

BOTANY AND ITS TECHNOLOGIES IN PENINSULAR INDIA IN THE EIGHTEENTH AND NINETEENTH CENTURIES

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Plant exploration leading to travel accounts, lists of plants collected, and eventually Floras, was the obvious first step. The emergence of the following botanical technologies during the period is traced: (1) Botanical Illustrations; (2) Economic botany especially regarding tea, rubber, teak, sandalwood, cardamum, tobacco, pepper, cinchona, cotton, coffee, sugarcane, and more generally about plants yielding oils, spices, fruits, vegetables, cordage and fodder; (3) Botanical Gardens and Horticulture especially as means of plant introduction; (4) Forestry, Ecology and Conservation; (5) Pharmacology; (6) Museums and other educational aids; (7) Documentation, especially Bibliographies.

Excluded are the three massive undertakings of the 19th century: the Flora of British India, the Indian Forest Service, and the Botanical Survey of India, all of which deserve separate treatment.

INTRODUCTION

The development of modern botany in India is associated with her colonial history from the 16th century. Obviously the initial effort was largely classificatory; branches of botany now recognized as distinct were yet to diverge. At the initial classificatory stage itself, the three following progressive developments may be noted:

- (1) Letters, accounts of travels, land surveys and in Gazetteers;
- (2) Checklists of plants collected over restricted, or even wider, areas;
- (3) Floras proper.

The emergence of the following 'technologies' or disciplines is traced: (4) Botanical Illustrations; (5) Economic Botany; (6) Botanical Gardens and Horticulture; (7) Forestry, Ecology and Conservation; (8) Pharmacology; (9) Museums and other educational aids; (10) Documentation (Bibliographies, biographies, accounts of personal herbaria, etc.).

The following delimitations have been found necessary: (i) Only peninsular India is covered; (ii) a few entries prior to the 18th century are mentioned briefly for the sake of completeness; (iii) workers who lived into the 20th century are generally

omitted; (iv) the Flora of British India, the Indian Forest Service, and the Botanical Survey of India, deserve separate treatments.

1 TRAVEL AND SURVEY ACCOUNTS

Two of the earliest Indian botanical publications (Garcia da Orta 1565 and Rheede 1678-1703) are quite specialized, and ahead of their times (the former is treated under 8: PHARMACOLOGY, and the latter under 4: BOTANICAL ILLUSTRATIONS).

The year 1754 marks the beginning of travel accounts which contained mention of plants and their medicinal properties (Ives 1773). Sonnerat's account (1782) is more elaborate and contains illustrations (Sonnerat 1806) as well.

Madras entered the picture through two servants of the East India Company, J. Petiver (1658-1718) an apothecary, and C. de Bois (1656-1740) who accumulated a *hortus siccus* of 74 volumes and sent dried plants to London. These two were followed by the Tranquebar team of missionaries: J. G. Koenig (1728-1789), who arrived in India in 1768 as a missionary surgeon, undertook energetic study of the plants of Madras and sent dried specimens to Solander, Retzius, Vahl and even Linnaeus in Europe. Subsequently he held the post of (economic) Botanist in the Madras Government till 1785 (see under ECONOMIC BOTANY). Worthy of particular mention among the Tranquebar team is W. Roxburgh (1751-1815) who published the first weather observations on Madras. J. P. Rottler (1749-1836) arrived in 1776, studied local plants, sent dried specimens to Germany and finally published an account of the vegetation between Madras town and Tranquebar (Rottler 1803). F. Buchanan's account (1807) is one of the earliest and comprehensive one for the peninsula. Lieutenant Ward surveyed the Palni (Pulney) hills around Kodaikanal in 1821 (Ward 1837).

A team of French botanists made some notable contributions with Pondicherry as base. The most significant ones came from J. T. Leschenault de la Tour (1773-1826), Research Officer in Natural Objects (Leschenault 1820 *a, b*) and G. S. Perrottet (1793-1870), specialist on Economic Botany, who together effectively covered a longitudinal slice of the peninsula from Mahe to Pondicherry across the Nilgiris. Perrottet's collections alone reached 1500 species. These collections were of great use to Alphonse de Candolle (1806-1893) in the writing of the monumental *Prodromus*. C. Belanger (1805-1881) made considerable collections during his Indian stay (1825-1829) and published an account (Belanger 1833-1837). The extensive traveller Jacquemont was in India during 1829-1832 and has left considerable records (Jacquemont 1834, 1841-1844; Jacquemont and Merimée 1867). Two preliminary lists of the less common plants are included in the above work (Cambessèdes 1844; Decaisne 1844).

