International Journal of the Malay World and Civilisation 11(1), 2023: 67 – 75
(https://doi.org/10.17576/jatma-2023-1101-06)

Remedies Containing Agarwood in Selected Traditional Malay Medical Manuscripts

Ubatan Tradisional Mengandungi Gaharu di dalam Manuskrip Perubatan Melayu Tradisional

Ummu Athiyah Mohammad Tormizi, Nurhusna Samsudin, Yumi Zuhanis Has-Yun Hashim, Anis Najiha Ahmad, Asmak Mutiah Mohd Nasir & Nur Umisha Zainudin

ABSTRACT

Agarwood (Aquilaria spp.) is an Asian native plant with various pharmaceutical potentials proven by recent scientific studies. It has been used for decades in ancient India, China, and the Malay Archipelago traditions. Ayurvedic and traditional Chinese medicine have been widely accepted and integrated into the current medical system. Regrettably, the traditional medicine of the Malay people has not reached this desired level despite the availability of knowledge as recorded in the Traditional Malay Medical (TMM) manuscripts. Agarwood is one of the materials observed in the traditional remedy formulations in TMM. Therefore, this work aims to explore the remedies in the TMM manuscripts with a focus on agarwood. Seven TMM manuscripts: MSS 2999, MSS 2515, MS 1998.400, Khazanah Perubatan Melayu Tumbuhan Ubatan, Kitab Tib Ilmu Perubatan Melayu, Khazinat al-Insan and Kitab al-Rahmah Fi al-Tibb wa al-Hikmah in the collection of the Malaysia National Library were reviewed systematically. The study finds around 100 agarwood-related formulations to treat around 20 diseases, including inner and physical illnesses, a specific approach to explicate the remedy that includes a discussion on selected Quranic verse and taboos, different sources of materials; plants, animals, and minerals, definitions on selected processing and dosing terms, three main methods to extract the materials; direct extraction, through heating or cooling, and maceration, and two ways to take the remedy; orally or externally. Findings from this study can be used as a reference for the practical application of the Malay traditional medication into current scientific development, verifying the relevancy of the discovery of new evident-based alternative medicine while safeguarding TMM as a national heritage.

Keywords: Agarwood; Aquilaria spp.; ethnomedicine; Traditional Malay Medical manuscripts

ABSTRAK

Gaharu (Aquilaria spp.) ialah tumbuhan Asia dengan pelbagai potensi farmaseutikal yang dibuktikan oleh kajian saintifik terkini dan telah digunakan dalam tradisi lama India, China, dan Kepulauan Melayu. Perubatan Ayurveda dan perubatan tradisional Cina telah diterima secara meluas dan disepadukan ke dalam sistem perubatan arus perdana. Malangnya, perubatan tradisional Melayu masih belum mencapai tahap yang diidamkan walaupun terdapat ilmu seperti yang tercatat dalam manuskrip Perubatan Melayu Tradisional (PMT). Gaharu adalah salah satu bahan yang seringkali dimanfaatkan dalam penghasilan ubat tradisional Melayu. Oleh itu, kajian ini bertujuan untuk meneroka formulasi dalam manuskrip PMT dengan memberi tumpuan kepada kayu gaharu. Tujuh manuskrip PMT iaitu MSS 2999, MSS 2515, MS 1998.400, Khazanah Perubatan Melayu Tumbuhan Ubatan, Kitab Tib Ilmu Perubatan Melayu, Khazinat al-Insan and Kitab al-Rahmah Fi al-Tibb wa al-Hikmah di bawah koleksi Perpustakaan Negara Malaysia telah disemak secara sistematik. Kajian menemui lebih kurang 100 formulasi untuk merawat lebih kurang 20 penyakit termasuk penyakit dalaman dan fizikal, satu pendekatan khusus dalam menerangkan formulasi yang merangkumi perbincangan tentang ayat al-Quran dan pantang larang terpilih, sumber bahan yang berbeza; tumbuhan, haiwan, dan mineral, definisi mengenai terma pemprosesan dan dos terpilih, tiga kaedah utama untuk mengekstrak bahan; pengekstrakan terus, melalui pemanasan atau penyejukan, dan melalui pemerahan, serta dua cara untuk mengambil ubat itu; sama ada ditelan atau penggunaan secara luaran. Penemuan daripada kajian ini boleh digunakan sebagai rujukan untuk mengaplikasikan ubatan tradisional Melayu ke dalam pembangunan perubatan semasa, mengesahkan kerelevanan terhadap penemuan perubatan alternatif berasaskan bukti baharu sekaligus memelihara PMT sebagai warisan negara.

