736.

MYSORE: North Kanara, *Puri*.

Garcinia indica Choisy, Hook. f. Fl. Br. Ind. I, 261 p., 1874; *Talbot*, I, 91 p., t. 57, 1909 (Guttiferae).

A tall tree growing in evergreen forests of western ghats, Malabar, Konkan and parts of Madras.

Mangosteen oil is extracted from the seeds. This has 52% stearic acid; it is used in cosmetics, textile, soap etc. (Dastur, 114 p., 1951).

BOMBAY: Lonavala, *Jain* 918; Near Shirgaon, *Vasavada* 17031; Khandala, *Gammie*; Thana, *Ryan*; Karli, *Gammie*; Matheran, *Talbot*; Ambe-ghat, *N.B.R.*; Konkan, *Talbot*.

MYSORE: Sirsi-Kumta road, *Puri* 2151; Yellapur-Teligiri, *Jain* 16504; Chipgi forest-Sirsi, *Jain* 29075; Yellapur-Mundgod Road, *Arora* 33627; Castle Rock, *Bhide*; Yellapur, *Talbot*; Anmodi-N. Kanara, *Talbot*; Wadlar Ghat, *Talbot*.

KERALA: Sadanandapuram, *Puri* 15226.

Madhuca indica Gmel. Syn. *Bassia latifolia* Roxb. Hook. f. Fl. Br. Ind., III, 544 p., 1882; *Talbot*, II, 157 p., t. 372, 1911 (Sapotaceae).

A large deciduous tree with densely clustered tomentose leaves and flowers, occurring almost all over India in plains and submontane areas.

The oil obtained from seeds is edible and is used in cooking and also for burning. The seeds and leaves contain saponin (Dastur, 40 p., 1951).

MADHYA PRADESH: Samarda-Central India, *Wadhwa* 48221.

BOMBAY: Gangapuri, *Mahajan* 13156; Chopda, *Jain* 11233; Haripur, *Mahajan* 13362; Apison Hill, *Mahajan* 20249; Broach, *Jain* 17693; Ambevani,

Gangurde 18286 ; Poona-Bombay road, *Jain* 11875 ; Sharavati, *Puri* 19050 ; Near Khandala, *Kanetkar*.
 MYSORE: Kalgar Kan, *Jain* 29857 A ; Mattikar, *Puri* 1306 ; Airatari forest Katgal, *Arora* 2500 ; Kalhalla, *Arora* 46129, 46114 ; Tittimati-Coorg, *Arora* 55514 ; Mundgod, *Talbot* ; Haliyal, *Talbot* ; Turanmal Akarani, *Talbot* ; N. Kanara, *Talbot*.

Mammea longifolia Planch. & Triana, Syn. *Ochrocarpus longifolius* Benth. & Hook. f. Fl. Br. Ind. I, 270 p., 1874 ; *Talbot*, I, 98 p., t. 61, 1909 (Guttiferae).

A tall evergreen tree with opposite or whorled leathery leaves growing in western ghats and eastern India. The flowers and buds yield a dye and perfume (*Dastur*, 159 p., 1951).

BOMBAY: Sonda, *Mahajan* 1522 ; Meroli-Khandala, *Mahajan* 16784 ; Matheran, *Puri* 9848 ; Ahmednagar, *Puri* 19273 ; Thana Tungar, *Ryan* ; Khandala, *Bhide & Bhiva* ; Kanheri Caves, *Bhide* ; Ratnagiri, *Bhide*.

MYSORE: Kumta Mirjan, *Jain* 16581 ; Siddapur-Aurguppa forest, *Puri* 1800 ; Katgal, *Puri* 1925 ; Katgal, *Mahajan* 1558 ; Agumbe, *Mahajan* 19540 ; Dandelli, *Jain* 16157 ; Radhanagari, *Ahuja* 47302 ; Kanara, Kumta, *Talbot* ; S. Kanara, *Bhiwa*.

