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ARTICLE

Influences of botanical knowledge from the East in the colonial medical developments: A case study from early modern Kerala, India

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Abstract
The paper looks into the indigenous medical tradition and the exchange of botanical knowledge that happened throughout colonialism and even before it to highlight Kerala's local knowledge base from around eleventh century CE, especially in botany. Plant-based healing practices have been followed in Kerala since antiquity, and the local physicians had considerable knowledge about the properties of the plants they used in and as medicines. The most common spices used in medicines in Kerala include pepper, cardamom, ginger, turmeric, and cinnamon. We also find a similar usage pattern in some early and medieval Western medicines. Since spices did not grow within European geography, it aroused much curiosity about their habitat and uses. This led to a quest for spices and an exchange of knowledge, especially regarding the properties and uses of the plants and spices used as medicines. The medical and botanical developments of early modern Kerala, the European curiosity about spices and plants of the East and how it became grounds for the exchange of knowledge and information relating to the botany of the region and its subsequent presence in European medicine in the medieval and early modern times forms the crux of this paper.

Keywords Early modern Kerala · Spices · Botanical exchange · Indigenous knowledge · Colonialism

1 Introduction

Ayurveda[1] is an interesting field of study not just because it is one of the ancient forms of medicine but also because it uses plants and herbs in its pharmacopeia. This article focuses on using plants and herbs as medicine in medieval and early modern Kerala and their influence on the Western world, especially in Europe. The region of Kerala, a state in the southern part of India, has been chosen as a case study. The paper looks into the indigenous medical tradition and the exchange of botanical knowledge that happened throughout colonialism and even before it to highlight Kerala's indigenous knowledge base from around eleventh century CE, especially in botany. The sources used for the study include medical literature produced within Kerala during the early modern period, like *Sahasrayogam* and *Vaidyamanorama*, various traveler accounts, European botanical works like those of Garcia da Orta and colonial trade records, and secondary materials regarding the same.

Considerable work has been done within India and outside on Ayurveda and its use of plants and herbs as sources of cure. Dominic Wujastyk, in his book *Roots of Ayurveda* (1998), traces the history of Ayurveda by studying the classical texts of the same written in Sanskrit. Kenneth. G. Zysk in *Asceticism and Healing in Ancient India: Medicine in the Buddhist Monastery* (1991) brings out the Buddhist influence in the healing practices followed in Ayurveda. Yet another work of his titled *Religious Medicine: History and Evolution of Indian Medicine* (1993) traces the history of Indian medicine from the Vedic times to the formulation of classical texts. Concerning Kerala, N. V. Krishnankutty Varrier wrote *History of Ayurveda* (2005), where he covered a broad range of topics, which include the origin of Ayurveda, the age of codification (*samhitā* period), different branches of Ayurveda, therapies for plants and animals, and ayurvedic education. Regarding spice trade and exchanges, there have

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[1] The term is used henceforth to mean all the indigenous practices of medicine that existed in medieval and early modern Kerala which relied upon herbs and plants as a cure for ailments.

been varied kinds of work that have looked at the various connotations of it; however, a few of them pertaining to this study is of Paul Freedman (2004), who has worked on the demand for spices and its various uses in Europe as not just a culinary thing but also as medicines and perfumes. John. M. Riddle (1965) explores the introduction and uses of spices and herbs from the East as medicines in Europe. He has tried to bring out the usage of eastern spices separately from the Islamic medicine tradition, arguing for continual trade contact. Stefan Halikowski Smith (2001) has attempted to understand the fascination behind eastern spices, the European curiosity about them, and how they led to explorations of new land and familiarizing Europeans with the habitats and environment in which these spices grew. His framework of understanding the curiosity with the eastern spices has been used in the current study to examine how European literature during the early modern period depicted Kerala's flora and fauna in particular. The present study agrees with his views that an element of mysticism surrounds eastern habitats. The existing scholarships have not dealt largely with the spice trade and its link to indigenous botanical knowledge. The medical and botanical developments of early modern Kerala, the European curiosity about spices and plants of the East and how it became grounds for the exchange of knowledge and information relating to the botany of the region and its subsequent presence in European medicine in the early modern times forms the crux of this paper.

