Studies in History and Philosophy of Biological and Biomedical Sciences 47 (2014) 12–22

Contents lists available at ScienceDirect

Studies in History and Philosophy of Biological and Biomedical Sciences

journal homepage: www.elsevier.com/locate/shpsc

Studies C Essay

Science in the service of colonial agro-industrialism: The case of cinchona cultivation in the Dutch and British East Indies, 1852–1900

Arjo Roersch van der Hoogte, Toine Pieters

University of Utrecht, Utrecht Institute for Pharmaceutical Sciences, Division of Pharmacoepidemiology & Clinical Pharmacology, Descartes Centre for the History and Philosophy of the Sciences and the Humanities, David de Wiedbuilding, Universiteitsweg 99, PO Box 80 082, Utrecht, 3584 CG, The Netherlands

ARTICLE INFO

Article history:
Received 13 January 2014
Received in revised form
22 May 2014
Available online

Keywords:
Cinchona
Quinine
Netherlands Indies
Colonialism
Laboratory revolution
Pharmaceutical industry

ABSTRACT

The isolation of quinine from cinchona bark in 1820 opened new possibilities for the mass-production and consumption of a popular medicine that was suitable for the treatment of intermittent (malarial) fevers and other diseases. As the 19th century European empires expanded in Africa and Asia, control of tropical diseases such as malaria was seen as crucial. Consequently, quinine and cinchona became a pivotal tool of British, French, German and Dutch empire-builders. This comparative study shows how the interplay between science, industry and government resulted in different historical trajectories for cinchona and quinine in the Dutch and British Empires during the second half of the 19th century. We argue that in the Dutch case the vectors of assemblage that provided the institutional and physical framework for communication, exchange and control represent an early example of commodification of colonial science. Furthermore, both historical trajectories show how the employment of the laboratory as a new device materialised within the colonial context of agricultural and industrial production of raw materials (cinchona bark), semi-finished product (quinine sulphate) and plant-based medicines like quinine. Hence, illustrating the 19th century transition from 'colonial botany' and 'green imperialism' to what we conceptualise as 'colonial agro-industrialism'.

1. Introduction

This study shows how the interplay between science, industry and government resulted in differing historical trajectories for the production, distribution and use of cinchona and quinine in the Dutch and British Empires during the second half of the 19th century. We will argue that these trajectories are closely linked to imperial metropolitan objectives, colonial localities, the rise of an ethical pharmaceutical industry in Europe and a laboratory revolution in botany, chemistry and pharmacy within the context of colonial agro-industrialism.[1] This topic serves as an exemplary case study of how the demands for standardisation, rationalisation and efficacy dramatically affected the production, distribution and use of an important plant-based medicine, quinine, at the end of the 19th century.[2]

Our comparative study of the Dutch and British cinchona cultivation during the second half of the 19th century can be understood in the wider historiography of 19th century science and technology as an illustration of the transition from 'colonial botany' and 'green imperialism' to what we conceptualise as 'colonial agro-industrialism'. First, it builds upon (recent) research concerning the history of pharmacy and more specifically the history of the international pharmaceutical industry and the role of standardisation and control.[3] Both cinchona and its most important alkaloid quinine (isolated in 1820) were part of an emerging alkaloid-based pharmaceutical industry in the 19th century.

E-mail address: a.roerschvanderhoogte@uu.nl (A. Roersch van der Hoogte).

[1] Cunningham & Williams (1992); Liebenau (1987); Wimmer (1994); Travis, Schröter, Homburg, & Morris (1998) and Church & Tansey (2007).

[2] Liebenau, Higby, & Stroud (1990) and Burhop (2008, pp. 1–30).

[3] Gaudillière (1998); Gaudillière & Hess (2008); Bonah, Masutti, Rasmussen & Simon (2009); Liebenau et al. (1990) and Anderson (2005).

http://dx.doi.org/10.1016/j.shpsc.2014.05.019
1369-8486/

Second, we touch upon the history of agriculture and the role laboratory science played in the emergence of a new kind of agricultural industrialism that we have recently conceptualised—so-called 'colonial agro-industrialism'. This term refers to a colonial agricultural–industrial system by which tropical crops were made exploitable and profitable by agricultural government laboratories led and organised by university-trained scientists producing a new hybrid knowledge combining botany and chemistry.[4] The system was supported by an elite group of policymakers, planters and bankers who came to realise that scientific knowledge and technical prowess were keys to wealth and power. This group of stakeholders recognised that efficient overseas transport networks allowed tons of raw plant materials to be processed by large-scale industrial complexes using an integrated management of labour, extraction and standardisation technology as well as expertise, capital and distribution networks in the colonial motherland.[5]

Third, we take colonial science into account, linking the history of colonialism with the history of science and technology. The emphasis is on studying the multidirectional circulation of knowledge and practices between multiple centres and diverse (colonial) peripheries.[6] In the particular case of (medicinal) plants, historians of science like Londa Schiebinger, Harold Cook and Richard Grove have emphasised the interplay between colonial trade networks and the circulation and production of knowledge during the early modern period.[7] Recently, Cook and Walker have argued that the synergy between the history of medicine and pharmacy and economic and cultural history is necessary to comprehend the processes that shaped these "life-altering" exchanges.[8] The Dutch and British cinchona and quinine historical trajectories offer an understanding of the 19th century by showing the intensified interplay of colonial networks, industrial prowess and circulation and production of knowledge regarding cinchona and quinine.

