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The Quest for Economic Botany: William Roxburgh and the Company Rule in India

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Abstract

Economic botany, defined as the study of the use of plants by humans, emerged as a branch of knowledge about the mid-eighteenth century with the effort of Swedish botanist Carl Linnaeus. Thereafter, botanical research shifted from 'search for nature' to the 'economic utilization and control of plants.' During the British East India Company rule in India, William Roxburgh (1751-1815), the founding father of Indian Botany and the Superintendent of Calcutta Botanic Garden, developed economic botany by using gardens as laboratory to introduce lucrative crops like hemp, sugarcane, pepper and others. Subsequently, medicinal plants were also explored and documented. However, the historiography is silent regarding the Roxburgh's quest and pursuit of economic botany. In this context, the present paper deals with Roxburgh effort in developing economic botany for imperial exigency.

Keywords: William Roxburgh, Economic Botany, Hemp, Pepper, Calcutta Botanic Garden.

Understanding Economic Botany

Economic botany, defined as the study of the use of plants by humans, emerged as a branch of knowledge about the mid-eighteenth century (Wickens 1990: 12-28). Carl Linnaeus, the Swedish botanist who formalised binomial nomenclature in classifying plants, observed the plants uses in his writings, such as, *Flora Lapponica* (1737) and *Flora Suecica* (1745). Guided by the Camaralist' approach,[1] Linnaeus focussed on acclimatization of plants and strove to cultivate foreign cash crops and find domestic substitute for imports such as tea, coffee and others (Koerner 1999). Subsequently, one of his students, Elias Aspelin wrote a dissertation titled *Flora Oeconomica*, a compendium of the economic uses of the indigenous plants of Sweden, in the year 1748. Amidst these developments, the botanical research shifted from 'search for nature' to the 'economic utilization and control of plants' (Wells and Stirton 1977). The domestic and commercial use of plants became the focus of botanical exploration.

The British East India Company which main purpose was to exploit the economic resources of India directed the botanists and naturalists to explore the introduction of commercially viable plants in the botanic gardens. The purpose was to use gardens as a laboratory to identify and introduce lucrative and cash crops' like cotton, sugarcane, coffee, tea, indigo, pepper and medicinal plants, and to further grow them in the other parts of the British Empire. William Roxburgh (1751-1815), the founding father of Indian Botany (Robinson 2008) and the Superintendent of Calcutta Botanic Garden, studied and documented plants in his writings, *Plants of the Coast of Coromandel* (1795), *Hortus Bengalensis* (1814) and *Flora Indica* (1820). Thus, the study of plants in colonial India emerged within the context of 'economic botany', and 'botany' remained a part of imperial tool to gain commercial advantage. However, the historiography is silent regarding the Roxburgh's quest and pursuit of economic botany (Kumar 2006; Drayton 2000; Kumar 2012). Viewed in this context, the present paper highlights the efforts of William Roxburgh in the development of economic botany during the Company rule.

Brief Bio of William Roxburgh

William Roxburgh joined the East India Company as a surgeon's mate in the year 1772 after being matriculated at the University of Edinburgh, Edinburgh. He studied surgery under Dr. Alexander Monro, a Scottish anatomist and physician, and botany under John Hope, an early supporter of Linnaeus classification system. Later he received his doctorate (MD) from Edinburgh University and joined the Madras Medical Service as an Assistant Surgeon in 1776. Subsequently, he started to work on collecting plants as the Superintendent of Samalkota Botanic Garden, situated in Rajahmundry region of the present

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Andhra Pradesh, and replaced Patrick Russell as the Company Botanist in 1789. After the death of Robert Kyd, he was appointed as the Superintendent of the Calcutta Botanic Garden in 1793 and occupied this position till the year 1813 (Robinson 2008). During these years of stay in India, William Roxburgh, grew various species of hemp, sugarcane, indigo, pepper, nutmeg, clove and medicinal plants. He also sent plant specimens and botanical illustrations to Joseph Banks, the President of the Royal Society, who was collecting plants from different parts of world for the Royal Botanic Garden, Kew. The search for 'useful' plant by Roxburgh led to the development of economic botany in colonial India.