2 Developments in the field of medicine in early modern Kerala

Ayurveda is a natural system of medicine practiced in India since ancient times, and it translates to 'knowledge of life' where *ayur* stands for life and *veda* stands for knowledge. As a system of medicine, Ayurveda has been an all-encompassing branch that has gone through many historical processes and interpretations. The treatment procedures mostly rely on oral medication, primarily obtained from plants or animals. It also employs several other therapies like diet control, enemas, massage, bloodletting, leeching, sweating, and surgeries (Wujasytk, 1998, p. 4). The medicines are in the form of different formulations like *kaṣāyaṁ* (decoction), *taila* (oil that is medicated), *ghṛta* (medicated ghee), *cūrṇa* (powder), *ariṣṭa* (fermented liquid), *gulika* (pill) and *lehyam* (linctus) (Nishteswar & Vaidyanath, 2020, pp. v–vi).

It is a commonly acknowledged fact that the evolution of Ayurveda in Kerala as a scientific branch of medicine had its roots in the Buddhist and Jain traditions, and the later Ayurvedic practitioners merged the indigenous system of medicine with their traditions to shape Ayurveda into what it is known for today. This merging is apparent from the kind of herbs, plants, and other materials that were locally grown or had their habitat in the region. They used the locally available plants as substitutes for the plants mentioned in the classical texts[2] that were unavailable in the area. Ayurvedic practitioners used locally available herbs and plants and changed their patterns (Devi, 2006, p. 62). According to N.V.K Warrier, "this change (in the pattern of Ayurveda) can be noticed by comparing the herbs, medicines prepared and the methods of treatment widely popularized in Kerala with those popular in other states" (Warrier, 1976, p. 64).

With the expansion and intensification of trade came new avenues and spaces of exchange and products of exchange. While examining the case of early modern Kerala, we see that new plants and crops like tobacco and potato were introduced to the region, which became a part of the people's daily cuisine and found their way into medical texts with research on their medicinal properties. It was not just the products being exchanged but also ideas and knowledge. It was two-way traffic, with the West taking back the indigenous knowledge of the locals to their native countries and vice versa.

One of the areas where significant developments were happening in early modern Kerala was the identification and assignment of healing or curing properties to local herbs available in the region, which were used for curing the most common illness. Even today, we find locally grown herbs for the most common diseases. Pepper, turmeric, cardamon, etc., were widely used for common diseases like flu, colds, and diarrhea. *Sahasrayogam,* for example, prescribes a decoction of *mustā* (*Cyperus rotundus*), *karañja* (*Millettia pinnata*), *ativiṣā* (*Aconitum hetrophyllum*), *citraka* (*Plumbago zeylanica*), *bilva* (Bael), *sunthi* (dry ginger), *grandhika* (long pepper root) and *kuṭaja* (*Holarrhena antidysenterica* Kurchi/Conessi) (Nishteswar & Vaidyanath, 2020, p. 26). These herbs and roots are locally grown in Kerala and have been used as household remedies for many years. Herbs such as *mustā* are peculiar to Kerala, and the references to their usage are primarily found in local Ayurvedic texts rather than in classical texts.

This is just one instance where the use of locally grown herbs has been detailed in the text. In all the medical literature produced within Kerala during this period, we see that much effort was put into assigning properties for the herbs available in the region. It could be because of the unavailability of certain herbs mentioned in the classical texts that the practitioners of medicine in Kerala felt the need to

[2] Classical texts refers to ayurvedic literature produced in the northern part of India, namely the *Caraka saṁhitā*, *Suśruta saṁhitā* and the *Aṣṭāṅga Hṛdaya*, though *Aṣṭāṅga Hṛdaya* being written in North India is debated. These texts form the base for many of the ayurvedic literature that was produced in the subcontinent, including those in Kerala.

replace them with what was available in the region. It is, however, indicative of a scientific procedure of knowledge production where the properties of herbs and plants were studied and analyzed to cure certain diseases.