The historical trajectories of cinchona and quinine have been studied from multiple historical and scientific angles.[9] Although these studies have pinpointed the central roles of science and government in the establishment and development of cinchona and quinine in the Dutch and British Empires, they do not explain the differing historical trajectories. In this regard we would like to mention the recent work published by Andrew Goss on the Dutch cinchona and quinine enterprise.[10] Although the basic sequence of historical events in our narrative is similar, the line of argumentation and the presentation of particularities is rather different and is based on new archival sources.[11] Goss's approach is to write a "global history of quinine," using as a framework of analysis the central role of the (Dutch) colonial state.[12] Our article has a comparative approach and uses as a framework of analysis the circulation of knowledge and interaction between the different domains of science, commerce, industry and (colonial) state.

We argue thus that by closely looking at the interplay between science (botany and chemistry), industry (pharmaceutical) and government (Dutch and British), we can better understand how these distinct historical trajectories developed and resulted in rather differing outcomes. We are fully aware of the fundamental differences in the nature of the historical sources used for describing the British case (primarily secondary literature) and the Dutch case (foremost primary material). This is why we have chosen to take the Dutch experience as the central case study. However, we would like to emphasise the need for a comparative approach to achieve a far more fine-grained analysis of how science, industry and government interacted within the Dutch cinchona cultivation program in particular.

The article is arranged as follows. The first part will discuss how the transfer, acclimatisation and experimentation of cinchona evolved during the 1850s and 1860s, and, how a similar point of departure in the Dutch and British colonies resulted in disparate outcomes. The second part of the article then discusses how professionalisation and networks of knowledge circulation played a role in further shaping the cinchona cultivation programs in the Netherlands Indies and British India by the 1870s. In the third part, the focus is on how the Dutch and British cinchona cultivation enterprises were shaped by market and industry developments during the last two decades of the 19th century.

2. Cinchona transfer, acclimatisation and experimentation in the Dutch and British colonies

The isolation of pure quinine from cinchona bark, in 1820, opened new possibilities for the mass-production and consumption of a popular medicine that was suitable for the treatment of intermittent (malarial) fevers and other diseases. As the 19th century European empires expanded in Africa and Asia, control of tropical diseases such as malaria was seen as crucial. Consequently, quinine and cinchona became a pivotal tool of British, French, German and Dutch empire-builders.[13] Several European natural scientists urged their governments to transfer cinchona seeds from South America to their Asian and African colonies. They argued that the destructive production and export methods of the South American *cascarilleros* (Andean bark collectors) were threatening the flow of sufficient cinchona bark to satisfy the exponentially growing demand for the malarial medicine quinine.[14]

The message was not lost on the British and the Dutch who put forward humanitarian ('preserve the cinchona for future generations') economic (profitable cash crop) and military (establishment of colonial rule) motives to secure the flow of sufficient cinchona for the production of the anti-malarial quinine.[15] The Dutch and British governments turned to their scientists for help. In the 1850s and 1860s, Dutch and British scientists (botanists and chemists) thus set out to identify the 'right' cinchona species for the job of acclimatising cinchona in British India and Ceylon and the Netherlands Indies.[16] The complexity of the taxonomy of the cinchona genus, however, resulted in two different ways of integrating scientific

[4] Roersch van der Hoogte & Pieters (2013).

[5] Fox & Guagnini (1999); Kohler (2008, pp. 761–768); Gooday (2008, pp. 783–795); Fitzgerald (1991, pp. 114–126); Finlay (2010, pp. 480–485) and Maat (2001).

[6] MacLeod (2000, pp. 1–13); Osborne (2000) & Schiebinger (2005, pp. 52–55). See also Cook & Walker (2013, pp. 337–351).

[7] Schiebinger & Swan (2005); Cook (2007) and Grove (1995).

[8] Cook & Walker (2013, p. 338).

[9] Duran-Reynals (1946); Maehle (1999, pp. 223–309); Brockway (1979); Headrick (1981); Ziegler (2003); Algera-van der Schaaf (1994); Kaufman & Rúvela (2005, pp. 854–885); Goss (2011) and Goss (2014).

[10] Goss (2014).

[11] Whereas Goss primarily uses Dutch colonial administrative archives, we have used additional colonial source material, such as the annual reports of the Government Cinchona Estate. These first hand and detailed reports of the overseas Colonial Cinchona enterprise, offer a new perspective on how scientists working at the Estate interacted with planters, European scientists and state-officials. But also how they implemented botanical and chemical practices on the estate and reacted to new scientific and technological developments in the European pharmaceutical industry.

[12] Goss (2014, p. 10).

[13] Brockway (1979) and Headrick (1981).

[14] Crawford (2009); Headrick (1988); Brockway (1979); Rocco (2003) and Honingsbaum (2001).

[15] Goss (2011, p. 34).

[16] Kerbosch (1931, p. 319) and Markham (1880, preface).