

ROXBURGH'S PLANTS OF THE COAST OF COROMANDEL: AN ASSESSMENT

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ABSTRACT

The past botanical works are repositories of scientific information awaiting further revelations. After critical scrutiny of species included in Roxburgh's 'Plants of The Coast Coromandel', total 52 angiospermic species pertaining to 50 genera and 36 families are focused to decipher either for their exotic status or extended distribution of foreign species introduced in the erstwhile India. Of these, 20 species are found exotic belonging to different countries, continents or geographical regions of the world. Total 32 species introduced from other countries or continents showed extended distribution also in India. The data accrued is debated for plant invasion in India and indigenous Indian taxa with broader distribution in the world. India has no flora as a separate entity, a viewpoint by Hooker and Thompson (1855) is negated. Re-investigation of the past floristic literature is desired to interpret the present Indian biodiversity in more authentic and correct taxonomic context.

Keywords: *Flora, Coromandel, Plant Invasion, India*

INTRODUCTION

India, being a vast country, has varying soil conditions and different agro-climatic zones which range from arid to alpine zones. Therefore, Every type of plant can be found growing in this subcontinent including exotic ones. Because of its lush and diverse flora, apart from some megabiodiversity centres of the world, is rightly called the vegetable emporium of useful plants such as spices, medicinal plants and plants of dietary importance. The mountain ranges of the Western and Eastern Ghats, the Himalayas, other mountains and valleys have been known to be repositories of important bioresources since time immemorial. Indian flora has always attracted attention of botanists all over world in various periods in past. Rulers and their institutions encouraged gathering empirical knowledge. They analysed it in decision making processes. This knowledge has based on the observations and experimentation of individuals such as settlers, officers, doctors, entrepreneurs and natural historians in Indian landmass. Spices and medicines were a low-volume high-profit commodities much sought after by early Europeans. The desire to reach the origins of such economically important bioresources compelled the foreigners to visit, stay and carry on their task in India. The discovery of direct sea route to India after 1498 was a major breakthrough for Europeans. They recognized India's potential for agricultural and botanical knowledge. They hence surveyed and documented India's biodiversity.

The founding father of Indian Botany executed systematic floristic investigation before Indian independence. *Plants of The Coast of Coromandel* (3 Vols.) was published by him (1795-1820) as a result of his hard field work and accuracy in plant descriptions. This was his earliest publication on a large scale which he explored with the greatest ardour. This landmark publication was/is thought worth to study high quality illustrations, description of many novelties, typification of plant species, extensive information on utility of plants, methods of extracting plant products, vernacular names, etc. Plants from Coromandel coasts are recently studied by Reddy and Parthasarathy (2003, 2007) and Muthilingam and Parthasapathy (2010) emphasizing biodiversity conservation, bioculture and medicinal plant diversity. They remained silent about the alien taxa in the said region. Roxburgh's contribution was re-studied in later period by Desmond (1977) and Wood (1969). Matthew (2004) enumerated the plant species contained in it. However, from his mentioning localities of collection one may lead or conceive some taxa as aliens. Only

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such species are restudied in the light of present knowledge about them and hitherto unfocused on this line. However, my peep into his contribution could bring forth some exotic species and extended distribution of other taxa in recent time. Information on this line can shed light on plant invasion in India in those days. The Indian mythological treatises or epics, ancient Sanskrit scripts, Vedas and Post-Vedic literature, besides accounts published during British regime revealed different exotic taxa on Indian landmass. The ancient Indian scripts, epics, puranas and past botanical works are repository of information relating plant invasion (Patil, 2017; 2018a,b; 2019a,b,c; 2020). This treatise is studied from this point of view, the results of which are being disseminated through this communication.

MATERIALS AND METHODS

Depending upon the foreign localities mentioned in the said treatise, some species were sorted out. Some other species in taxonomic literature known as exotic but not pointed out so by Roxburgh himself were also selected. Both groups of species are arranged alphabetically with their recent names and synonyms if any to clarify the said species. These are enlisted in Table-1 with respect to plant name, family, locality mentioned by Roxburgh himself and modern literary source to decipher exotic status or its extended distribution. The data gathered is then interpreted in view of plant invasion in the erstwhile India and extended distribution of some foreign plant species in present Indian territory.

