HISTORY AND FOOTPRINTS OF PLANT EXPLORATIONS IN INDIAN SUB CONTINENT

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Indian subcontinent has been very rich in biological and cultural diversity since eon. The importance and utility of plants to the people have been mentioned in our various ancient scriptures like Vedas, Puranas, Epics and Samhitas etc. The India's rich natural biological wealth has always been the target of robbers and invaders. The Muslim robbed our country's wealth from 13th to 16th centuries. But in 16th and 17th centuries, the first invaders and plant explorers were Dutch, followed by Portuguese and Europeans particularly Britishers, who have explored vast plant wealth of Indian Subcontinent in systematic manner. The history of plant explorations divided in two periods viz. Pre Linnaean and Post Linnaean. In Pre Linnaean period the main Portuguese plant explorers were Garcia de Orta, C. Acosta, Paul Hermann and Dutch explorers were John Burman, N.L. Burman and Handrik Van Rheede. But after the visit of Linnaeus's pupil J.G. Koenig in India, and joining the society of "The United Brothers" at Tranquebar in 1768, an extensive, authentic and systematic botanical explorations were initiated in India by the botanists of British East India Company and established several botanic gardens. The notable plant explorers of British India were Lieutenant Colonel Robert Kyd, William Roxburgh, Nathaniel Wallich, Robert Wight, William Griffith, Sir J.D. Hooker, T. Thomson, N.A. Dalzell, R.H. Beddome, Sir D. Brandis, Sir George King, J.S. Gamble, T. Cooke, David Prain, J.F. Duthie, H.H. Haines, P.F. Fyson and U.N. Kanjilal etc. Their collections and literatures are available in various herbaria and libraries in India and Kew in United Kingdom.

Key Words: British botanists, Indian Subcontinent, Plant Explorations

Indian subcontinent has been very rich in natural, biological, ethnic, cultural and religion diversity since eon. In India, the literature which is available stating about plants is very old. The importance and utility of plants to the people have been mentioned in Vedas. At that time the plants were explored and classified on the basis of their utility e.g., as medicinal, food, fibre etc. In *Rigveda*, the complete utility of plants was given in *Vrikshayurveda*.
Vrikshayurveda is a traditional science of plant life of India for the production of superior quality yields from the healthy plants in terms of its uses as food and medicine. Understanding of physiology and pathology of plant life similar to that of Animal and Human life based on the philosophy of ancient Indian system of panchamahabhuta and its products are clearly described. Various measures for nutrition, prevention of diseases, diagnosis and treatment based on the theory of Tridosha (Vata,Pitta,Kapha) has been also visualized in this science of plant life.

Ayureveda in one of the medical sciences which is available now a day's also which totally depends upon herbs. *Charak Samhita* and *Sushrut Samhita* are also one of our oldest documents which deal with medicine and surgery. The first and foremost use was as medicine and of course all these medicines were discovered by our grand old sage and hermits (Rishi and Munies), who lived their life in forests and extensively worked systematically to explore the plants. But after many years of slavery we actually lost all the beliefs and literature on plants and plant explorations which is found with the Europeans. Now once again the belief in Ayurveda is being restored.

There are three terms related to plant exploration or scientific field studies are excursion, exploration and expedition. The Excursion is collection trips are of short duration, usually of one day and to some nearby places, generally done by students, explorations are done for preparing detailed floristic account and/ or building up herbaria and for study of (economic) plants of some region. For this purpose, the region is intensively studied and collections are made regularly in different seasons, generally four to six week duration. Expeditions are undertaken to remote and difficult areas and usually of several months' duration and generally

organized with collaboration with more than one institutions or organizations. The research articles on the history of botanical explorations in India, time to time were published by several stalwarts such as King (1899), Agharkar (1949), Biswas (1943), Santapau (1956), Burkill (1965), Subramanyam (1977), Stewart (1982), Desmond (1992), Rau (1994) and Pandurangan *et al.* (2015) etc. The detailed comprehensive account of history of plant explorations of India with details of plant explorers is described by the author.

HISTORY OF PLANTS EXPLORATION

The history of plant explorations in India can be divided in two periods such as Pre Linnaean and Post Linnaean period.

Pre Linnaean Period

The Portuguese and Dutch were the first to carry out botanical explorations in India in modern lines (Bhattacharyya, 1982). These were -

Garcia de Orta (1501-1568) was a Portuguese explorer, physician, herbalist and naturalist. He was a pioneer of tropical medicine, pharmacognosy and ethnobotany working mainly in Goa. His *Magnum Opus* was a book on the simples (Herbs used singly) and drugs published in 1763 Indian flora, entitled "*Coloquois dos Simples e Drogas da India*", the earliest treatise on the medicinal and economic plants of India. This contained a description of a large number of drug Plants.

C. Acosta (1525-1594) was a Portuguese doctor and natural historian. He is considered a pioneer in the study of plants from the Orient. Together with the apothecary Tome Pires and the physician Garcia de Orta, he was one of the pioneers of Indo-Portuguese medicine. He published the next book on medicinal plants of the Orient in 1578, entitled "*Tractado de las Drogas y medicinas de la Indias Orientalis*".

Caspar Commelijn or Caspar Commelin (1668-1731) was a Dutch botanist published *Flora Malabarica* in 1696.

Paul Hermann (1646-1695) collected a large number of plants from Ceylon and India. He published his "*Paradiscus Botanicus*" in 1687. Later many of his collections were dealt with by Linnaeus in 1747 in "*Flora Zeylanica*" and by N. L. Burman in 1768 in "*Flora Indica*".

John Burman (1707-1779) was a Professor of Amsterdam (commonly known as the elder Burman), published a book entitled "*Theasaurus Zeylanicus*" in 1737. This contained an account of the plants of Ceylon and Peninsular India.

N.L. Burman (1734-1793) known as Younger Burman was a Dutch botanist and was a son of John Burman. He was the author of *"Flora Indica"* (1768) which was later completed by J.G. Koenig. The standard author abbreviation Burm.f is used to indicate this person as the author when citing a botanical name.

Handrik Van Rheede (1636-1691) - Hendrik Adriaan van Rheede tot Drakenstein was a military man and a colonial administrator of the Dutch East India Company. He was the Governor of Malabar, a Dutch by origin and an amateur botanist, who made a large collection of Indian plants about 1676 and published their descriptions in the "*Hortus Indicus Malabaricus*" in 12 volumes with 794 plates, which appeared in Amsterdam in 1678-1693 under the editorship of Jan Commelyn.

The famous *Species Plantarum* published in 1753 by Carl Linnaeus, which described all the, then known plant species of the world. One of the many books which Linnaeus confidently depended was Van Rheede's "*Hortus Malabaricus" (*Meaning the Garden of Malabar). The book has been translated in to English and Malayalam by Prof. K.S. Manilal and published by the University of Kerala. As many as 255 Rheedean elements were used by Linnaeus for description of plants in *Species Plantarum* (1753).