In Search of Hemp

The British Empire was dependent on the American colonies for the supply of hemp, a fibrous plant useful in making a variety of commercial and industrial products, including rope, textile, clothing and others. Due to the American war of Independence and struggle with France, the price of hemp in Britain increased from 27 pound to 41 pound per ton in 1786 (Mattingly 2012: 111-34). In this context, Britain was desperate to search the local species of hemp in its colonies to sustain the demand of domestic manufacturing industries. As the Transactions of the Society for the Encouragement of Arts, Manufactures, and Commerce, London, noted that:

In the present state of Commerce of this Country, when our Enemies are endeavouring to close every Foreign Port against us, it is the Society's wish and endeavour to show the great Advantages and Resources which may be derived from our Colonies, and to give every Encouragement in facilitating their Efforts to furnish Articles which will answer the purpose of those usually derived from Foreign Kingdoms (Papers in colonies and trade 1811: 249-50).

The search of local substitute for hemp became the primary motive for British explorers. Sir Joseph Banks during his Voyage of Endeavour to New Zealand in 1780s, pointed about the locals producing cloth and rope from a plant which was later to be known as the New Zealand flax. He hoped that this plant might be superior to the traditional hemp and sent a box to London with some very fine plants (McNab 1908: 179-80). Subsequently, various writings came up on the cultivation of hemp by A.M' Donald (1784), Abbe Brulles (1790), George Sinclair (1797) and R. Wissett (1804) others in the last decades of the eighteenth century. Amidst the focus on growing hemp, William Roxburgh, started to search its local alternative in India and experimented on the cultivation of Asian and Europeans varieties of hemp in Calcutta Botanic Garden.

Roxburgh found that Indian made their rope, cordage and fishing nets by a plant called *sunn* (*Crotolaria juncea*). He compared cordage made up of *sunn* "to the sinews and muscles of a ship", and its strength to English hemp (The Annual Biography 1817: 8*)* There were other vegetable substances which were used by the native Indians for cordage, such as, Murgha (*Aletris nervosus*), Kantala (Agave *americana*), Douchy, (*Robinia cannabina*), Merty Paut (*Hibiscus cannabinus*), Paut (*Corchorus olitorius*) and others (Wissett 1804: 19). He found true hemp plant (*Canabis sativa)* on the Coromandel Coast of Madras and Bengal. Roxburgh encouraged the cultivation of local hemp with the help of George Sinclair, who was sent by the Court of Directors to assist him (The Annual Biography 1817: 7).

William Roxburgh also wanted to acclimatize hemp of other countries in India. He wrote to C R Crommeline, the Secretary to the Government, Public Department, in 1796 to procure the seeds of Chinese hemp from Canton. And at the end of the year, he received a quantity of seeds of Chinese hemp but it turned out to be common jute (Home Department 1796). Roxburgh got a new species of hemp *Caloee*, a shrubby species of *Urtica* which was sent by Walter Ewer, the Governor of Bencoolen Presidency, situated at the South Western coast of Sumatra. Roxburgh wrote to Dr. Charles Taylor, the Secretary of the Royal Society of Arts, in 1807 that *Caloee* was strongest plant material which he had ever seen (Papers Relating to the East India Affairs 1813: 5-6).

Due to Roxburgh's effort, Britain managed the domestic demand of hemp and the Court of the Directors of the East India Company acknowledged that the continuous supply of Indian hemp was a subject of national importance for the general consumption and use in royal navy of Britain. The import of hemp in Britain continued to increase during the period between 1786 and 1803 (Table 1). Regarding the exploration of hemp, Roxburgh published a paper on the 'Culture, Properties and Comparative Strength of hemp' in the Transactions of the Society for the Encouragement of Arts, Manufactures, and Commerce in 1804.

Table 1: Hemp and Flax Imported into Great Britain (1786-1803)

Years	Hemp (in Cwt.)
1786	291,482
1790	379,801
1794	564,070
1798	647,832
1803	727,000

Source: Milburn (1813: 211).