Mesua ferrea Linn. Hook. f. Fl. Br. Ind. I, 277 p., 1874 ; *Talbot*, I, 103 p., t. 64, 1909 (Guttiferae).

An evergreen tree growing in eastern coast, western coast and Cochin.

The oil from the seeds is of medicinal value ; the flowers are used in Pharmacy (*Dastur*, 149 p., 1951).

BOMBAY: Rajapur, Kodawli, *Bhide* ; Banwasi, *Kulkarni* ; Konkan, *Talbot* ; Konkan-Ghat, *Gamble*.

MYSORE: Agumbe, *Mahajan* 19545 ; Sirsi, *Puri* 1451 ; Godalli, *Puri* 1098 ; Makut, *Arora* ; Castle Rock, *Bhide* ; Yellapur, *Talbot* ; Nilgiri, *Gamble*.

Michelia champaca Linn. Hook. f. Fl. Br. Ind., I, 42 p., 1872 ; *Talbot*, I, 12 p., t. 8, 1909 (Magnoliaceae).

A large evergreen tree with very fragrant flowers found in eastern India and Deccan.

The oil obtained from flowers is used in perfumery. An oil is reported to be extracted from the leaves in Java (*Dastur*, 150 p., 1951).

RAJASTHAN: Mount Abu, *Jain* 5394.

GUJERAT: Surat, *Jain* 17397.

BOMBAY: Poona, *Mahajan* 479 ; Poona, *Javlekar*, *Garade* ; Bombay, *Gamble*.

MYSORE: Ankala Ghat, *Talbot* ; Naggarholai, *Puri* 32468 ; Brumhore, *Talbot* ; Tondur, *Talbot* ; Nilgiris, *Talbot*.

Mimusops elengi Linn. Hook. f. Fl. Br. Ind. III, 548 p., 1882 ; *Talbot* II, 162 p., t. 375, 1911 (Sapotaceae).

An evergreen tree with small aromatic flowers, found in Deccan peninsula.

Flowers yield a volatile oil used in perfumery. Oil obtained from seed is edible and is also used as

luminant. Oil is medicinal (*Dastur* 150 p., 1951).

GUJERAT: Dumas, *Toor* 25501 ; Gujarat, *Cooke*.

BOMBAY: Matheran, *Puri* 14054 ; Mahabaleshwar, *Mahajan* ; Karli, *Gammie* ; Bundgarden-Poona, *Garade* ; Tungar, Bassein, *Ryan*.

MYSORE: Yellapur, *Jain* 16529 ; Sirsi-Kumta road, *Puri* 2169 ; Castle Rock *Gammie* ; Kalgar-Khan, *Jain* 29882 A ; Gondalli, *Sidenur* ; Yellapur, *Talbot* ; Ratnagiri, *Bhide*.

Pongamia pinnata Pierre, Syn. *P. glabra* Vent. Hook. f. Fl. Br. Ind. II, 240 p., 1876 ; *Talbot*, I, 433 p., t. 243, 1909 (Papilionaceae).

A moderate sized tree growing in moist mixed or evergreen forest almost all over India, particularly along water streams.

The seeds yield an oil useful as a luminant and also for its insecticidal properties and for soap making (*Dastur*, 171 p., 1951).

RAJASTHAN: Gajaner, *Bhagwat* 23541 ; Ankaleshwar, *Jain* 17419 ; Bhuj, *Jain* 11658 ; Junagad Datar Hills, *Chibber*.

BOMBAY: Khed Ghat, *Puri* 2559 ; Bhore Ghat, *Jain* 546 ; Matheran, *Puri* 12899 ; Ambevani, *Gangurde* 18224 ; Ambaude, *Vasavada* 17069 ; Koyna river bed, *Puri* 315 ; Bhimashankar Road, *Puri* 2220 ; Vitthalwadi, *Mahajan* 7250 ; Purandhar, *Jain* 819 ; Mulshi, *Jain* 735 ; Bhore-Ambowna, *Jain* 5122 ; Katraj, *Puri* 410 ; Ambegaon forest, *Deshmukh* 30057 ; Chopda-Kharak Bharek, *Jain* 11228 ; Jalgaon, *Mahajan* 20262 ; Khanapur, *Ahuja* 47663 ; Walhe, *Jain* 6958 ; Poona College garden, *Garade* ; Lonavala, *Gammie* ; Thana, *Ryan* ; Ganeshkhind, *Jhavare*, *Patwardhan* ; Koyna valley, *Talbot*.