RESULTS AND DISCUSSION

Manilal and Ramesh (2009-2010) re-investigated 'Hortus Malabaricus' published by Rheede (1678-1693) thereby revealing sources of medicine to treat various diseases. The present author extended similar investigation but on a different aspect. This investigation examined the status of distribution of plants *vis-a-vis* plant invasion by the exotic species in the erstwhile India from the account by Roxburgh (*loc.cit.*). It was possible to determine exotic status of the plant species included in 'Plants of The Coast of Coromandel'. Although its author William Roxburgh (1795-1820) named the treatise after Coromandel region (eastern coastal territory) of India, the plant species were collected and described from different parts of the then India and even from abroad. Topological data for each species occur exclusively there. However, during present comparative examination of the said treatise revealed other localities of their occurrence in Indian territory. Plant species mentioned against foreign countries also sometimes occur in the present Indian territory. The erstwhile India has been divided after 1947 and hence some places of collection of plants are not within territorial limit of the present India. Such species may now be conveniently referred as exotic ones after their critical examination. There are other species which were said to be Indian, but they are found to be aliens from different countries. About 300 species have been subject-matter of this treatise. Of these, 52 species belonging 50 genera and 36 families of Angiosperms are studied comparatively using recent, earlier and relevant data on distribution. Out of 52 species, 21 species are earmarked for their exotic status (* asterisked in Table-I). While others (29 species) are indigenous to India and integral part of Indian biodiversity. The exotic taxa belong to different countries or non-Indian territories such as Africa, Arabian region, Indonesia, Malaysia, Ceylon (Srilanka), Burma, Siam, Mediteranean Region, Congo, Australia, Micronesia, South-East Asia, America, Moluccas, Austral-Asian, Mexico, China and Europe (Table-I). Roxburgh used to cultivate plants from different countries and regions with particular emphasis on potentially useful plants in his garden. These floral elements are reflected in his book. The name of treatise although suggest Coromandel region (South-eastern costal region), the plants from different parts of India such as Circars, Malabar (Kerala), Mysore (Karnataka), Andaman Islands, Baher (Bihar), Rajmahal Hills, Northern India, etc. are included (*cf.* Matthew, 2004). Some localities e.g. Chitagong and Silhet now belong to Bangladesh (earlier Bengal region of India). Obviously, these species if occurring exclusively there, are to be thought now as exotic species (Table-1). In the 17th century, the coastlines of Coromandel region consisted of modern states of Tamil Nadu, Andhra Pradesh and the southern tip of Orissa (Odisha). Roxburgh established a botanical garden at Samalkot in Rajahmundry district for botanical research. Later on, by 1799, East India Company

Table 1: Plant Species in Flora of Coromandel

Sr.No. (1)	Plant Name & Synonym (If any) (2)	Family (3)	Locality Mentioned for Collection (4)	Nativity & Reference (5)
1.	* <i>Acacia nilotica</i> (L.) Delile (Syn. <i>Mimosa nilotica</i> L.)	Mimosaceae	India	North Africa & Arab Rajagopal & Panigrahi, 1965; Purseglove, 1968
2.	<i>Adenia trilobata</i> (Roxb.) Engl. (Syn. <i>Modecca trilobata</i> Roxb.)	Passifloraceae	Chittagong (Bangladesh)	Eastern Himalaya, Arunachal Pradesh (India) Singh <i>et al.</i> , 2015
3.	* <i>Amomum compactum</i> Sol. ex Maton. (Syn. <i>A.cordatum</i> auct non. L.)	Zingiberaceae	Sumatra & Malay Islands (Indonesia & Malaysia)	Tropical East Himalaya (India) Karthikeyan <i>et al.</i> , 1989.
4.	<i>Amonum costatum</i> (Roxb.) Baker [Syn. <i>A.costatum</i> Roxb.) Bth.]	Zingiberaceae	Silhet (Bangladesh)	Indonesia & Malaysia Jane Droop <i>et al.</i> , 2013
5.	<i>Bauhinia scandens</i> L. (Syn. <i>B.anguina</i> Roxb.)	Caesalpiniaceae	Silhet & Chittagong (Bangladesh)	Western Peninsula Almeida & Almeida, 1998; Singh <i>et al.</i> , 2001. Madras Presidency Erstwhile Gamble, 1957.
6.	<i>Beaumontia grandiflora</i> (Roxb.) Wall. (Syn. <i>Echites grandiflora</i> Roxb.)	Apocynaceae	Chittagong & Silhet (Bangladesh)	Eastern Himalaya (India) Gamble, 1957
7.	<i>Berrya cordifolia</i> (Willd.) Burrett (Syn. <i>B.ammonilla</i> Roxb.)	Tiliaceae	Ceylon (Sri Lanka)	Ceylon (Sri Lanka) Gamble, 1957. Peninsula, Sri Lanka, SE India Matthew, 1991.
8.	* <i>Borassus flabellifer</i> L. (Syn. <i>B.flabelliformis</i> Murray)	Arecaceae	Coromandel Coast (India)	Tropical Africa Reddy, 2008