Apart from substituting herbs that were not available in the region but are mentioned as cures for various diseases in the classical literature with locally available plants and herbs and configuring their properties to use to cure not just one but many illnesses, few other developments have taken place over time concerning the medical knowledge production in the region. We find different kinds of formulations being created to be administered to the patient as a part of treatment procedures unique to Kerala and thus absent in the classical literature. *Kastūryādi gulikā* (used to treat respiratory and gastric problems containing aromatic turmeric, lesser galanga, acacia catechu, camphor, nutmeg, etc.), *vāyu gulikā* (used to treat digestion issues, cough and cold containing cinnamon, cardamom, turmeric, gooseberry, myrobalan, nutmeg, vetiver, etc.), *dhanvantaram gulikā* (used to treat problems arising from digestive disorders like bloating of the stomach containing cardamom, ginger root, myrobalan, moringa, jasmine, camphor, etc.), *ilanirkuzhampu* (used to treat eyes and its disorders containing gooseberry, myrobalan, liquorice, coconut water, etc.), *marma gulikā* (used to treat external injuries sustained to vital organs containing kudzu, nut grass, white bat flower, arrowroot, gooseberry, sarsaparilla, sandalwood, etc.) are few of the formulations that have been produced in Kerala and cannot be found in the classical texts (Varier, 2016).[3] In some medicines like *dhanvantaram gulika,* we find the use of camphor, which could be an influence of trade with China,[4] from where camphor was introduced to Kerala. We also see various developments and research being carried out to cure prevalent diseases that people are generally affected with, like fever (*sannipāta*). The use of *karalayam* (*Aristolochia indica*/Indian birthwort), *mukkutti* (*Biophytum sensitivum*/ little tree plant), *tumpa* (*Leucas aspera*/ Tumbai), which are specific to the geography of Kerala for treating fever is also an example of knowledge being produced locally (Varier, 2016, p. 308).

Similarly, although we find references and mentions of coconut as a cure in classical literature, in Kerala, every part of the coconut tree was used as medicine. This feature remains unique to the medical tradition of Kerala. The midrib of leaf blade, fronds, root, fibers of husk, shell etc. were used as medicines (Varier, 2016, p. 308). Tender coconut water and coconut milk were used to make many formulations, which is a development unknown in the classical tradition. Other discoveries include the use of *auṣadha gana* (group of raw drugs), such as roots of ixora and *pacha puzhu* (which is the musk of civet cat) and *verukinpuzhu* (semen of civet cat) (Unnikrishnan, 2004, p. 12; Varier, 2016, p. 308). In addition, a few therapeutic procedures were developed locally and were very much in use. This includes *navarakizhi, dhara, pizhichil, talam, thala pothicil,* etc., for which different oil extracts were used (Unnikrishnan, 2004, pp. 12–13). The making and usage of *dhārāpaṭṭi* (wooden table top for oil therapy) was also a feature of the Kerala healing system and medicine practice (Varier, 2016, p. 308).

3 The European experiments with Eastern spices and herbs

The prowess of the local physicians of Kerala in botany through identifying properties of herbs was appreciated by Europeans even amidst staunch criticisms of their technique in curing people of their ailments (Bartolomeo, 1800, pp. 412–413; Fryer, 1698, p. 114). A few medicinal value herbs and plants, like pepper, cinnamon, cardamom, ginger, clove, etc., also found favor with Europeans, which is apparent from the trade volumes of these spices. It has been noted that by the end of the fifteenth century, the hospital of Countess L'Isle regularly purchased medicines made of pepper, ginger, cinnamon, cassia, nutmeg and mace, cloves, cardamom and turmeric (Nam, 2014, p. 320). These spices, mainly pepper, cardamom, ginger, cinnamon, cassia, nutmeg, and turmeric, were consistently found to be in stock at various pharmacies throughout medieval Europe (Riddle, 1965, p. 187).

There was a continuing belief in the humoural balance of the body among the Europeans, which led to the cooks making a balanced diet. Black pepper and long pepper were used to treat malarial fevers and asthma. Apothecaries played an essential role in prescribing these spices as medicine and compounding medicines made with them. Even though there were local herb substitutes, the apothecaries, in tune with the traders, preferred to prescribe the expensive herbs to the population that could afford them (Freedman, 1949, p. 69).

The trade records of the Companies give us an insight into the amount of these spices being carried back to Europe. They were particularly for culinary and medical use and thus were in ample demand. The Portuguese procured the spices by giving monetary rewards to local rulers. For example, the rulers of Vadakkenkur, Thekkenkur, Alengadu, Parur, Diamper as well as Porcad were given a sum of 72,000 *reais* each per annum, and the Karta of Alwaye a sum of 42,000 *reais* per annum in return for their help in supplying spices to the Portuguese factory in Cochin; the King of

[3] For more information refer to the *Gutikā Prākaraṇa* section of *Sahasrayogam.*

[4] For more information on trade with China see *The Rehla of Ibn Batuta: India, Maldive Islands and ceylon.* (A. M. Husain, Trans.) Baroda, Oriental Institute, p. 190 and T.Wright, *Travels of Marco Polo, the Venetian.* Montana, Kessinger Publishing Co. p. 238.