MYSORE: Katgal, *Puri* 1365 ; Siddapur, *Puri* 1882 ; Yekkambi, *Puri* 1041 ; Jog falls, *Puri* 2071 ; Sirsi-Kumta Road, *Puri* 2155 ; Dandelli, *Jain* 16124 ; Karwar, *Jain* 16452 ; Bisle forest, *Mahajan* 19819 A ; Shimoga, *Mahajan* 34307 ; Hunsur, *Puri* 33166 ; Nagarhalli, *Arora* 46239 ; Chikballapur, *Jain* 31090 ; Dharwar, *Talbot* ; N. Kanara, *Talbot*.

MADRAS: Cape comorin, *Wadhwa* 42662.

Salmaal malabarica Schott. & Endl. Syn. *Bombax malabaricum* DC. Hook. f. Fl. Br. Ind. 349 p., 1874 ; *Talbot*, I, 130 p., t. 79, 80, 1909 (Malvaceae).

A tall deciduous tree with handsome 5-7 foliate, digitate leaves, occurring throughout India.

Seeds yield an oil used as luminant and for soap making (*Dastur*, 185 p. 1951).

GUJERAT: Dhinodhar, *Jain* 11703.

BOMBAY: Chiplun, Koynanagar Road, *Vasavada* 5026 ; Manjeri forest, *Javlekar* ; Kirkee, *Paranjpye* ; Poona, *Garade* ; Deccan-Poona, *Mongpoo* ; Yawal, *Mahajan*.

MYSORE: Kalhalla, *Arora* 46125 ; Balicop forest, Siddapur, *Jain* 29806 A.

Schleichera oleosa Oken. Syn. *S. trijuga* Willd. Hook. f. Fl. Br. Ind. I, 681 p., 1875; Talbot, I, 336 p., t. 198 1909 (Sapindaceae).

A tall deciduous tree with pinnate leaves occurring almost all over India.

Seeds yield a brownish oil called Kusum oil used for cooking and as luminant, also in hair oil and soap making (Dastur, 190 p., 1951).

GUJERAT: Junagarh Hills, Burns, Chibber; Dhamani forest, Toor 39325.

BOMBAY: Kasara-Igatpuri Ghat, Jain 14953; Khandala, Jain 24; Matheran-Neral Road, Puri 14108; Matheran, Puri 14070; Thana, Jain 12962; Thana, Talbot; Amboli Ghat, Gammie; Kanehri Caves, Burns; Khandala, Bhide.

MYSORE: Sirsi, Puri 1066; Dandelli, Jain 16043; Jog falls, Puri 2077; Katgal, Puri; 1590; Bandipur, Puri 53132; Sampajee, Wadhwa 49201; Kallahalla, Arora 41863; N. Kanara, Talbot; Juranmal, Akrani Dist., Talbot; Dharwar, Talbot; Kundgod, Talbot; Narjarejafatna, Puri 31902; Deverkolly, Puri 31838.

KERALA: Karambala, Puri 15239.

Semecarpus anacardium Linn. f. Hook. f. Fl. Br. Ind. II, 30 p., 1876; Talbot; I, 355 p., t. 208. 1909 (Anacardiaceae).

A moderate sized tree with ovoid or oblong smooth black drupes occurring in several parts of India.

The oil extracted from seed is used for lubricating carts and as wood preservative (Dastur, 191 p., 1951).

RAJASTHAN: Jhajra, Sharma.