Sugar

The other plant which received the attention of botanists from an economic point of view of the Company was sugar. West Indies was the main centre of sugar cultivation where the production was based on slave labour. As the late eighteenth century witnessed the agitation against slavery in England and other parts of the world, the Company wanted to project Indian sugar as "slave free". In April 1789, a representation was made before the Court of Directors to cultivate sugar in India with focus on quality and reduction of cost with respect to West Indies' sugar (Royle 1840: 87; A Report of the Proceedings of the Committee of Sugar-Refiners 1792: 15). The Directors requested the botanists and collectors of Indian revenues '"to ascertain various particulars relative to the existing state of the sugar cultivation" (Royle 1840: 87).

In response to the direction, Roxburgh wrote a letter to Robert Clerk, Civil Secretary, Fort St George, with a detailed description on "Account of the Hindoos Method of Cultivating the Sugar Cane, and Manufacturing the Sugar and Jagary, in the Rajahmundry Circar" (Letter from Dr. Roxburgh to Robert Clerk 20 June 1792). Roxburgh discussed a species of brown raw sugar, *S. officinarum*, cultivated in Rajahmundry region, and of other three varieties of sugarcane of Bengal. The first variety was a yellow cane called as *Bengalees poori*. The second one was the purple cane called as *Kajooli*, which yielded one-eight part more juice than the yellow cane, but the sugar extracted was of dark colour. And the third variety was light coloured cane called *Kullooa* (Roxburgh 1832: 237-39). The letter to Clerk also contained a detailed description of the sugar production by the local residents of Ganjam district (Figure 1).

William Roxburgh also tried to receive specimen of sugarcane seed from other parts of the world. He requested the government to send the seeds of sugarcane from China. The Chinese species of sugarcane, *S. sinensis*, was sent to Roxburgh by A. Duncan, the Surgeon to the Factory at Canton. The species was introduced at the Calcutta Botanic Garden in 1796 with a hope of better result. The Chinese species was solid and hard for two great enemies of East Indian plantation, jackal and white ants. At the same time, the Chinese species was profitable crop even to the third year while the common cane of India was renewed every year. Roxburgh distributed the Chinese species in various parts of Bengal and received the positive feedback. As Richard Carden, the Superintendent of the Company's Rum and Sugar Works at Mirzapore, Culna, in Bengal, wrote in a letter to Roxburgh on 13 August 1801 that "I did purchase twelve cottas of the best Bengal canes last January, merely as an experiment, which yielded just half the quantity of sugar my China canes did" (Roxburgh 1832: 243). Amidst these experimentations, the cultivation of sugarcane became popular in colonial India.

Pepper and Spices

Roxburgh botanical exploration also focussed on pepper and spices. The demand for common spices as pepper and cinnamon in medieval Europe was extravagant due to its varied utility in the treatment of diseases, preservation of meat and cooking the medieval cuisine. At the dawn of the modern age, the expense and fragrance of the spices inspired the geographical and commercial exploration in the various land of the orient, the main production belt of the spices.

Black pepper, which consisted of the dry unripe fruit *of Piper nigrum*, was the most beneficial trade. The earliest record of the description of pepper in Indian subcontinent was given by John Vaan Rheede in his *Hortus Indicus Malabaricus* (1678), the first printed document on plants of the Malabar Coast of India. He described five types of wild peppers including black pepper and long pepper. Carl Linnaeus's *Species Plantarum* (1753) discussed 17 species of pepper from India. William Roxburgh in his *Flora Indica* (1832) described seven species of pepper found in Indian Peninsula.