Thodupuzha also was accorded a sum of 72,000 *reais* by the end of 1605 by the Portuguese (Malekandathil, 2014, p. 97).

With the influx of spices into the European markets, there was a considerable change in the diet, and the demand for spices like pepper, ginger, cinnamon etc. kept growing. It was an expensive commodity, and hence, few could afford it. The apothecaries were prescribing drugs containing herbs and spices, and so were the traders who traded spices. Since they knew the uses and properties of spices and herbs from different lands of the East, the spice traders also acted as pharmacists in prescribing medicines with these spices and herbs.

Spices and herbs remained widely used in medieval and early modern Europe due to its continual belief in the humoral theory propagated by Hippocrates and Galen (Riddle, 1997, p. 102). This was in many ways similar to the humoral theory of Ayurveda. All the classical literature in Ayurveda follows this principle of three-humor theory. The humoral theory propounded by Hippocrates is based on four humors; black bile, yellow bile, blood, and phlegm, all of which had their properties, just like the four elements of the universe: earth, water, fire, and air. Spices as medicines were commonly used to deal with maintaining balance. For example, pepper and ginger was used for lung and respiratory-related issues (Nam, 2014, p. 325). Spices supposedly had warm properties; hence, they were used to treat ailments like the common cold, asthma, and indigestion etc. cinnamon, for example, helped to strengthen the brain and was good for the stomach; clove was used to treat problems related to the heart and so on (Nam, 2014, p. 328). In one of the recorded exchanges of the Dutch trading records, there is a reference to a ship carrying goods from Malabar, which noted separate uses for the company and private use. The entry states that the Captain of the Ship called *The Royalen Eyk*, departing on the 10th of December, 1661, would take with them 800 baren of pepper, 20 loads of saltpeter, and 50 bales of cassia fistula for the use of the company and private use, was 200 jars of ginger and 250 piculs of white pepper (Chijis, 1889, p. 308). Another entry for the year 1664 records the commodities shipped from Malabar, which included ginger, sugar, pepper, sandalwood, lac, saltpetre, cardamom, sappanwood, cassia fistula, hemp, oil, and dried coconut kernels, among other articles (Chijis, 1903, pp. 374–375). In Ayurveda, which was practiced in early modern Kerala, the most commonly used ingredients to prepare medicines for the cure of fever were pepper, cardamom, ginger, long pepper, gooseberry, dry ginger, cassia fistula, sandalwood, turmeric, etc. (Orta, 1913, pp. 163–164; Moosat, 1960, pp. 13–16, 1931, p. 3). Of the works that have been produced on the European demand and consumption of Asian spices as medicine, most of them have shown a growing demand for Asian spices in European markets, especially concerning their medicinal properties. The flow of knowledge on the properties and uses of these spices is evident as we often find that the merchants dealing with the spice trade also prescribed medicines for the people's ailments (Riddle, 1965, p. 187).

As time progressed, mixing spices to create a better, effective medicine was discovered in Europe, leading to the development of compounding medicine. Everett and Gabra bring out a vivid demonstration of compounding medicine in their study of Great Rest, which is an anesthetic recorded by a physician, Nicholas of Salerno, in the thirteenth century. Its ingredients included nutmeg, cinnamon, sandalwood, and other herbs like poppy, mandrake, wild lettuce, fleawort, and purslane seeds. The Great Rest was prescribed to overcome insomnia caused due to fever or pain. Few of the ingredients used in it, like opium and mandrake, posed a threat to the patients, but Everett and Gabra (2014, p. 444) point out that it was prepared in a manner that posed no danger to the patient consuming it.

Interestingly, we find similar claims of non-risk involved with certain plants that had dangerous properties in the works of Garcia d'Orta and Linschoten. The botanical works of both Garcia de Orta and Linschoten emphasize the medicinal properties of the herbs and spices they describe. One of the herbs that is written about is Datura. Da Orta writes about the potent properties of this plant by stating that the person who consumes it is left in a state of intoxication. He hints about women using it to conduct their liaisons without the knowledge of their husbands (Orta, 1913, p. 174). He also emphasizes the strength of Datura and states that the local people do not take it very seriously.