BOMBAY: Bhamburwadi, Mahajan 20444 A; Katraj, Puri 108, 424, 2325; Sinhgad, Puri, Garade; Jeesta, Gammie; Poman forest, Ryan; Bassein Thana, Ryan; Shivapur to Nasrapur, Bhide; Karli, Gammie; Near Khadakwasla Kanetkar; Katraj Ghats, Gammie; Bhatna, Bassein Thana Dist., Ryan; Kharbar Bassein, Ryan.

MYSORE: Heturgunji, Puri 13875; Desur, Puri 13843; Chipgi forest-Sirsi, Jain 29078; Siddapur forest, Puri 1990; Jog Falls, Puri 19216; Belgaum, Sutgatti, Mahajan 29749; Belgaum, Puri 13802; Bandipur, Puri 53121; Ekambi to Halyal, Chibber; Yellapur, Talbot.

Terminalia belerica Roxb. Hook. f. Fl. Br. Ind. II, 445 p. 1878; Talbot, II, 13 p., t. 294, 1911 (Combretaceae).

A large deciduous tree with greenish foetid flowers and ovoid fruits occurring throughout India.

Seeds yield an oil used as hair oil (Dastur, 207 p., 1951).

RAJASTHAN: Banjoi, Vasavada 13600.

BOMBAY: Katraj Ghats, Puri 659; Near Donja village, Puri 4155; Shivneri, Puri 12411; Ghodnadi, Rajgurav 7758; Malapur Chopda, Mahajan 13479; Kharak-Bharak-Chopda, Jain 11248; Kakadpara, Puri 4545; Bassein, Ryan; Poona College Garden, Cooke; Lohagad, Gammie; W. Khandesh, Chibber.

MYSORE: Near Radhanagri, Puri 20067; Castle Rock, Jain 29171 A; Haliyal, Puri 18104; Turinmal, Talbot; Yellapur, Talbot.

Vateria indica Linn. Hook. f. Fl. Br. Ind. I, 313 p., 1874; Talbot, I, 114 p., t. 68, 1909 (Dipterocarpaceae).

A tall evergreen tree with large ovoid leathery fruits, occurring in Western Ghats.

The seeds yield an oil used in medicine, as luminant and in soap making (Dastur, 218 p., 1951).

MYSORE: Patwardhan garden-Sirsi, Jain 29086 A; Siddapur, Puri 19015, 1763; Hanea, Puri 19256; Bisle forest, Mahajan 19857 A; Yellapur, Jain 16382; Kanara, Cooke; Garsappa, Chibber.

Vetiveria zizanioides Stapf. Syn. *Andropogon squarrosus* Linn. Hook. f. Fl. Br. Ind. VII, 186 p., 1896; Bor. t. 64, 1940 (Gramineae).

A densely tufted perennial grass, wild throughout India. Roots yield the Khaskhas oil.

MADHYA PRADESH: Near Tunked, Puri 27334.

BOMBAY: Pirangut, Jain; Khandala, Jain.

ACKNOWLEDGEMENT

We are grateful to Dr. J. C. Sen Gupta, Chief Botanist, for kindly granting facilities for these studies.

LITERATURE CITED

1. BOR, N. L.—Common Grasses of United Provinces. *Indian For. Rec.* 2(1): 222. 1940.
2. C.S.I.R.—Wealth of India, Raw Materials II, 1950.
3. DASTUR, J. F.—Useful Plants of India, 1951.
4. HOOKER, J. D.—Flora of British India, 7 vols. 1872-97.
5. KIRTIKAR, K. R. & BASU, B. D.—(Kirt. & Basu) Indian Medicinal Plants, 4 vols., 1935.
6. PURI, G. S. & JAIN, S. K.—Flora of the Deccan Trap in Bombay State, I, *Proc. Indian Sci. Congr.* III: 293, 1959.
7. PURI, G. S., JAIN, S. K. & DESHPANDE, U. R.—The Flora of Kutch, *Ibid.* III, 291, 1959.
8. TALBOT, W. A.—Forest Flora of Bombay Presidency & Sind, 2 vols., 1909-11.