For the work on the *Species Plantarum,* Linnaeus synthesized a huge amount of botanical data from different regions of the world produced by many scholars. Among the many old books he consulted his explicit faith and admiration. "I have not put my whole trust in any author excepting the work *Hortus Elthamensis* by the very celebrated Dillenius and the work *Hortus Malabaricus* by the illustrious Van Rheede, having my firm conviction in their accurate data" (Linnaeus, 1754). *Pavetta* L. *Pavetta* is Malayalam name for *Pavetta indica* L., adapted from Rheede, *Hortus Malabaricus* 5:t.10.1665. *Basella* L. *Basella* is a Malayalam name in Kerala for *Basella alba* L. and adapted by Rheede in *Hortus Malabaricus* 7: t. 24. 1688. *Helicteres isora* L. Isora is a Malayalam name of *Helicteres isora* adapted from Rheede Hort. Malab.6:55.t.30. The plant *Entada rheedii* is named for him. The genus *Rheedia* L., commemorated Hendrik Van Rheede (1637-1692), and species *Rheedia floribunda* Planch. & Triana. An international peer reviewed journal *Rheedea* founded in 1991 and published by Indian Association for Angiosperm Taxonomy named in honor of Hendrik Van Rheede.

Post Linnaean Period

Johan Gerard Koenig (1728-1789) a Danish botanist, an pupil of Linnaeus arrived in India in 1768 and joined Tranquebar Mission, a Danish settlement 150 miles south of Madras. He organized a society in Tranquebar (now Tanjavur in Tamilnadu), called "The United Brothers" in order to promote the study of Indian plants. He made explorations in the Madras region and sent many specimens of Indian plants to botanists like A.W. Roth, A.J. Retz and H.A. Shrader in Europe who described them. Koenig had published descriptions of some plants he had collected in India in the "*Observations of Botany of Retzius*" published in 1783 in Europe. Three other European Missionaries Heyne, Klein and Rottler also made botanical contributions while attached to Tranquebar Mission. Their names have been commemorated in genera like *Heynea* Roxb., *Kleinea* Mill., *Koenigia* L. *Rottlera* Roxb., and species *Euphorbia heyneana*, *Impatiens kleinii, Murraya koenigii* and *Chrozophora rottleri*. An account of Indian Plants in the form of lists was also included in the work of the N.L. Burman and J. Burman in their *Flora Indica* (1768) and *Flora Malabarica* (1769).

Lieutenant Colonel Robert Kyd (1746–1793) was a British army officer stationed in India. Kyd was interested in horticulture and owned a private garden in Shalimar near Howrah. He proposed the idea of a botanic garden to the then Governor-General Sir John Macpherson, who passed on the idea to the Court of Directors of the East India Company. Kyd had proposed that the botanical garden would help in introduction of economically important plants and help the East India Company *Outstrip our rivals in every valuable production which nature has confined to this part of the globe*. His idea was that it should help in finding alternate sources of food to prevent famines and to identify plants that might be commercially useful. The plan was approved on 31 July 1787. Kyd founded the Botanical Garden named as East India Company Botanic Garden at the bank of river Hooghly in Sibpur near Howrah, Calcutta in 1787 and he was made an honorary superintendent. By 1790 Kyd had 4000 plants in the garden. Kyd made a request in his will that he be buried without any religious ceremony in the botanical garden that he founded. His memorable monument is erected in the botanic garden in the buried place. A genus *Kydia* (*Kydia calycina*) of the family Malvaceae was named after him by William Roxburgh.

This Botanic Garden is situated on the west bank of river Hooghly, in Sibpur, Howrah near Kolkata, previously it is known East India Company Botanic Garden, thereafter Royal Botanic Garden, Calcutta Botanic Garden, after independence known as Indian Botanic

Garden and now the Garden was re-designated the *Acharya Jagadish Chandra Bose Indian Botanic Garden* on June 25, 2009 in honor of Jagdish Chandra Bose, the Bengali polymath, and natural scientist. It has nearly 15,000 live specimens including a large collection of bamboos, cycads and palms and wide variety of rare and endangered plants, spread over 110 hectares. It is under the control of Botanical Survey of India (BSI) of Ministry of Environment, Forests and Climate Change, Government of India.

William Roxburgh FRSE, FRCPE, FLS (1751-1815) was a Scottish surgeon and botanist, studied in medicine at Edinburgh University. He arrived in India in 1771 and joined the Tranquebar Mission. In 1776 he joined the Madras Medical Service as an Assistant Army Surgeon and became a surgeon in 1780. At Madras he turned his attention to botany. The East India Company recognized his botanical knowledge and sent him to Samulkotah (Samalkot), a small station about 7 miles from the town of Coconada (Kakinada) in 1781. Here he established a garden for the growing and investigation of economic plants and explored the surrounding area of the northern Circars. He employed native artists to illustrate plants. He had 700 illustrations by 1790. He made rapid progress and acquired a good reputation and was in a short time invited by the government of Bengal, to take charge of the East India Company Botanic Garden (EICBG) from Colonel Robert Kyd. In 1793 he succeeded Colonel Robert Kyd as Superintendent of the RBG Calcutta.

Roxburgh founded the Herbarium in 1793 which attained fame later as the Calcatta Herbarium (CAL) and today is our National Herbarium. His most spectacular publication was *The Plants of the Coast of Coromandel* (1795-1820) and it was also the first published book devoted to the plants of the east coast of India. In 1814, his significant work *Hortus Bengalensis: or A Catalogue of the Plants growing in the Honourable East India Company Botanic Garden at Calcutta* was published. His famous and outstanding *Flora Indica* was published posthumously in 1820, 1824, 1832 in three volumes. His monumental unpublished *Roxburgh Icones*, contain 2533 plates in 35 volumes, prepared under his supervision by local artists mark him as an outstanding botanist of all times of our country "The Father of Botany in India". Roxburgh has also been described as "The Linnaeus of India". A name of several plant species given in honour of him like *Pinus roxburghii, Combretum roxburghii, Putranjiva roxburghii, Sansevieria roxburghiana* etc. He was succeeded by Francis Buchanan Hamilton (Nair and Dash 1985).

Dr Francis Buchanan FRS, FLS, FRSE, FAS, DL (1762-1829) later known as Francis Hamilton but often referred to as Francis Buchanan-Hamilton was a Scottish physician who made significant contributions as a geographer, zoologist and botanist while living in India. From 1803 to 1804 he was surgeon to the Governor General of India Lord Wellesley in Calcutta, where he also organized a zoo that was to become the Calcutta Alipore Zoo. In 1799, after the defeat of Tipu Sultan and the fall of Mysore, he was asked to survey South India resulting in *A Journey from Madras through the Countries of Mysore, Canara and Malabar* (1807). He also wrote *An Account of the Kingdom of Nepal* (1819). He was succeeded William Roxburgh (1813) as the third Superintendent of the East India Company Botanic Garden, Calcutta for a very short period. *Decalepis hamiltonii, Drocera hamiltonii* etc. named in honour of him.