Linschoten (1885, p. 69) also writes about Datura on similar lines where he states,

> 'and some time it maketh him sleep as if he were dead, in that sort he continueth for the space of twentie fower houres: but if his feete bee washed with colde water, then hee commeth to himself againe before the twentie foure howers be expired. This Herbe the Indian and Portingall women use much to give unto their husbandes, and often times when they are disposed to bee merrie with their secret lovers, they give it him, and goe in his presence and perfume their leacherie together...'

Though both are seemingly unrelated, we see a similar trend in using herbs with strong properties in appropriate amounts across the regions. The difference, however, is that in the case of Datura, the local population seems to know the potency of the plant. In contrast, regarding Great Rest, the physician has issued great details on how it should be compounded, the quantity to be used, and the amount to be taken, among other things. Many compounded medicines produced in Europe using Asian spices started gaining popularity. Several of them, like the Great Rest, became

famous all over Europe, of which one was called the Theriaca (Freedman, 2004, p. 68; McVaugh, 1982, p. 254). The main ingredients in it included: white pepper, black pepper, ginger, cardamom, long pepper etc. (Freedman, 2004, p. 68). These spices were native to and produced in Kerala, and we see it being prescribed in local ayurvedic literature for various humor-related fevers (Varier, 2009, p. 51; Moosat, 1960, p. 7).

Even though we see the demand for and use of spices increasing in Europe, procuring it was still expensive. Only the elite had access to the costly spices of the East, at least until the sixteenth century. Studies have shown that physicians prescribed expensive spices imported from the East to upper-class elite patients, whereas regular people were prescribed locally available herbs that were used for centuries. Freedman brings out the various innuendoes that were in circulation because of such practices by the physicians. He writes about a common saying which was used among physicians i.e., "in return for mere words [of gratitude], we use mountain herbs, but for real money, we recommend spices and aromatics" (2008, p. 69). According to him, such statements helped bolster the demand for and the value of the spices used as medicines. Even when an apothecary or a physician was exposed as corrupt, upper-class people in Europe still believed in the efficacy and potency of the spices that they prescribed because of their exotic nature and high price (69).

Evidently, with the spice trade, there was also an exchange of information and knowledge on its properties and uses. Europe became familiar with various properties of the spices and began including them in their dietary routine and also in their medical experiments. The most common and popular European spices, especially medicinal, were pepper, cinnamon, cardamom, ginger, and long pepper. They were frequently used to compound medicines and drugs, especially by the apothecaries. Other plants, known to have medicinal properties, were also traded apart from spices. *Cassia fistula* could be an example. Garcia da Orta (1913, pp. 116, 383) writes in detail about its medicinal properties and that it is abundant in Malabar (part of Kerala). We find the mention of its trade in the accounts of travelers like Barbosa (1918, p. 83) and Varthema (1863, p. 214). The Dutch trade records also have cargo entries, including cassia fistula, as a part of the order (Chijis, 1889, pp. 374–375).

4 The European quest for spices

The European knowledge of spices from the East dates back to classical times. Their inclusion in medical pharmacopeia was also an ancient phenomenon. As early as the fourth century BCE, Greek physician Hippocrates, in his work *Corpus Hippocrateum* mentions the use of pepper (*péperi*) to cure three different kinds of problems faced by women. In other instances, he called it the 'Indian remedy' and the 'Indian product' (Tola & Dragonneti, 1986, p. 171), indicating that the knowledge of its use came from the said region. Later, pepper became one of the most sought-after medicinal spices, along with ginger, cinnamon, and cardamom, especially in Rome. The first-hand knowledge of its use would probably have come from the traders and merchants involved in the trade with India. The merchants who traded in slaves, drugs, and groceries were also known to have sold medicine in ancient Rome (Friendlander, 1913, p. 176). The demand for spices from the East has always been relevant in old Europe, a fact attested by the records in texts like the *Periplus*.

Medieval Europe witnessed a similar demand for spices, though few people could afford them. There was also less knowledge about the cultivation, geography, and conditions required to grow these spices. The people were curious and in awe of spices and their potency to cure multiple ailments. Spices formed a part of the intrigue that soon became part of the European literature produced in the early medieval period. The representation of spices was visible in many allegorical works where the portrayal of the East was associated with them, like the heavily adorned woman sitting on an elephant with the twigs of nutmeg and cloves (Smith, 2001, p. 120).