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Sr.No. (1)	Plant Name & Synonym (If any) (2)	Family (3)	Locality Mentioned for Collection (4)	Nativity & Reference (5)
9.	<i>Burmannia disticha</i> L.	Burmanniaceae	Ceylon (Sri Lanka)	Vizagapatam District (India) Gamble, 1957
10.	* <i>Congea tomentosa</i> Roxb.	Verbenaceae	Chittagong (Bangladesh)	Burma & Siam Gamble, 1957
11.	<i>Cynometra polyandra</i> Roxb.	Caesalpiniaceae	Silhet (Bangladesh)	Barak Valley, Assam (India) Borah <i>et al.</i> , 2016
12.	* <i>Cuscuta reflexa</i> Roxb.	Cuscutaceae	Circars (Andhra Pradesh, India)	Mediterranean Region Singh <i>et al.</i> , 2001; Chandra Sekar, 2012
13.	<i>Dalhousiea bracteata</i> (Roxb.) Graham (Syn. <i>Podalyria bracteata</i> Roxb.)	Papilionaceae	Silhet (Bangladesh)	Behali Reserve Forest, Assam (India) Borah <i>et al.</i> , 2016.
14.	* <i>Dichrostachys cinerea</i> (L.) Wight & Arn. (Syn. <i>Mimosa cinerea</i> L.)	Mimosaceae	Circars (Andhra Pradesh, India)	Congo Negi & Hajra, 2007
15.	<i>Eleocharis dulcis</i> (Burm.f.) Trin. ex Hensch. (Syn. <i>Scirpus turberosus</i> Roxb.)	Cyperaceae	Canton (China)	Maharashtra (India) Sharma <i>et al.</i> , 1996 India Karthikeyan <i>et al.</i> , 1989.
16.	<i>Ensete glaucum</i> (Roxb.) Cheesm. (Syn. <i>Musa glauca</i> Roxb.)	Musaceae	Pegu (Burma)	China, Indonesia, Laos, Myanmar (Burma), Philippines Thailand & India (North East), Joe <i>et al.</i> , 2016. India, Karthikeyan <i>et al.</i> 1989.
17.	<i>Erythrina arborescens</i> Roxb.	Papilionaceae	Nepal	Himalayan Terai Region (India) Bajpai <i>et al.</i> , 2015