Nathaniel Wallich FRS, FRSE (1786–1854) was a young surgeon and botanist of Danish origin, who worked in India, initially in the Danish settlement in Serampore near Calcutta and later for the East India Company. He was involved in the early development of the Calcutta Botanical Garden, describing many new plant species and developing a large herbarium collection which was distributed to

collections in Europe. Wallich was appointed Superintendent of East India Company's Botanical Garden at Calcutta in 1815 after Roxburgh had relinquished that post due to ill health and served there till 1846 when he retired from the service. Nathaniel Wallich prepared a catalogue which is known informally as the "*Wallichian Catalogue*" (*Wall. Cat*.), is a catalogue of 9148 dried specimens published by Wallich from 1828-1849. The specimens in the catalogue were either collected by Wallich himself or from other collectors around the same period, including collections by William Roxburgh, W. Gomez, W.Griffith and Robert Wight.

One of Wallich's greatest contributions to the field of plant exploration was the assistance he regularly offered to the many plant hunters who stopped in Calcutta on their way to the Himalaya. His major contributions were two books viz. *Tentamen Florae Nepalensis Illustratae* (vol I-II, 1826-26) and three volume flora *Plantae Asiaticae Rariores* (1830-32*)*. The *Plantae Asiaticae Rariores* made use of artists employed by the Calcutta Botanic Garden, 146 drawings by Gorachand, 109 by Vishnupersaud and one work by Rungiah (the artist employed by Robert Wight, Genus *Rungia* comm. By Ness.), rests of the plates were by John Clark and 3 by William Griffith. Two hundred and fifty copies of the work were made of which 40 were purchased by the East India Company. Wallich made extensive plant explorations in Nepal, Western India and Lower Burma (Nair & Dash, 1985, Ranee, 2016). During 1837 and 1838 he served as professor of botany, Calcutta Medical College. Some plant species like *Allium wallichii, Cirsium wallichii, Buxus wallichiana* named in honour of him.

Carl Ludwig Willdenow (1765-1812) was a German botanist published travelling account of Rottler (1802) between Tranquebar and Madras with botanical notes.

Jean-Baptiste Leschenault de La Tour (1773-1826) was French botanist travelled to India to collect plants and establish a botanical garden at Pondicherry. He was given permission by the British to travel through Madras, Bengal and Ceylon. He published results of his journeys in the interior of the peninsular India in the neighborhood of Salem and Pondicherry.

Benjamin Heyne FLS (1770--1819) was a German born Scottish botanist who worked in British India as a botanist to Samalkot in the Madras Presidency through William Roxburgh. Later he appointed to serve Lalbagh botanical garden, Mysore. He collected and described plants from southern India, many of which named after him by European botanists. The collections of Benjamin Heyne were published by A.W. Roth in 1821.

A.W. Roth (1757-1834) was a German physician and botanist. He is remembered for his influential scientific publication particularly in the field of botany. His better written book on Indian flora was *Novae Plantarum Species Praesertim Indae Orientalis* (1821). This work is primarily based on botanical specimens collected by Benjamin Heyne.

Robert Wight MD FRS FLS (1796- 1872) was a Scottish surgeon in the East India Company, arrived in India in 1819 and made outstanding collections with G.A.W. Arnott from Madras and southern parts of India. Whose professional career was spent entirely in southern India, where his greatest achievements were in botany- as an economic botanist and leading taxonomist in south India. As a taxonomist he described 110 new genera and 1267 new species of flowering plants. He employed Indian botanical artists to illustrate a large number of plants collected by him and Indian collectors. He began to employ the artist Rungiah, who was employed from possibly as early as 1826 to around 1845, and thereafter employed Govindoo. Unlike other British workers of the time, he gave credit to his artists,

printing their names on all his publications of their drawings. He named a genus of orchid *Govindooia* (now *Tropidia*), after Govindoo, but could not do so for Rungiah, as a genus *Rungia* already existed (1834). Wight's illustrated publications included *Icones Plantarum Indiae Orientalis* (1838–53) more popularly known as "*Wight's Icones*", 2101 plates in 6 volumes, two hand-coloured, two-volume works, the *Illustrations of Indian Botany* (1838–50) and *Spicilegium Neilgherrense* (1845–51). Some of these illustrations were published William Hooker in Britain, By the time he retired from India in 1853 he had published 2464 illustrations of Indian plants. Several name of Plant species named in honuor of him viz. *Andrographis wightiana* Arn. ex Nees, *Andropogon wightianus* Nees ex Steud., *Anisochilus wightii* Hook. f., *Anotis wightiana* (Wall. ex Wight & Arn.) Hook. f., *Arenga wightii* Griff, *Arisaema wightii* Schott etc.

Saharanpur Botanical Garden - In north-western parts of the country, a garden was in existence during the Moslem rule during later half of 17th Century. Under the British Governance, Marquis of Hastings established it as a botanical Garden at Saharanpur in 1750 with the aim of promoting the introduction of new crops of commercial value. This garden attained fame under Dr. George Govan who came there in 1817, joined as Superintendent of botanical Garden, and soon thereafter J.F. Royle arrived in India and took charge of garden as Superintendent in 1823. J. F. Royle organized botanical collections from north-western Himalayan sectors and Kashmir. He also setup a Herbarium at the garden which now forms part of herbarium of Forest Research Institute, Dehradun.

John Forbes Royle (1798-1858) British botanist and teacher of Materia Medica, was born in Kanpur (then Cawnpore) in 1798. He was incharge of the botanical garden at Saharanpur and played a role in the development of economic botany in India. In 1823 Royle was appointed as Superintendent of the botanical garden at Saharanpur which had been established by the East India Company in 1750 with the aim of promoting the introduction of new crops of commercial value. Royle was assisted by Hugh Falconer who also took an interest in paleontology. One of Royle's major interests was in the traditional botanical remedies used by Hindu medical practitioners based on which he would later write *On the Antiquity of Hindu Medicine* (1837). He noted the effectiveness of many of these remedies. He also began a scheme of recording weather data at Saharanpur. The work on which Royle's reputation chiefly rests is the *Illustrations of the Botany and other branches of Natural History of the Himalayan Mountains, and of the Flora of Cashmere*, in 2 vols published during the years 1833-40. In addition he took a special interest in fibre yielding crops such as cotton in his on *the Culture and Commerce of Cotton in India and Elsewhere* (1851) and *The Fibrous Plants of India fitted for Cordage* (1855), together with papers in scientific journals. Royle suggested the idea of state protection for forests in his *Essay on the Productive Resources of India* (1840). The plant genus *Roylea* and species *Ochotona roylei* and *Nepeta royleana* are named after him. Other prominent collectors of this region include William Moorcraft, W.S. Webb, Gerard Brothers, Victor Jacqemont and T. Thomson.