In the literature of early medieval Europe, elements of mysticism and intrigue were attached to spices. However, most of the Eastern plants and spices were already known to the European world, unlike that of America (Lach, 1965, p. 428). Spices were associated with the East and had a coveted position among the elites of the time. We find several references of the spices being positioned as a part of the terrestrial paradise and thus much coveted. Stefan Halikowski Smith argues that the spices during this period were mystified and thus accorded a status matching the spiritual elements. Citing spices as one of the earliest wonders of the world, he provides the example of the work of Tacitus, where he describes the phoenix, this rarest bird that lived over 600 years, had its nest made of cinnamon and twigs of Frankincense filled with spices (2001, p. 124).

What is also worth noting is that spices were mainly believed to be a component that bestowed a prolonged and healthy life. A thirteenth-century physician, Arnaldus de Villa Nova, was said to have prepared an elixir mostly made of oriental spices, including licorice, myrobalans, sugar, lemon, cinnamon, cloves, nutmeg, galangal, aniseed, and coconut, along with dried grapes (Smith, 2001, p. 128). It is very similar to the *dṛākṣādi kaṣāyaṁ* prescribed in the ayurvedic texts for fever (see, for example, Moosat, 1960, pp. 8–9; Vaidyanath, 2013, pp. 55–58). Barring a few ingredients like galangal, most of the ingredients are the same. The *dṛākṣādi kaṣāyaṁ* also includes many local ingredients

like *nannari kizhangu* (the fruit of Indian sarsaparilla), *muthanga* (*Cyperus rotundus*), *amalagam* (gooseberry), *iruveli*, *padmakesaram* (tendril of the lotus plant), *pathimukam* (sappan wood) and ginger etc. which were indigenous to the geography of Kerala.

Travel accounts and reports suggest that they were searching for the mysterious lands abundantly laid with spices and had much more to offer. Varthema, for example, tries to explain nutmeg and mace plants with what the Europeans were familiar with. Detailing the appearance of the same, he states,

> The trunk of the nutmeg is formed like the peach tree and produces its leaves in like manner, but the branches are closer, and before the nut arrives at perfection, the mace stands around it like an open rose, and when the nut is ripe, the mace clasps it, and so they gather it in September (1863, p. 244).

Similarly, we find Nicolo Conti (1857, p. 9) explaining the form of pepper while comparing it to the ivy and the seeds resembling the form of those of the juniper tree. Tome Pires, in his text (1944, p. 84), expresses wonder about the sheer volume and quality of ginger produced in Malabar. Hence, we see that the early accounts left by the travelers have tried to explain the form and structure of the spices they came across because their people back home were not aware of it. We see them comparing the spices and their structure to what European people were familiar with. Along with explaining the forms and the habitat they grew, we also know that they point out minor details about the uses of these spices, especially in the medical context. For example, Nicolo Conti (1857, p. 8) mentions in the passing that the oil extracted from the cinnamon tree makes an ointment used as medicine.

With the Portuguese's discovery of the Cape of Good Hope, new doors to the trading networks were opened, one in which the spices remained a significant product of exchange. The spices' curiosity and potency remained a constant factor in the explorations of the early Portuguese. One of the groups of people who made this possible was the apothecaries. Their inquiry into the indigenous medicines and spices was well documented and received. In one of the letters Tome Pires (1944, p. xxviii) wrote to his brother, he states that the Portuguese state dispatched him on a mission to India because he was an apothecary. He was asked to serve as an apothecary and choose the drugs that could be used back in his kingdom. Apothecaries remained a consequential link between the traders, merchants, and the local population. They carried back the information obtained from their visits or the traders of the East and prescribed spices as drugs in their capacity as healers. The missions that the apothecaries were sent successfully familiarised people with the properties and uses of the spices. Not just the apothecaries but also traders and merchants who went on voyages to the East were having them prescribed for various ailments. The quest for botanical information and knowledge finally culminated in the creation of the botanical corpora of Garcia da Orta and Hendrik van Rheede, whose influences could be felt in Linnaeus's work on botanical taxonomy.