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Sr.No. (1)	Plant Name & Synonym (If any) (2)	Family (3)	Locality Mentioned for Collection (4)	Nativity & Reference (5)
18.	* <i>Flacourtia inermis</i> Roxb.	Flacourtiaceae	Moluccas (Indonesia)	Malaysia Singh <i>et al.</i> , 2000
19.	<i>Flemingia semialata</i> Roxb. ex W.T.Aiton	Papilionaceae	Nepal	Central Himachal Pradesh, North-Western Himalaya (India) Pooja Kumari <i>et al.</i> , 2018
20.	<i>Garcinia dulcis</i> (Roxb.) Kurz (Syn.Xanthochymus dulcis Roxb.)	Clusiaceae	Moluccas (Indonesia)	Indochina (Myanmar), Malesia Peninsular Malaysia, Maluku Islands, Philippines, New Guinea, Queensland (Australia), Andaman & Nicobar Islands (India) Anonymous, 2019
21.	<i>Globba pendula</i> Roxb.	Zingiberaceae	Pulo Pinang Island Malaysia	Bangladesh, Indonesia, Malaysia, Myanmar, Thailand, Vietnam, India. Leong, Skornickova <i>et al.</i> , 2012
22.	* <i>Gossypium herbaceum</i>	Malvaceae	India	Arabia & Asia Minor Bailey, 1949 Africa & Asia Purseglove, 1968
23.	<i>Gymnema tingens</i> (Roxb.) Speng.	Asclepiadaceae	Pegu (Burma)	Western Ghats (Peninsula) India. Gamble, 1957; Cooke, 1958
24.	<i>Gynocardia odorata</i> Roxb.	Flacourtiaceae	Silhet (Bangladesh)	Barak Valley, Assam (India) Borah <i>et al.</i> , 2016
25.	<i>Hedychium coccineum</i> Buch. Ham. ex Sm.	Zingiberaceae	Chittagang & Silhet (Bangladesh)	India Karthikeyan <i>et al.</i> , 1989
26.	<i>Heynia trijuga</i> Roxb.	Meliaceae	Nepal	Eastern & Western Ghats, India Gamble, 1957; Cooke, 1958

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Sr.No. (1)	Plant Name & Synonym (If any) (2)	Family (3)	Locality Mentioned for Collection (4)	Nativity & Reference (5)
27.	* <i>Hibiscus cannabinus</i> L.	Malvaceae	Circars (Andhra Pradesh, India)	Tropical & Subtropical Africa Purseglove, 1968; Africa Patil, 2003; Shetty & Singh, 1987
28.	<i>Hopea odorata</i> Roxb.	Dipterocarpaceae	Chittagong (Bangladesh)	Bangladesh, Cambodia, China, Laos, Malaysia, Myanmar, Thailand, Vietnam & India Orwa <i>et al.</i> , 2009
29.	* <i>Hydrilla verticillata</i> (L.f.) Royle Hydrocharitaceae	Hydrocharitaceae	Circars (Andhra Pradesh, India)	North Australia Kohli <i>et al.</i> , 2012
30.	* <i>Inocarpus fagifer</i> (Parkinson) Forberg (Syn. <i>Ledulis</i> J.R.Forst. & G.Forst.)	Papilionaceae	Moluccas (Indonesia)	Micronesia & Malaysia Majorie, 2015
31.	<i>Mantisia saltatoria</i> Sims. (Syn. <i>Globba radicalis</i> Roxb.)	Zingiberaceae	Chittagong (Bangladesh)	India Karthikeyan <i>et al.</i> , 1989
32.	<i>Magnolia pterocarpa</i> Roxb.	Magnoliaceae	Silhet & Chittagong (Bangladesh)	Northeast India (Assam, Sikkim) and Nepal Khela, 2014
33.	<i>Meliosma simplicifolia</i> (Roxb.) Waltp. (Syn. <i>Millingtonia simplicifolia</i> Roxb.)	Sabiaceae	Silhet (Bangladesh)	Eastern & Western Ghats (India) Gamble, 1957
34.	* <i>Millingtonia hortensis</i> L. f.	Bignoniaceae	Tanjour (India)	South-East Asia & Malaysia Singh <i>et al.</i> , 2001; Gaikwad & Garad, 2015; Burma Singh <i>et al.</i> , 1991