William Griffith (1810-1848) was a British doctor, naturalist and botanist who made large collections for 13 years (1836-1848). When he was civil surgeon in Burma, where he studied local plants and made collection trip to Assam Barak Valley, Burma, Bhutan, Sikkim, Central India (Malwa and Narmada valley and Jabalpur) and Malacca, collected 9000 species and described and published posthumously under the title "*Notulae ad Plantas Asiaticas* "in 4 parts in 1854. Sir George King referred to Griffith "No botanist (of India) ever made such extensive exploration or himself collected so

many species as Griffith did during the brief 13 years of his Indian carrier; none ever made so many descriptions of plants from living specimens-Griffith was a man of genius". Species name *Hoya griffithii, Cannaria griffithii* named in commemoration of Griffith.
Among the other well known explorers of the mid 19th century were Hugh Falconer, M.P. Edgeworth, T. Thomson and T. Anderson. T Anderson worked of family Acanthaceae of India. Extensive collections during this period made by two officers Richard Strachey and J. Winterbottam collected plants from Kumaon and Garhwal Himalayan region and published a *Catalogue of Plants of Kumaon and of the Adjacent Portion of Garhwal and Tibet*. in 1952. A plant species named in honur of Richard Strachey as *Allium stracheyi* by Baker.

Hugh Falconer MD FRS (1808-1865) was a Scottish botanist and studied the flora of India, Assam and Burma. He was the superintendent of Royal Botanical Garden, Calcutta during Hooker's visit in India.

Michael Pakenham Edgeworth (1812-1881) was an Irish botanist who specialized in seed plants and ferns. He was also an pioneer of photography. He joined the Bengal Civil Services of British colonial regime in India. He was initially based at Ambala, Muzaffarnagar, than Saharanpur and finally Banda until 1850 covering an area from Lahore to Madras. Edgeworth widely travelled in northern India where he collected large number of plants and made notes. Edgeworth has been described as the first ecologist and he wrote a paper on the 'Relation of crops and spontaneous plants to the soil'.
The well known plant of dry region of India *Capparis decidua* was described by Edgeworth. The plant genus *Edgeworthia* was dedicated to him and numerous other plant including *Primula edgeworthii, Impatiens edgeworthii, Rhododedron edgeworthii* and *Platanthera edgeworthii* were named after him.

Sir Joseph Dalton Hooker OM GCSI CB PRS (1817-1911) was a Kew botanist, and later became the Director of Royal Botanical Garden, Kew. In 1847 his father Sir William Jackson Hooker, the Director, Royal Botanical Garden, Kew, nominated him to travel to India and collect plants for Kew. He was the first European botanist who collected plants from the Himalayas. He visited India stayed for 3 years (1847-1851) in India and collected plants from Sikkim Himalaya and in the plains of eastern India (Khasia Hills one of the richest collecting grounds in the world), and also to some extent the districts of Sylhet, Cachar, and Chittagong). He was accompanied by Thomas Thomson, a fellow student from Glasgow University. He travelled widely in unexplored regions between 1848 and 1851, and published his observations in his *Himalayan Journals* in 1854, 1855 and again in 1891.

J.D. Hooker and T. Thomson's combined collections were estimated at 1,50,000 specimens comprising 3500 species from Sikkim, 3000 from Khasia Hills, 1000 each from the plains of north eastern and north western India and about 2000 from the northwestern Himalaya. Hooker discovered Himalayan Roses (*Rhododendron* species) on which he prepared a monograph the *Rhododendrons of the Sikkim-Himalaya* (1849 - 51). In 1885 Hooker published "*Illustrations of Himalayan Plants*" from London.

The need for a flora of British India was widely recognized. Upon their return to Kew from India in 1851, Hooker and Thomson started preparing the *Flora Indica* based on their own collections and large collections of Indian plants, including the East India Company Herbarium ('The Wallich Collection'), and the herbarium of Robert Wight from southern India. The first volume of *Flora Indica* was published in 1855 with detailed and exhaustive account of the Indian flora. The aim was to "present a systematic account of the vegetable products of British India arranged according to natural principles besides the descriptions".

His greatest botanical work was the *Flora of British India*, published in seven volumes starting in 1872, on the basis of Griffiths and Thomson's collections which were sent to him at Kew. He himself visited India (1847-1851) along with the Thomson, made extensive collections in the Himalaya. Hooker has described 15,900 species of flowering plants in *Flora of British India*. The dominant family was Orchidaceae, Leguminosae and Compositae. On the publication of the last part in 1897, he was promoted Knight Grand Commander of the Order of the Star of India (being made a Knight Commander of that Order in 1877). Ten years later, on attaining the age of ninety in 1907, he was awarded the Order of Merit. He also published *A Century of Indian Orchids* (1895) in which he Descriptions and illustrations of 101 species of Indian Orchids were published in Annals of Royal Botanical Garden, Calcutta in memory of William Roxburgh in 1895.

In 1904, at the age of 87, Hooker published *A sketch of the Vegetation of the Indian Empire*. Hooker (1904) remarked that the Indian flora is more varied than that of any other country of equal area in the eastern hemisphere, if not on the glove. This is due to its geographical extension, embracing so many degrees of latitude, temperate and tropical; to its surface rising from the level of the sea to heights above the limits of vegetation; to its climates varying from torrid to arctic, and from almost absolute aridity to a maximum of humidity. There are number (at least 30) of plants with specific name *hookeri* and *hookeriana* named in honour of Sir Joseph Dalton Hooker, including *Banksia hookeriana, Grevillea hookeriana, Iris hookeriana, Polygonatum hookeri,* and *Sarcococca hookeriana, Cymbidium hookerianum, Eriolaena hookeriana, Allium hookeri, Nepenthes hookeriana* etc (Sikarwar, 2019).

Thomas Thomson (1817-1878) was a British surgeon with the British East India Company before becoming a botanist. He was a close friend and class fellow of Joseph Dalton Hooker and helped in writing the first volume of *Flora Indica*. Whilst in India he investigated the botany of the plains and outer Himalayas, Kashmir and the Karakoram Pass. He published an account of his explorations in *Western Himalaya and Tibet* (1852). In 1855 Thomas moved to Calcutta where he became the Superintendent of the Honourable East India Company's Botanic Garden at Calcutta and professor of botany at the Calcutta medical college. He held these posts until 1861, when he retired and moved back to England. Sir J.D. Hooker named *Rododendron thomsonii* in honour of his close friend Thomson.

John Lindsay Stewart FRSE FRCS FRGS FLS (1831-1873) was a Scottish botanist remembered for his conservation of Indian forests. He made collections in Flora and vegetation of the Panjab and published "*Panjab Plants*" in 1869. J.L. Stewart initiated the writing "*Forest Flora of North-West and Central India*" which was completed by D. Brandis (1874).