The Company wanted a substitute of black pepper into the world market to break the Portuguese monopoly in spice trade and assured William Roxburgh of every possible help for introducing pepper at Samalkota Botanic Garden. As the Court of Directors in their General Letter to the Government of Madras on 31 July 1787 conveyed that assure "Dr. Roxburgh every encouragement; and assistance in your power, in the cultivation of such useful Articles of our commerce, particularly that of Pepper" (Dalrymple 1793: 24). The Company gave orders to the Chief and Council of Masulipatam to furnish Roxburgh with all the necessary disbursements. During the survey, Roxburgh found that *Piper nigrum* which originated in Southern India, particularly in Malabar, was also found in Ceylon, Singapore, Penang, Borneo, Java, and Sumatra. In place of the real pepper plant of Sumatra and the coast of Malabar (*Piper nigrum)*, he found a new species, *Piper trioicum*. The new species was an equally good pepper but was difficult to cultivate. Altogether, pepper plantation in Samalkota remained a failure step (The Edinburgh Gazetteer 1822: 409). According to Roxburgh, the failure was due to picking up of a nearly allied species. However, Benjamin Heyne, the Superintendent of Mysore Botanic Garden, found the problem with the method of cultivation. As he explained that the Malayas planted the pepper vine at a distance of five cubits in every direction and supported it on pieces of mootchy tree so that the plant can grow with moisture, strength and vigour (Heyne 1814: 403-04). In spite of the failure, the door had opened for the large study on pepper plantation.

Alexander Anderson, the Superintendent of the Royal Botanic Garden at St. Vincent, and Vansittart, the Superintendent of the Dehradun Garden, also tried to succeed in pepper plantation (Introduction of the coffee plant into the Deyrah Doon 1845). Alexander Dalrymple, the Hydrographer in the British East India Company, wrote his monogram, *Oriental Repertory*, on pepper cultivation and the efforts of William Roxburgh. Apart from pepper, other commercially viable plants which were studied by Roxburgh included clove, nutmeg, indigo, lac and others (Kumar 2012). Subsequently, medicinal plants were also searched as the civil and military explorers of the East India Company who came from an oceanic climate to the tropical region suffered with dysentery, fever and similar other diseases. The economic value of the medicinal plants was also realised by the Company and the Directors asked their botanists and naturalists to explore specific plants for the tropical diseases.

Medicinal Plants

William Roxburgh documented plants with astringent, laxative and purgative qualities as these were considered as the basic ingredients for curing dysentery and fever. William Roxburgh gave special attention to Myrobalans, the unripe drupe-like fruits of a tree in natural order *Combretaceae*, which were preferred as astringents by Indian physicians in curing dysentery. However, after sending the sample of Myrobalans to London, he did not receive encouraging reply as Europeans were not aware of the medicinal value of this plant. Roxburgh himself noted in his writing on the plants of Coromandel that the medical virtue of the Myrobalans "are discarded by the late writers on the *Materia medica* in Europe, and the College of London and Edinburgh have rejected them from their catalogues of official samples" (Roxburgh 1798: 53). With the help of a contemporary naturalist, John Fleming, and a "Hindu Druggist", Roxburgh identified the medicinal virtue of the Myrobalans with its local name *Zengi Har*. Further he studied two particular species of Myrobalans, *Terminalia chebula* and *Terminalia citrina*, in detail from Indian *Materia medica*.

When William Roxburgh was compiling his book on the plants of the coast of Coromandel, he came across a plant *Aglemarmelos* or Bael fruit referred in *Chakradatta-Sangraha* (Roxburgh 1798: 23). The Bael plant had high regard among the local physicians because of its laxative quality. It contained tannin and a large amount of peculiar mucilage and astringent. In the acute stage of dysentery, the unripe fruit was very useful. As Roxburgh observed that the "the fruit, delicious to the taste, and exquisitely fragrant, is not only nutritious, but possesses a laxative and aperient quality, confirmed by experience, which renders it particularly serviceable in habitual costiveness" (Roxburgh 1798: 23). Soon, Bael entered in the London market and Matthew Pound, a Dispensing Chemist, advertised it in the journal *Lancet* in 1850. The advertisement was as follows:

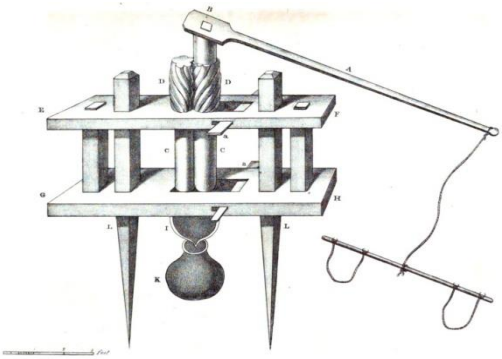
Mr. Pound begs to inform the medical boards of hospitals, dispensaries, &c., and the medical profession generally, that he has received a fresh supply of that valuable medicine, the Indian bael, (so usefull in dysentery, diarrhea, and irritation of the mucous membrane), and now prepared to supply it in any quantity...it does not produce constipation... The Bael is imported by Matthew Pound, Dispensing Chemist, 198, Oxford-street, London (The Lancet, 17 August 1850).