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Sr.No. (1)	Plant Name & Synonym (If any) (2)	Family (3)	Locality Mentioned for Collection (4)	Nativity & Reference (5)
35.	* <i>Monochoria vaginalis</i> (L.) Solms. (Syn. <i>Pontederia vaginalis</i> Burm. f.)	Pontederiaceae	Circars (Andhra Pradesh, India)	Tropical America Reddy, 2008; Naik, 1998; Chandra Sekar, 2012
36.	<i>Morinda angustifolia</i> Roxb.	Rubiaceae	Chittagong (Bangladesh)	North Circars & Nullamalai Hills (India)
37.	* <i>Murraya konigii</i> (L.) Spreng. (Syn. <i>Bergara Koenigii</i> L.)	Rutaceae	Circars (Andhra Pradesh, India)	Tropical Asia Martin <i>et al.</i> , 1987
38.	<i>Musa balbisiana</i> Coll. (Syn. <i>M.sapientum</i> Auct. non L.)	Musaceae	Chittagong (Bangladesh)	India Karthikeyan <i>et al.</i> , 1989
39.	* <i>Myristica fragrans</i> Houtt. (Syn. <i>M.aromatica</i> Lam.)	Myristicaceae	Moluccas (Indonesia)	Moluccas Singh <i>et al.</i> , 20001
40.	* <i>Ottelia alismoides</i> (L.) Pers.	Hydrocharitaceae	Circars (Andhra Pradesh, India)	Austro-Asian Naik, 1998
41.	* <i>Pistia stratiotes</i> L.	Araceae	India	Tropical America Reddy, 2008; Chandra Sekar, 2012; Graf, 1980.
42.	* <i>Pithocellobium dulce</i> (Roxb.) Benth.	Mimosaceae	Philippines	Mexico & Central America Singh <i>et al.</i> , 2000; Patil, 2003; Yadav & Sardesai, 2002 Tropical America Purseglove, 1968; Shetty & Singh, 1987
43.	<i>Pterogota alata</i> (Roxb.) R.Br. (Syn. <i>Sterculia alata</i> Roxb.)	Sterculiaceae	Chittagong & Silhet (Bangladesh)	Western Ghats, Malabar to Tinnevely (India) Gamble, 1957
44.	* <i>Saccharum sinense</i> Roxb.	Poaceae	China	Cultivated in India Karthikeyan <i>et al.</i> , 1989

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Sr.No. (1)	Plant Name & Synonym (If any) (2)	Family (3)	Locality Mentioned for Collection (4)	Nativity & Reference (5)
45.	<i>Sandoricum koetjape</i> (Burm.f.) Merr. (Syn.Melia koetjape Burm.f.)	Meliaceae	Moluccus (Indonesia)	Brunel, Cambodia, Laos, Malaysia, Myanmar, Philippines, Vietnam, Sri Lanka, Australia & India. Orwa <i>et al.</i> , 2009
46.	<i>Stixis suaveolens</i> (Roxb.) Baill. (Syn. Roydsia suaveolens Roxb.)	Capparidaceae	Silhet (Bangladesh)	Nepal, Bhutan, Bangladesh, Myanmar, China & India (S.E.Asia) E.Ref.1.
47.	<i>Tacca integrifolia</i> Ker.-Gawl.	Taccaceae	Chittagong (Bangladesh)	India Karthikeyan <i>et al.</i> , 1989
48.	* <i>Trapa natans</i> L. (Syn.T.bispinosa Roxb.)	Trapaceae	India	Europe Kak, 1990
49.	<i>Turpinia nepalensis</i> Wall. [Syn.T.pomifera (Roxb.) DC.]	Staphyleaceae	Silhet (Bangladesh)	Western Ghats, Nilgiri, Pulneys & Travancore Hills (India) Gamble, 1957
50.	<i>Wallichia caryotoides</i> Roxb.	Arecaceae	Chittagong (Bangladesh)	Eastern India Karthikeyan <i>et al.</i> , 1989
51.	<i>Willughbeia edulis</i> Roxb.	Apocynaceae	Chittagong & Silhet (Bangladesh)	Assam (India) to Peninsula Malaysia Anonymous, 2017
52.	<i>Xanthophyllu flavescens</i> Roxb. (Syn.X.virens Roxb.)	Xanthophyllaceae	Chittageng & Silhet (Bangladesh)	Central Kerala (India) Geethu Krishna & Sanilkumar, 2019

N.B.: *=indicate exotic status.