The company's trade records and other documents attest that brisk trade was happening with spices. Most of it was for culinary and medicinal uses. The first Portuguese commercial fleet was dispatched under Pedro Alvares Cabral in 1500, which marked the commencement of the Portuguese foray into the trading activities of the region. He provides a long list of commodities that could be categorized as medicinal cargo that was to be exported from the port of Calicut. The list includes nutmeg, cinnamon, dry ginger, tamarind, mace, pepper, long pepper myrobalan, sandalwood, and camphor (Cabral, 1984, pp. 91–92). Pepper remained the most popular spice for export. However, apart from pepper, Portuguese exports through the sixteenth century from the ports in Kerala included ginger, tamarind, zedoary, lac, cardamom, and *Cassia fistula*. The spices, however, had to be imported, paying heavy duties, which was a cause of concern for the private merchants who were on an increase in the trade scenario of the region. Nevertheless, their export remained relatively stable in terms of quantity.

The primary purpose of the Dutch trade in Kerala was the acquisition of spices, mainly pepper, which they called the 'black gold' (Markus and Vink, 2015, p. 193). Other items that the Dutch traded in included cardamom, cotton, areca, sandal, cowries, chanks, saffron, indigo, timber, lime and bricks, rice, coir, hides, coconut oil, salt, charcoal, and firewood (Alexander, 1946, p. 187). From the data mentioned in the memoir of the Governor of Ceylon, Stein van Gollonesse, the text, *The Dutch in Malabar* tries to trace the places of procurement of various articles that the Dutch East India Company (V.O.C.) traded in. They comprise cardamom, sandalwood, coir, coconut oil, areca root, tamarind, etc. (Alexander, 1946, pp. 187–189).

Harold Cook (2008) argues through his study that trading activities changed the thinking or perspective of the Dutch people. They started to emphasize values such as objectivity, accumulation, and description. This newfound interest in objectivity and accuracy led to the rise of scientific inquiries in places with which the Dutch had trade connections. One of the areas where a lot of scientific studies were conducted was in the field of medicine. According to Cook, the increasing number of botanical gardens, anatomical theatres, and well-researched and heavily illustrated books on nature indicate this process.

Most of these gardens, especially in the Netherlands, were directed by physicians with substantial knowledge of botanical sciences, and the gardens often expressed political and religious messages in their layout (Grove, 1996, p.

125). Their popularity grew so much that students from all over Europe came to study under the sought-after medical teachers of the Netherlands, like Clusius and his successor Hermann Boerhaave (Grove, 1996, p. 125). Grove also claims that Dutch attempts at botanical networking provided the intellectual and information basis for the English and the French to undertake similar botanical inquiries (140). However, these inquiries and accumulation of knowledge could not have been possible without the active involvement of the local population and their understanding of the indigenous flora and fauna, as we see from the collaborators of Van Rheede like Itty Achuthan, who belonged to a lower caste *Ezhava* family in Kerala.

5 Conclusion

The European fascination with spices and their representation in their literature had a profound impact during the age of discovery when the kingdoms were setting sail to explore new lands and what lay for them there. The curiosity related to spices was evident from Roman trade with the East. The medieval literature circulated only bolstered its position as a precious thing that was attainable but laden with mystery by way of its habitat and environment. The use of spices in medicine was one of the primary reasons behind the need to understand its habitat and the environment in which it grew. Spices became an inherent and one of the most valuable trade items in the following years of European colonialism. However, what was not considered in scholarships regarding trade and natural history was the indigenous knowledge system about the value and properties of these traded herbs and spices, which could form a remarkable corpus of botanical knowledge.

Medical practices of early modern Kerala, though having been through many developments and innovations, were not received with much success outside of the region. What did get circulated was the undisputed knowledge of the local physicians on the properties of spices, herbs, and other plants. This is attested by the fact that in their treatise, both Garcia d'Orta and Van Rheede categorically mention all the medicinal properties and how the local people use each plant and herb they describe. In some cases, every part of the plant or an herb and its uses in medical terms have been discussed in great detail.

Though studies have shown that treatment with expensive spices imported from the colonized world was not very affordable, and it remained accessible to a few, there was still a growing demand for them in the culinary and medical fields. Their varied properties and uses were familiarised through texts like *Hortus Malabaricus,* which prompted more profound studies into botanical knowledge by creating botanical gardens and studies in Europe, resulting in revolutionary changes in botany. The circulation and reception of these ideas and information were indeed a form of appropriation of indigenous knowledge for furthering the trade prospects of the colonial powers.

Declarations

Conflict of interest The author has no conflict of interest to declare and no financial interest to report. This is an original work and has not been published elsewhere.

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