On the west coast, A. P. Hove, a Polish surgeon, reached Bombay in 1787 and travelled along the coast to Ahmedabad collecting live plants for Kew. His travel

diary was published long after his death (Hove 1855). Lawson (1894) contains short notes for the south-western region of the peninsula.

2 CHECKLISTS OF PLANTS AND PRELIMINARY ACCOUNTS OF VEGETATION

The hill stations of the Nilgiris and the Palnis (Pulneys) which proved an early summer attraction for the European officers (the botanists of the time were all from among them!) received an early and even disproportionate attention. Baikie, a resident officer of the Nilgiris prepared a guidebook for the area (Baikie 1834, 1857). Zenker (1835) is based on the collection of B. Schmid (1787-1857) a missionary originally resident at Tirunelveli (Tinnevely) but driven to the Nilgiris by ill-health. The illustrations were provided by Zenker (1799-1837). A general account of the vegetation of the Nilgiris was given by Allardyce (1836) and later a Gazettee account of the same region was provided by Beddome (1880).

R. Wight (1796-1872) quietly dominates the subsequent history of plant exploration in the peninsula. Coming to India in 1819, he began an energetic study of the flora. The Samalkot-Rajamundhry (Andhra Pradesh) and the Madras-Vellore tracts were first explored (Wight 1833, 1834). During another 2½ months' zig-zag journey to the south, he covered the Courtallam (Wight 1835-1836) and the Palni hills (Wight 1837 *a*). He had planned a longer one the next year but with the abolition of the post of (economic) Botanist in 1828 (Wight apparently preferred the collection and study of wild plants than their utilization), he was stationed at Nagapattinam (Nagapattam), from where however he explored the Thanjavur (Tanjore) district for 2½ years and could take to England, when proceeding on sick leave, two tons of dried plants! Col. R. H. Beddome (1830-1911) of the Madras Forest Department has given accounts of the Palni Hills (Beddome 1858 *b*) and Anamallays (Beddome 1866), and also more systematic accounts of the flora of the peninsula (Beddome 1861, 1864).

Next to the hill stations, the administrative headquarters received the attention of the botanists (who, as has already been pointed out, were largely self-made botanists in the service of the various East India Companies). This resulted in accounts of Pondicherry (Perrottet 1858), Telugu country (Elliot 1859), Madurai (Nelson 1868), Mysore and Coorg (Rice 1877) and Madras (Hunter 1886).

On the west coast of the peninsula considerable work was based on Bombay. J. Graham (1805-1839) in charge of the Botanical Garden of the Agri-horticultural society, set himself to write a Flora of Bombay. However he could only partly accomplish an enumeration (Graham 1837), later completed by Nimmo (Graham 1839). N. A. Dalzell (1817-1878) beginning life as a forest employee, intercalated descriptions of plants in Graham's Catalogue (Dalzell 1858) that finally appeared as Bombay's first Flora (Dalzell and Gibson 1861). Lisboa (1877-1880) published novelties not included in Dalzell and Gibson (1861). Subsequently the hill station of Mahabaleshwar

attracted attention (Lisboa 1881-1882; Birdwood 1897). The country south of Bombay was covered in Christie (1836), Hohenacker (1849) and Gell (1863).

3. FLORAS

Burman's (1768) *Flora Indica* may be regarded the first for the area, though, out of the 1305 species treated therein, only 500 were from India (20 from the Coromandel, 25 from Malabar, etc.). A. W. Roth (1737-1834) arrived with the reputation of a botanist and his publication (Roth 1821) was considered "the first approach to a Flora of any considerable part of India". R. Wight, during his sick leave in England (1830-1833), studied his collections with G. A. W. Arnott and published the *Prodromus* (Wight and Arnott 1834) in addition to other important contributions (Wight 1837, 1845-1847). He achieved so much in spite of considerable obstacles: his printer was stationed in Madras over 300 miles away, he was transferred repeatedly and had to meet all the expenses from personal funds.

Dalzell and Gibson (1861) was the first full-fledged Flora for Bombay, followed by Talbot (1894), closely followed by Dalgado (1898) for Goa. Drury (1864-1869) is a fair summary of the flora of the peninsula till the subsequent publication of the national and the provincial floras.