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abolished this garden and proposed a new garden at Mysore. Roxburgh sent packets of drawings and descriptions of this region to Joseph Banks at London of about 500 plants. He suggested Roxburgh to publish them. This book entitled as 'A Progressive Work, in which a Preference was given to Subjects Connected with Medicine, the Arts, and Manufacture'. It was published in 1795 (Royle, 1840). This publication was later known as Roxburgh's Coromandel Plants. Information on biodiversity elements documented by Roxburgh has been later included later in 'Flora of British India' (Hooker, 1872-1897). The botanical names of many species have been, however, changed in the light of recent rules of nomenclature by ICN. Majority of the species introduced in India in those days are found today in several classic (Watt, 1889-1893; Anonymous, 1948-1976) and traditional use-reports (Jain, 1991). However, there are some exotic species which interfere with ecosystem and agricultural economy of India e.g. *Cuscuta reflexa*, *Hydrilla verticillata*, *Ottelia alismoides*, *Pistia statiotes*, etc.

There are certain plant species which seemingly belong to other countries e.g. *Adenia trilobata*, *Amonum costatum*, *Bauhinia scandens*, *Beaumontia grandiflora*, *Burmannia disticha*, *Cynometra polyandra*, *Dalhousiea bracteata*, *Eleocharis dulcis*, *Ensete glaucum*, *Erythrina arborescens*, *Flemingia semialata*, *Garcinia dulcis*, *Mentisia saltatoria*, *Gymnema tingens*, *Gynocardia odorata*, *Hedychium coccineum*, *Heynia trijuga*, *Hopea odorata*, *Magnolia pterocarpa*, *Meliosma simplicifolia*, *Musa balbisiana*, *Morinda angustifolia*, *Pterogota alata*, *Sandoricum koetjape*, *Stixis suaveolens*, *Tacca integrifolia*, *Turpinia nepalensis*, *Wallichia caryotoides*, *Xanthophyllum flavescens*, *Willughbeia edulis* and *Globba pendula*. Roxburgh mentioned these species collected from other countries. The present state of knowledge clearly showed these species as an integral part of Indian biodiversity.

Knowledge of vegetable kingdom and plant science in India as such was/is generally ignored while interpreting the progress of botanical science at world level. India has a rich heritage of ancient Sanskrit literature e.g. Vedas, Puranas, Bramhanas, Aranhyakas, etc. These also inform on fauna and flora on Indian territory and their utilitarian significance. For example, (i) Atharveda has the oldest record of 127 plants of medicinal importance. (ii) Agni Purana stated about plantation of trees and their hygienic effects. Evolution of tree is interpreted through its different stages in Markandeya Purana. Varahmihira classified plant life based on habit. It is also so noted in Vayupurana (Chaudhari, 1991). Charak and Sushrut classified plants in different categories based on morphological features, besides other characteristics (Singh, 2008). Parashara in his 'Vrksayurveda' (science of longevity of plants) also dealt with classification of plants (Kanjilal, 1999; Singh, 2008). It is devoted exclusively to plant sciences. His botanical knowledge of the period could be placed under many recognised branches of botany (Ghosh and Sen, 1971). It appears that ancient Indians were well acquainted with life, morphology and classification of plants. However, these literary sources are ignored in the name of Indian mythology and culture.

CONCLUSION

Once, it was concluded that 'India has no flora as a separate entity but is an admixture of the floras from adjacent countries' (Hooker and Thompson, 1855). This was the impression based on floristic studies carried during pre-independence period of India. The above resume clearly indicated that undoubtedly floral elements were present as exotics in Indian territory. But it also proves beyond doubt that there was/is 'flora of India of its own'. The present author, therefore, inclined to reinstate that contributions on flora of India completed before Indian Independence should be again critically evaluated in the light of present information to project a fact about Indian biodiversity. Maheshwari (1960, 1979), Nayar (1977) and Reddy (2008) assessed the status of exotic plants and changing patterns of Indian biodiversity. The timely evaluation is essential to help biodiversity management and conservation. The ancient evidences revealed through literature, scripts, botanical accounts are likewise important which history, phytogeography and genesis of biological invasions.

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