James Edward Tierney Aitchison MD LLD CIE FRSE FRS FRCSE (1835-1898) was a Scottish surgeon and botanist. He worked as a civil surgeon at Amritsar. He suffered from a liver ailment and returned to England during which time he worked on a "*Catalogue of the Plants of Punjab and Sindh*" in 1869. In 1872 he was appointed Commissioner to Ladakh where he collected nearly 10000 specimens of 950 species of plant during his service in the 29th Punjab Regiment under Lord Roberts in the Kuram valley. In 1884 he was naturalist with the Afghan Delimitation Commission and on this expedition too he collected nearly 10000 specimens of 800 species. His herbaria is preserved in the Royal Botanic Garden, Kew and Calcutta. The plant genus *Aitchsonia* was named after him.

John Graham (1805-1839) was appointed as deputy post master general of the Bombay Presidency. He was also made superintendent

of botanical garden at Bombay soon after its establishment and occupied himself in enriching it with exotic and indigenous plants. After his death in 1839, his completed work entitled *"A Catalogue of the Plants Growing in Bombay and Its Vicinity*" was published by his friend Mr. J, Nimmo in 1839.

Nicol Alexander Dalzell (1817–1878) was a Scottish botanist, visited Bombay in 1841 and was appointed assistant commissioner of customs. He became forest ranger of Scinde, and on the retirement of Dr. Gibson, conservator of forests, Bombay. In 1849 he communicated to the Bombay Asiatic Society's 'Journal' a paper entitled 'Indications of a New Genus of Plants of the Order Anacardieae.' In 1858 he published a "*Catalogue of the Indigenous Flowering Plants of the Bombay Presidency*". In 1861 he published 'The Bombay Flora,' (two volumes) which bore also the name of Dr. Gibson, who volunteered to bear the expense of publication. It is the only general descriptive work on the vegetation of Western India. This publication contains the names of upwards of two hundred plants, scientifically named and described, for the first time, by Dalzell himself. In 1857 he published in 'Hooker's Journal of Botany' 'Observations on *Cissus quadrangularis* L.' He also published a pamphlet upon the effects of the denudation of forests in limiting the rainfall, which is highly praised in Forsyth's 'Highlands of India.'

Hugh Cleghorn (1820-1895) a professor of Botany, at Madras Medical College, established a small Herbarium at the Madras Museum. Herbarium was enriched when Cleghorn become the first Conservator of Forests of Madras Presidency in 1856. Cleghorn sometimes known as the "Father of Scientific Forestry in India" was instrumental in the creation of forest department in the presidency of Madras. The plant genus *Cleghornia* was named after him by the botanist Robert Wight.

Col R. H. Beddome (1830-1911) was a British military officer and naturalist in India, who succeeded Cleghorn, also made significant contributions to Madras Herbarium. Later year it grew in to one of the well-known herbarium called Madras Herbarium (MH) in the country. Now located in Coimbatore BSI. In the mid 19th century, he extensively surveyed several remote and unexplored hill ranges in Sri Lanka and south India, including those of Eastern Ghats such as Yelandur, Kollegal, Shevaroy Hills, Yelagiri, Nallamala Hills, Visakhapatnam hills and the Western Ghats such as Nilgiri Hills, Anaimalai hills Agasthyamalai Hills and Kudremukh. Beddome published "*Flora Sylvatica for Southern India*" during 1869-1874 in 2 volumes. Beddome also published the book on the ferns, *The Ferns of British India* (1866), *The Ferns of Southern India* (1863,1873) and *Handbook the Ferns of British India, Ceylon and the Malaya Peninsula* (1883).

Lalbagh Botanical Garden- Hyder Ali a Moslem Chieftain, established a orchard with many exotic plants, later become the famous "Lalbagh Botanical Garden" Bangalore. This is enriched by Britishers and has a large number of exotic plants. John Cameron FLS was a botanist and is regarded as the "Father of Horticulture". On his arrival to India appointed as curator of the Lalbagh botanical garden in 1874. He enriched the plant wealth of Lalbagh by introducing countless native and exotic plant species. It is John Cameron who conceived the idea of constructing a conservatory (Glass house) for acclimatizing exotic plants and also holding flower show. He toured extensively in the then princely state of Mysore and other parts of India. He Published "*Forest Trees of Mysore and Coorg*" in 1894 and "*Catalogue of Plants in the Botanical Garden, Bangalore City and its Vicinity*" in 1891.

Sir Dietrich Brandis KCIE, FRS (1824-1907) the "Father of Indian Forestry", established Indian Forest Services in India. In 1864 Lord

Canning appointed Dr. Brandis as first Inspector-General of Forests to the Gov. of India, a position he held with distinction for 19 years until his retirement in 1883. His monumental publications include "*The Forest Flora of North-West and Central India*" (1874) and the journal "*Indian Forester*" was founded in 1875, which earned him Fellow of Royal Society in 1875. In 1881 he published his famous book "*Manual of Indian Timbers*" and his other monumental work "*India trees*" (1906) which was published after his retirement. He was awarded Knight Commandership in 1887. The genus *Brandisia* Hook.f. & Thomson and a host of plant species are named after him.

Imperial Forest School, Dehra Dun was instituted in 1881. The forest officers were keen plant collectors and association with botanists like Duthie and Gamble. A forest herbarium was setup which, in due course, became part of Forest Research Institute (FRI) Dehradun. This FRI Herbarium (DD) received the collections from the Saharanpur Botanical Garden dating back (1820) to the time of Govan and Royle. In 5th June 1906 new Building was constructed and renamed "Imperial Forest Research Institute and College", Dehradun, Later become FRI, Dehradun. In 1881, Dehradun Forest School was instituted. A forest herbarium was set up which in due course became the part of FRI.

Sir George Watt CIF MB CM FLS, LLD (1851–1930) was a professor of botany, reporter and editor, graduating as a Doctor of Medicine. He accepted the post Professor of Botany, Calcutta University, 1873-74 in order to facilitate his botanical interests. His "*Dictionary of the Commercial products of India*" (1889–90) in ten volumes is perhaps the greatest compilation of commercial plants in India ever achieved, in terms of the range and depth. The compilation includes description of non-agricultural plants. He won the Daniel Hanbury Gold medal, 1901. He was knighted in 1903, and retired in 1906. He was the Fellow, Royal Society, Haarlem; President, Richmond Athenæum, 1907and died in 1930. One rhododendron (*Rhododendron wattii*) has been named after him.

An exhibition of rich collections of economic products was organized at Calcutta (1883-84) and created awareness in the IG to acquire and document the abundant wealth of natural resources in order to exploit it commercially. Sir George Watt associated with Bengal Education Department and a respectable botanist was entrusted with the work of compiling a *Dictionary of Economic Products of India* (1889-1896) by consolidating all available information of India's natural resources. Wealth of India is revised form of Watt's Dictionary.