4. BOTANICAL ILLUSTRATIONS

Though often accompanying the Floras, these are being treated separately to focus attention on the application of a technology when materials and trained personnel were hard to come by. The outstanding pioneering attempt was that of Heinrich van Rheedee tot Draakestein (1637-1691), a Dutch Governor of Malabar, who published the 12-volume *Hortus Malabaricus Indicus* (Rheedee 1678-1703) consisting of text and plates from original study of the important local plants. This was a phenomenal achievement for the time as the numerous commentaries amply testify (Commelyn 1696; Burman, J. 1769; Hill, J. 1774; Dennstedt, A. W. 1818; Buchanan, F. 1822-1837; Dillwyn, L. W. 1839, and Hasskarl, J. C. 1867).

Roxburgh's (1795-1819) *Plants of the Coast of Coromandel* (300 plates with text in three volumes) is another admirable achievement for the period. Sonnerat (1806) and Zenker (1835) have been mentioned already.

However, it was R. Wight, who made a landmark in peninsular Indian botany by illustrating most of the species, having learnt the art of lithography during his stay in England during 1830-1833 (Wight 1831-1833; 1838-1853; 1840-1850; 1846-1851, and Cleghorn 1856). Smith (1857) applies a new technique in illustrating plants. Beddome (1869-74; 1874) are impressive illustrations of the forest species of the peninsula.

5. ECONOMIC BOTANY

J. G. Koenig, in 1782, was appointed Economic Botanist for ascertaining if plants yielding cardamum, tobacco, pepper, gamboge, sappen, etc., could be introduced in the Madras State. He held the post till 1785 and travelled to Malacca and Siam in search of suitable plants for introduction. His successors in the post were P. Russel (to 1789), W. Roxburgh (to 1793), B. Heyne (to 1819), J. Shutter (to 1826), and R. Wight (to 1828). Subsequently the post was abolished. Roxburgh located wild pepper at Samalkot (Andhra Pradesh) and started an experimental garden there.

R. Wight, during his Palayamkottai assignment (1833) inspected the experimental spice garden at Courtallam. He was to inquire into the state of agriculture in southern India and to conduct experimental cultivation of cotton, tobacco, senna, sugarcane, coffee, spices and madder, and to inquire into the possibility of Cinchona. Later, while residing in Madras, he managed the garden of the Agri-horticultural Society in Madras.

Bombay had certain firsts: the earliest Indian experimental work on cotton by C. Lush (1779-1845) at Poona with the 'Botanical Garden at Dapuri' under his charge, was published in 1835, even before Wight's work. Gibson, who succeeded Lush, reported on Teak in 1840, and Senna and Tobacco in 1841.

The earlier publications on useful plants were in the form of reports for restricted areas: Palnis (Beddome 1858 *a*), Nilgiris (Bidie 1874, 1880), Bombay (Birdwood 1862, 1865; Lisboa 1886), and Madras (Bidie 1878). These were followed by accounts for wider areas (Drury 1858, 1884; Church 1886). Of particular interest is a survey of plants used as food during famine (Schrott 1877). Study of the economic aspects of local plants also led to enquiry into their local names and etymology etc. (Watson 1866; Mateer 1873; Duferne 1887).

These general accounts were followed by an impressive array of monographs on plants yielding useful products: of these, a classified list should suffice. (*a*) *INDIGENOUS*: Coconut (Anon. 1869; Short 1888), Date (Bonavia 1885), Palmyra (Thurston 1894), Cucurbits (Dymock 1890), Oranges and Lemons (Bonavia 1890), Oil and cordage plants (Sykes 1837), Grasses (Symonds 1886) and Sandal wood (Lushington 1900); (*b*) *INTRODUCED*: Tea (Bamber 1866), Rubber (Thiselton—Dyer 1879, Caouchouc (Collins 1872) and Teak (Dalzell 1869).

6. BOTANICAL GARDENS AND HORTICULTURE

Initially the aim was the cultivation of useful plants introduced from outside. This was based on the great success of horticulturists in Europe in transplanting tropical plants and growing them successfully there. The five main south Indian gardens, in chronological order of starting, are:

- (1) *Bangalore*: Tippu Sultan converted his father's fruit garden into a recreational one, which Heyne in 1800, converted into a botanical garden. Gowda (1949) gives its early history; three successive lists of plants grown in the garden are available (New 1862, Black 1864, and Cameron 1880).
- (2) *Bombay*: Started before 1830 by the local Agri-Horticultural society, it was looked after by J. Graham during 1805-1839.
- (3) *Madras*: This, again, was started by the local Agri-Horticultural Society in 1838 with R. Wight in charge. From 1852, H. F. C. Cleghorn (1820-1895) looked after it and published a 95-page list of plants grown there (Cleghorn 1853). Three later lists of the century are available (Brown 1862, 1866 and Gleeson 1898).
- (4) *Ootacamund*: From 1848 by W. G. MacIvor, also for raising Cinchona. Cleghorn (1857) has a memorandum on the garden. From extensive cultivation both by the Government and the private gardeners, there were two significant findings:
 - (a) *Cinchona calisaya* had the maximum of sulphate of quinine and eventually *C. calisaya* var. *ledgeriana* was preferred;
 - (b) *C. succirubra* had more total alkaloids. However, cinchona did not get the profit incentive that tea got, with the obvious consequences.
- (5) *Trivandrum*: Little is known about the beginnings. Anon (1901) is a list of plants from the turn of the century. Cleghorn's (1861) account is a competent review of the fruits and gardens of the peninsula.

7. FORESTRY, ECOLOGY AND CONSERVATION

Bombay was the first Presidency to try to arrest the wasteful destruction of forests; Captain Watson, a police officer was empowered in 1860 to control the felling of trees. When Gibson in 1847 succeeded as Conservator of Forests, things were more under control, and he continued to do outstanding service in forestry till 1860 (Gibson 1863).

Madras: Dr Cleghorn of the Madras Forest Service, starting professional life at Shimoga, gave the lead taking interest in teak, and by 1847 could officially protest against destruction of teak forests and represent the case before the British Association meeting at Edinburgh. Consequently he was appointed to report back in 1851. Such background eminently qualified him for appointment to the post of Conservator of Forests (1859-1870) during the tenure of which a forest policy was defined. He is rightly remembered as an outstanding forest ecologist (Cleghorn H.F.C. 1861), probably second only to M. P. Edgeworth (1812-1851). Beddome, who succeeded

Cleghorn, learnt forestry inside forests and his publications attest to his first hand knowledge of the subject (Beddome 1863, 1869-1874, 1877).

Coorg and *Mysore*, obviously, attracted the attention of foresters (Someren 1879; Anderson 1888; Cameron 1894). The Nilambur Teak Plantations in Malabar were well known where Mr Conally raised 50,000 seedlings in 1842. In Travancore, Bourdillon (1863) was the authority. Several publications on the timber trees of the south were published from Madras: Balfour (1855, 1858 & 1862); Bidie (1862); Skinner (1862).

8. PHARMACOLOGY

The earliest attempt was by the noted Portugese pharmacist Garcia da Orta (c. 1490-1570) who was in Goa during 1534-1570 during which period he visited local drug shops, learnt the ways of native physicians and grew medicinal plants in his garden (Garcia da Orta 1565). Several commentaries on this work are available (Clusius 1567; Acosta 1578; Dalgado 1894 and Soares 1923). Several lists on medicinal plants and enquiries into their therapeutic value resulted (Fleming 1810; Ainslie 1813, 1826; Fluckiger and Handury 1874; Arjun 1879; Dhargalkar 1899). Dymock, Warden and Hooper (1890-1893) was a pioneering publication synthesizing the existing knowledge, putting it on a scientific basis. The junior author, D. Hooper (1858-1947), a chemist assisting M. A. Lawson (1840-1896), the Director of the Ootacamund Cinchona plantations, was particularly competent for this work. Kirtikar (1894) appears before the close of the century as a forerunner of the massive 8-volume *Indian Medicinal Plants* of the current century.

9 MUSEUMS AND OTHER EDUCATIONAL AIDS

The educational value of museums was recognized early. Madras had its museum in 1819 which was further enriched in 1846, and especially in 1855, from the Madras exhibition following on the 1851 London Exhibition. In 1857, the exhibits were permanently housed in the Madras Museum under the direction of E. G. Balfour (1813-1889) whose two volumes (Balfour 1855, 1858) are an inventory of the exhibits in the Museum.

Another important initiative towards the close of the 19th century was the teaching of botany in the Universities (Nairne 1899 *a, b*).

10 DOCUMENTATION

Among the extensive bibliographies on the subject, the following are the most important: Blatter (1911); Santapau (1952, 1953, 1958), Narayanaswamy (1961, 1963). Hooker and Thomson (1855) and King (1899) are concise accounts of early Indian botany and botanists. But the indispensable *vademecum* is Burkill (1965) in

which the author ably summarizes his lifetime acquaintance with most of the stalwarts of Indian botany.

CONCLUSION

The beginnings are clearly impressive: in fact the achievements in peninsular India are more striking than for any other comparable sector of the country. The foundations of present day achievements were solidly laid during the period under review. Such beginnings call for proportionate efforts at the development of indigenous technologies for the present needs.

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