In order to document plants with medicinal values, Roxburgh also tried to find alternatives of laxative and purgative plant like Ipecacuanha. In this regard, he documented a plant, *Asclepias asthmatica* (Untamool), found in Bengal and Coromandel regions with the help of a German Botanist, J. Koenig. After the finding, Roxburgh described that:

At the Coromandel, the roots of this plant have often been used as a substitute for Ipecacuanha. I have often prescribed it myself, and always found it answer as well as I could expect ipecacuanha to do…It was a very useful medicine with our Europeans who were unfortunately prisoners with Hyder Ali, during the war of 1780-3. In a pretty large dose it answered as an emetic, in smaller doses often repeated, as a cathartic, and in both ways very effectually (Cooke 1870-71: 165).

For curing fever, some of the plants were already mentioned by the Dutch Governor of Malabar, Hendrik Van Rheede, who wrote a botanical treatise, *Hortus Malabaricus,* on the medicinal properties of flora of the Western Ghats. Along with floras, spices and condiments were other remedies for fever. Company's surgeons were recommended to carry spices and condiments for being cure from stomachache and fever (Harrison 2004: 232). Roxburgh discovered a bark, *Swietenia febrifuga* (Figure 2), as a substitute for Peruvian bark for fever and stomach related irritation (Extract of a Letter from John Grant 1821: 325). Roxburgh came to know this plant through a doctor of a local hospital in Tranquebar, who used this plant more frequently for treating fever. Soon after its discovery, Roxburgh sent the samples of Swietenia bark to his trusted Dane-Halle missionary friend, Christopher Samuel John, in Tranquebar to explore the outside laboratory's reaction. In 1792, John reported to Roxburgh that he had given the bark to the mission doctors, T L F Folly and J G Klein, to try on the patients in their hospital and the experiment was successful. As John noted that "Your Bark *Swietenia febrifuga* gets here highest reputation by these two doctors" (Chakrabarti 2010: 75-94). Dr Folly also described extensively the findings of this bark in his paper *Bemerkungen der von Dr. Roxburgh entdeckten Fieber-Rinde Swietenia Febrifuga* in 1792 (Jensen 2005: 489-15). Further, Johann Ludwig Schulze asked Christoph Samuel John for arrangement of growing this plant in Halle (Letter from Johann Ludwig Schulze 27 October 1795). Through these measures, medicinal plants received a lot of popularity in the European medical market.

Figure 1: A Traditional Sugar Mill



Source: Third Appendix to Report on Sugar Trade (1822: 6-7).

Figure 2: A Drawing of *Swietenia febrifuga*

Roxburgh (1798: Plate 18)

In Conclusion

British interest in exploration and documentation of *Flora Indica* did not originate from the scientific interest in botany, but it was the result of exigencies of running the empire. The East India Company directed the botanists and naturalists to focus on economic botany by exploring the possibility of acclimatization to find alternatives of expensive imports. William Roxburgh, considered as the founding father of Indian Botany, used gardens at Samalkota and Calcutta to 'seed' the strains of commercially viable plants like hemp, pepper, sugarcane and others. Subsequently, medicinal plants were also explored and documented. These efforts of Roxburgh helped in developing economic botany in India during the East India Company rule. His documentation and exploration of plants became the basic foundation for further botanists like Whitelaw Ainslie, W. O'Shaughnessy, Fleming and others.

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Notes

[1] Camaralist' approach, developed in the late eighteenth and early nineteenth century Germany, focussed on promoting centralized economy for the benefit of state. Camaralism fostered a cadre of naturalists and explorers who were not necessarily administrative officials but served the country by engaging themselves in economic activity with the help of state machinery.

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