Sir George King MD FLS (1840-1909) was a British botanist appointed superintendent of the Royal Botanical Garden in 1871, established Botanical Survey of India in 1890, and become the first Director of the Botanical Survey of India from 1890. Under the Direction of G. King, the well known Publication *Annals of the Royal Botanical Garden*, Calcutta was started in 1887, and the *Records of the Botanical Survey of India* started in 1893. George King (1878) also studied the plants of Bundelkhand, Malwa, Guna and Sagar. King was awarded the Linnaean Medal in 1901. Some noble works of George King are- The species of Ficus of Indo-Malayan and Chinese Countries (1887), Materials for a flora of the Malaya Peninsula (1889-1936), The Magnoliaceae of British India (1891), The species of Myristica of British India (1891), The Annonaceae of British India (1893), A century of new and rare Indian Plants (1896), The Orchids of Sikkim Himalaya (1898) jointly with Robert Planting.

Dr. C.B. Clarke MA FLS (1832-1906) formerly Superintendent of Royal Botanical Garden, Calcutta and author of several works in Indian Botany. His major contribution was in *Flora of British India*. In 1898 he explored the

area of Jaspur and Surguja. The other prominent workers deserve to mention are Victor Jacquemont (1841-44) was probably the first botanist who collected plants of Bundelkhand and Malwa plateau. J.J. Wood (1902) published *The Plants of Chota Nagpur including Jaspur and Surguja*. Hole (1904) explored the Forest Flora of Jabalpur and Gen William Munro (1839-1840) explored Chambal ravines. C Maries and Col Wingate (1890) surveyed Gwalior Region.

Important Plant Explorers of 19th Century
William Roxburgh (1795-1819) "Coromandel Coast", B. Schmid (1835) "Coimbatore and the Nilgiries", J. Grahm (1836) " Bombey", J.W. Masters (1840) "Bengal, Calcutta", J.F. Royle (1842) "Kashmir", R.F. Hohenacker (1849) "Plants of Canara and neighboring areas of Maharashtra and Malabar", J. Long (1857-59) "Bengal", W. Illiot (1859) "Andhra", A.N. Dalzell & A. Gibson (1861) "Bombey", R.H. Beddome (1863) "Madras", (1866) "Annamalai Hills", J.L. Stewart (1869) "Panjab", R.H. Beddome (189-743) "South India", J.F. Watson (1874) "Kumaon", George King (1878) "Rajasthan", J.F. Duthie (1881) "North west India", A.K. Nairne (1894) "Western India" and J. Cameron (1894) "Mysore and Coorg".

Plant Exploration in 20th Century
Early decades of 20th Century saw the publication of the regional floras inspired by the monumental work on the "*Flora of British India*" which was issued by Sir Joseph Dalton Hooker and his associates in 1872 to 1897. In the first quarter of this century an extensive work on plant explorations has been carried out in almost all parts of the country.

James Sykes Gamble CIE FRS FLS (1847-1925)) was an English botanist who specialized in the flora of the Indian Sub-Continent. He became Director of the British Imperial Forest School at Dehradun in 1871.s first posting was in Burma but after a year he moved to Bengal where he worked in the Darjeeling forests. Here he produced the first list of the trees and shrubs of Darjeeling. From 1872 to 1877 he worked mostly in the Darjeeling and Jalpaiguri area with short visits to Allahabad and Shimla. In 1877 he moved to the capital in Shimla where he worked on the local flora. In 1879 he moved back to Calcutta and travelled around the Sunderbans, Chota Nagpore, Santal Parganas and Orissa regions. He worked along with his colleague Sulpiz Kurz at the Calcutta Herbarium and Dr. George King. In 1890, Gamble founded the Forest School Herbarium (renamed the Dehradun Herbarium in 1908). In 1882 he was made Conservator in the Madras Presidency and here he worked in collaboration with W. A. Talbot of the Bombay Presidency. During this time he took an interest in the cultivation of *Eucalyptus globulus* in the Nilgiris. In 1890 he moved to the North-West Provinces and became Director of the Forest School in Dehradun. At Dehradun he developed his collections, adding from the Himalayan regions and also receiving specimens from J.F. Duthie and C.G. Rogers. He was a collaborator with D. Brandis. His remarkable work in forestry was "*Manual of Indian Timbers"* (1881) which continues to be the reference book for forestry scientists today. He was the Editor of Indian Forester from 1878-1882 and again from 1891-1899. *Flora of the Presidency of Madras* was a monumental work.

Theodor Cooke FGS FLS (1836-1910) was an engineer erected Bassein Iron Bridge, 4312 feet longitude, later turned botanist and became Director of Botanical Survey of Western India. Acted as Director of Agriculture to Government of Bombay and was Fellow of Bombay University. Throughout his service Dr. Cooke had taken a keen interest in botanical studies and fieldwork. He soon became a recognized authority on the vegetation of Bombay and Scinde. When, in 1891, the Botanical Survey of India was organized by George King, Dr. Cooke was

appointed director of the botanical survey operations in western India with Mr. Q. M. Woodrow as an assistant. Encouraged thereto by Sir George King, then director of the botanical survey, Dr. Cooke made collections and preparations for the production of a *Flora of the Presidency of Bombay* which was published in 3 volumes (1901-1908). The Presidency of Bombay, including Sind and Baroda (Anonymous, 1910).

Sir David Prain CMG CIE FRS FRSE (1857-1944) was a Scottish physician remembered as a noted amateur botanist. Prain duly went to India in 1887 as a physician/botanist in the Indian Medical Service, and was appointed as curator of the Calcutta herbarium. He researched Indian hemp, followed by other crops like wheat, mustard, pulses, and indigo for the Bengal government. Prain's most crucial work involved Cinchona plantations in Darjeeling. In 1898 he was promoted to Director of the Royal Botanic Garden, Calcutta as well as the Botanical Survey of India, and superintendent of Cinchona Cultivation in Bengal, remaining there until 1905. From 1898 to 1905 he also served as Professor of Botany at the Medical College of Calcutta. In 1905 he became Director of the Royal Botanic Garden, Kew. His major contributions in Indian flora are the *Flora of the Sundribuns* (1903) and *Bengal Plants* (1903) (Burkill 1944).

John Firminger Duthie (1845–1922) was an English botanist and explorer from 1875 to 1903 he was the Superintendent of Saharanpur Botanical Garden. His major contribution is *Flora of the Upper Gangetic Plain and of the adjacent Siwalik and Sub Himalayan Tracts* in 3 volumes.

Henry Haselfoot Haines (1867-1945) arrived in Calcutta late in 1888, and was sent to Darjeeling. From 1888- 1899, he served in various forestry divisions in this area. In 1899, he was transferred to the south of the Ganges working on plans for the Singhbhum forests. His transfer to the Singhbhum brought him in contact with plants and trees and started preparing of his personal herbarium. When it was time for his leave, he visited other districts of Chota Nagpur collecting diligently. In 1905, Haines was sent to Dehradun to act as Deputy Director of the Imperial Forest School, and then, Imperial Forest botanist. This allowed him some time to work on the specimens that he had collected and continued to work on the *Forest Flora of Chota Nagpur*, which was published in Calcutta. in 1914. He was appointed Conservator of Forests of Behar and Orissa. He collected materials during this period for his "*Flora of Behar and Orissa*". In 1919, he took some leave prior to retirement and took up residence in the Royal Botanic Garden, Calcutta using the time to work on his collections. He then returned to England (and Kew) to complete '*The Botany of Behar and Orissa'* which appeared in six parts from 1921 onwards.

Philip Furley Fyson (1877–1947) was a botanist and educator who worked in India. He is noted as the author of the first illustrated volumes on the flora of the South Indian Hills. He wrote a textbook of botany in 1912 for college students. He also wrote a book on Madras Flowers with 100 illustrated plates, a Flora of the South Indian Hills and a monograph on the genus *Eriocaulon*. He helped establish and launch the Journal of Indian Botany through the Indian Botanical Society started in 1919. The journal was later to become *Journal of the Indian Botanical Society.* He took leave for this study and in 1915 this resulted in *The Flora of the Nilgiri and Pulney Hill-tops* with 286 illustrated pages and 483 species. A supplement followed in 1921 with species from the lower elevations and notes on the Sheveroy Hills. This was followed in 1932 by *The Flora of the South Indian Hill Stations'* covering 877 species.

Upendra Nath Kanjilal or U.N. Kanjilal FLS (1859–1928) was an Indian botanist and forest officer. He published numerous botanical works. He was given the title of Rai Bahadur in

1911. Kanjilal was born in 1859 and studied at the Mahratta School in Jessore, the Hetrampur School in Birbhum and the Presidency College in Calcutta followed by the Imperial Forest School at Dehra Dun. He became a forest officer and rose to the position of Extra Deputy Conservator of Forests. He was elected Fellow of the Linnean Society in 1902. He died in 1928 while he was working on the *Flora of Assam*. The work was completed by his son P. C. Kanjilal a forest officer serving in Uttar Pradesh.

It is not possible to describe the work of all great botanists who have contributed a lot to explore the plant resources of Indian sub-continent. The botanical explorations in early 20th century were witnessed by a publications of large number of regional floras different parts of British India viz.-

Southern India

T.F. Bourdillon (1908) "*Forest Trees of Travancore*", J.S. Gamble (1915-1936). "*Flora of the Presidency of Madras*" in 11 parts, P.F. Fyson (1915) "*Flora of the Nilgiri and Pulney Hill Tops* (3 Vol.) and in 1932 "*Flora of the South Indian Hill Stations*", P.V. Mayurnathan (1929) " *Flowering Plants of Madras City*", M. Rama Rao (1914) *Flowering Plants of Travancore*".

Western India

T. Cooke (1901-1908) " *Flora of the Presidency of Bombay*" in 3 volumes, W.A. Talbot (1909-1912) "*Forest Flora of the Bombay Presidency and Sind*", E. Blatter & F. Hallburg (1918-1921) "*The Flora of the Indian Desert*", E. Blatter & J. Fernandez (1933-34), *"Flora of Wajirastan"*, E. Blatter, F. Hallburg & McCann, (1919-20) "Flora of Baluchistan", Santapau wrote "*Flora of Khandala*" (1953), " *Flora of Purandhar*" (1958), and "*Flora of Saurashtra*" (1962) and G.L. Shah (1978) "*Flora of Gujarat State*".

Central India

D.O. Witt (1908) "*List of Trees, Shrubs and Climbers of the Central Provinces*", W.F. Biscoi (1908) *A List of Trees and Shrubs of the Indore State*", H.H. Haines (1910) "*A Forest Flora of Chhota Nagpur*", (1921-1925) "*The Botany of Bihar and Orissa*", L.A. Kenoyer (1924). "*Weed Manual of Gwalior State*".

Northern India

J.F. Duthie (1903-1922) "*Flora of the Upper Gangetic Plain and of the adjacent Siwalik and Sub Himalayan Tracts*" in 3 vols, A. E. Osmaston (1917) "*Forest Flora for Kumaon*", R.N. Parker (1918) "*Forest Flora for the Panjab with Hajara and Delhi*", U.N. Kanjilal (1911) *Forest Flora of the Siwalik and Jaunsar Forest Divisions of the United Provinces of Agra and Aoudh*", U.N. Kanjilal (1928) "*Forest Flora for Chakarata, Dehra Dun and Saharanpur Forest Divisions of the United Provinces"*, P.C. Kanjilal (1933) "*Forest Flora for Pilibhit, Oudh, Gorakhpur and Bundelkhand*", C.J. Bamber "*Panjab Plants*" (1916), H. Collett " *Flora Simlensis*" (1902), B.O. Coventry (1923) "*Wild Flowers of Kashmir*" 3 vols, E. Blatter (1927-29) "Beautiful *Flowers of Kashmir*" 2 vols, F.S. Smythe (1938) "*The Valley of Flowers*" etc.

Eastern India (including North-east)

D. Prain (1903) "*Bengal Plants*" 2 vols, U.N. Kanjilal (1934-40) "*Flora of Assam*" 5 vols, A.M. Covan et al ((1929) "*Trees of Northern Bengal*". U.N. Kanjilal and his coworkers (1934-1940) "*Flora of Assam*" in 5 vols., Bor (1940) fifth volume of "*Flora of Assam*" to deal with Poaceae, Bor (1942) "*The Relic Vegetation of Shillong Plateau, Assam, Naga Hills and Khasi Hills*". Fischer (1938) "*Flora of Lusai Hills*".

Andaman and Nicobar Islands

C.E. Parkinson (1923) "*Forest Flora for the Andaman Islands*".

Botanical Survey of India-

BSI was formally instituted by East India Company (EIC) on 13 February 1890 under the direction of Sir George King who became first ex-officio Director, earlier he had been

superintendent of Royal Botanic Garden, Calcutta since 1871. The Calcutta Garden became the headquarters of the Survey and was given regional responsibility for Bengal, Assam, North East, Burma, and the Andaman and Nicobar Islands. Prior to 1890, EIC had already established botanical gardens at Sibpur, Pune, Saharanpur and Madras as centres for improving botanical knowledge and experimentation under the local Governments, for example Saharanpur botanical garden, dating earlier than 1750, was acquired by EIC in 1817 for growing medicinal plants. Most of the EIC botanical gardens' work was for the cultivation of plants for exploiting resources of India for commerce and trade. The Botanical Survey of India has been engaged in exploring, identifying and documenting rich plant resources of the country. Sir George King, who was the then Superintendent of the Royal Botanical Garden, Calcutta (now rechristened as Acharya Jagadish Chandra Bose Indian Botanical Garden), became the first Director of the Botanical Survey and was holding the dual charges of Garden and the Survey. A consolidated flora of the Indian subcontinent had been published under the leadership of Sir J.D. Hooker between 1872 and 1897. The Survey flourished for about half a century and generated both material base and literature for taxonomic research.

Reorganization of BSI

BSI was organized in 1890 with Sir George King as its first Director. But due to the lake of fund, the activities of BSI were on the wane and with the last British Director C.C. Calder, having left in 1939, only a skeleton staff was left under the supervision of K. Biswas. After independence (1947), the first Prime Minister of India Pt. J.L. Nehru initiated reorganization of BSI by inviting Dr. E.K. Janaki Ammal, resident in England at the time, to return to India and prepare a project report. Dr. E. K. Janaki Ammal was appointed Officer on Special Duty on 14 October 1952. Her report was accepted and the reorganization plan was finally approved by the Govt. of India on 29 March 1954 with Calcutta as the headquarter of Botanical Survey of India. Reorganized department came in to existence towards the close of 1955. The regional offices have been established in different parts of the country and first batch of scientists took charge in their units in 1956. Calcutta Herbarium now under the control of BSI and was named CNH. The RBG of Howrah was transferred to control of BSI as Indian Botanic Garden. Library and classical literature were also under the supervision of Director of BSI. Head office of BSI was made in Calcutta.

The prime objectives of the Survey were:

- To undertake intensive floristic surveys and collect accurate and detailed information on the occurrence, distribution, ecology and economic utility of plants in the country.
- To collect, identify and distribute materials which may be of use to educational and research institutions and,
- To act as custodian of authentic collections in well planned herbaria and to document the plant resources in the form of local, District, State and National Flora.
- To coordinate the botanical work of others in different parts of India.

For the purpose of intensive exploration and study, 4 regional centres (under the control of Regional Director) have been established in different parts of the country. They are as follow:

1. Southern Regional Centre, Coimbatore: Established as Southern Circle on 10 October 1955 (covering the states of Kerala and Tamil Nadu and Union Territories of Lakshadweep & Minicoy Islands). The circle has a National Orchidarium, an associated Botanic garden and a Tissue Culture laboratory at Yercaud. The Southern Circle Herbarium has 2, 33,000 specimen sheets.

2. Western Regional Centre, Pune: Established as Western Circle on 12 December 1955 (covering states of Goa, Karnataka and

Maharashtra and Union Terrirories of Dadra & Nagar Haveli, Daman, Diu). The circle has an associated Botanic Garden at Mundhwa. The Western Circle Herbarium has 1, 50,000 specimen sheets. Old herbarium based on Cooke's and Talbot's collections was transferred to this office.

3. The Eastern Regional Centre, Shillong: Established as Eastern circle on 1 April 1956 (covering the states of Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura. The circle has a National Orchidarium at Shillong and an associated Botanic Garden at Barapani and Tissue Culture laboratory at both Shillong and Barapani The Eastern Circle Herbarium has 2,50,000 specimen sheets.

4. Northern Regional Centre, Dehradun: Established as Northern Circle on 1 August 1956 (covering the states of Hariyana, Himachal Pradesh, Jammu & Kashmir, Panjab, Uttarakhand, and Union Terrirory of Chandigarh. The circle has three associated Botanic Gardens at Dehra Dun Khirsu and Pauri, one green house, one Orchidarium and one Tissue Culture laboratory at Dehra Dun. The Northern Circle Herbarium has 1, 12,000 specimen sheets.

5. **Central Regional Centre, Allahabad:** Established as Central Circle in 1962 (covering the states of Madhya Pradesh, Chhattisgarh and Uttar Pradesh). The circle has an associated Botanic Garden at Allahabad.

6. **Arid Zone Regional Centre, Jodhpur:** Established as Arid Zone Circle in 1972 (covering the states of Rajasthan and Gujarat). The circle has an associated Desert Botanic Garden at Jodhpur.

7. **Andaman and Nicobar Regional Centre Port Blair:** Established Andaman & Nicobar Circle in 1972, (covering all the oceanic Islands under Andaman & Nicobar). The circle has an associated Botanic Garden at Dhanikhari.

8. **Arunachal Pradesh Regional Centre, ltanagar:** Established as Arunachal Pradesh Circle in 1977, covering the state of Arunachal Pradesh. The circle has an Arboretum at Sankie View, Itanagar.

9. **Sikkim Himalayan Regional Centre, Gangtok:** Established as Sikkim Himalayan Circle in 1979, covering the states of Sikkim and Darjeeling district of West Bengal. The circle has a Green House and a Glass House at Gangtok.

10. **Botanic Garden of Indian Republic at Noida**: Established in 2002, covering the National Capital Territory Region of Delhi. The Centre is currently under the development.

11. **Deccan Regional Centre, Hyderabad**: Established as Deccan Circle in 2005, covering the states of Andhra Pradesh and Orissa.

Major Herbaria (Plant Collection Centres) of India

Blatter Herbarium at ST. Xavier's College, Bombay

The Blatter Herbarium is an internationally recognized herbarium for taxonomic studies and allied branches in Botany. It was established in 1906 in St. Xavier's College, Bombay, by the Jesuit Priest - Rev. Fr. E. Blatter. In 1941 it was renamed "The Blatter Herbarium" by Rev. Fr. H. Santapau, who served as its director for many years. Fr. Santapau later becomes the Director of Botanical Survey of India at Calcutta. He was awarded the Padmashri by the Govt. of India and the Birbal Sahani Medal by the Indian Botanical Society in 1964 for his services to Indian Botany.

BLAT is the only herbarium in India which holds collections of Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and Flowering Plants. The flowering plants collections ranges from the year 1816 onwards, and over 2,00,000 plant specimens including grasses, sedges, orchids, and other flowering plants collected

from various parts of India. The herbarium now is known as Blatter Herbarium (BLAT).

Forest Research Institute, Dehradun

Forest Research Institute is the next in importance only to the CNH in the country. Many classical collections of Royle, T. Thomson, Falconer, J.D. Hooker, Strachey, Winerbottam and others of Saharanpur Botanical Garden now incorporated in Dehradun Herbarium (DD). Collections of Gamble, Duthie, Parker, N.L. Bor, H.G Champion, and M.B. Raijada are placed here. The Dehradun Herbarium houses approximately 3, 30,000 specimens. T*he Indian Forester,* a journal founded in 1875 ahs rendering services to botany and forestry.

National Botanical Research Institute, Lucknow

NBRI (CSIR) formerly known as NBG has been the centre of plant explorations in India. The CSIR-NBRI herbarium which is third largest in the country, contains about 2, 86, 927 specimens, of which 1, 00, 369 specimens belong to angiosperms, 500 to gymnosperms, 5,258 to pteridophytes, 15,000 to bryophytes, 2473 to algae and 1,47,827 to lichens. The herbarium also holds 240 type specimens and about 820 type photographs. It's Herbarium constructed by Late Dr. K.N.Kaul in the pattern of Kew Herbarium.

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