Kata kunci: Gaharu; Aquilaria spp.; etnoperubatan; manuskrip perubatan Melayu tradisional

INTRODUCTION

Aquilaria spp. is a genus under the Thymelaeaceae family and consists of about 27 species, of which 13 can produce the fragrance heartwood (The Plant List 2013). It has been known by various vernacular names in many cultures, such as agarwood, aloewood, *agar* (Hindi), *agaru* (Tibetans), *akil* (Tamil), *chenxiang* (Chinese), eaglewood (Papua New Guinea), *gaharu* (Malay), *jinkoh* (Japanese), *oud* (Arabic), *mai ketsana* (Laos), *mai kritsana* (Thai), *sasi* or *sashi* (Assamese), and *tramhuong* (Vietnamese) (Rasool and Mohamed 2016). It is a native plant of Southeast Asia (Elias at al. 2017) and has been used as incense, perfume, and remedy by various cultures. In the Malay world, agarwood has been used in its traditional medicinal practice and recorded in several manuscripts collectively known as *Kitab Melayu Jawi* (Malay manuscripts written in Jawi script) or *Kitab Tib* (Malay Medical Manuscript). The topics discussed in the manuscripts ranged from illness caused by the supernatural world, tips to maintain health, treatment for common conditions, valuable herbs, and their value in treating diseases (Mat Piah 2015).

To date, crude extracts of agarwood and some of the isolated compounds have been shown to exhibit anti-allergic, anti-inflammatory, anti-diabetic, anti-cancer, anti-oxidant, anti-ischemic, anti-microbial, hepatoprotective, laxative, and mosquitocidal properties and effects on the central nervous system (Hashim et al. 2016). Although agarwood has shown numerous beneficial effects proven by scientific research and has a long tradition in the medicinal practice of the Malay people, its modern analysis based on the complete framework of Traditional Malay Medicine (TMM) is deficient. There is little study linking agarwood usage in the TMM manuscripts with a scientific approach. Hence, this paper aims to explore the use of agarwood in traditional remedies in the TMM manuscripts based on several elements, including types of diseases, the process of preparing the remedy, method of treatment, and taboos. Findings from this work are expected to be the reference for the practical application of TMM into current research methodology and scientific development. It also aims to verify the relevancy of traditional remedies containing agarwood towards discovering new evident-based alternative medicine while safeguarding TMM as a national heritage.

METHODOLOGY

The search in this article was based on seven transcribed medical manuscripts from the Malaysian National Library collection, which were as follows.

1. *MSS 2999 Kitab Tib: Pandangan dan Tafsiran Perubatan Moden Terhadap Manuskrip Perubatan Melayu*
2. *Khazanah Perubatan Melayu Tumbuhan Ubatan*
3. *Kitab Tib Ilmu Perubatan Melayu*
4. *Kitab Perubatan Melayu Khazinat Al-Insan Perbendaharaan Manusia*
5. *Kitab Tib Muzium Terengganu (MS 1998.400)*
6. *Kitab Tib MSS 2515*
7. *Kitab Perubatan Melayu al-Rahmah Fi al-Tibb wa al-Hikmah*

The criteria for manuscript selection were (a) accessibility and (b) transcribed manuscripts from *Jawi* writing (a classic Malay writing style influenced by the Arabic language from the Quran) into Roman Malay. All phrases and keywords related to *Aquilaria* spp. particularly *gaharu*, *garu*, *karas*, *gaharu tenggelam, galagaru*, *khalambak* and *jadam* were extracted. Data extraction was performed by three trained researchers familiar with the terminologies and specifically trained to extract the relevant information.

The agarwood-related formulations were then systematically reviewed to extract the information guided by several elements, which are (a) the type of diseases, (b) the formulation structure, (c) the sources of materials used, (d) the processing and dosing terms used in the formulations, and (e) the method of treatments.

RESULTS AND DISCUSSION

The discussion begins with the descriptions of the selected manuscripts, diseases found in the selected manuscripts, and the approach used to explicate the remedy, followed by the sources of the materials, the processing and dosing terms, and the treatment methods used in the agarwood- related formulations.

DESCRIPTION OF MANUSCRIPTS

Seven medical manuscripts in the Malay Manuscript Center of Malaysia National Library collection were selected and reviewed. Each prescription contained any Malay terminology representing agarwood,

namely *gaharu*, *garu*, *galagaru*, *gaharu tenggelam*, *jadam*, *karas*, and *khalambak* was extracted and analyzed. The selected manuscripts were as follows:

1. *MSS 2999 Kitab Tib: Pandangan dan Tafsiran Perubatan Moden Terhadap Manuskrip Perubatan Melayu,* published by Institut Penyelidikan Perhutanan Malaysia in 2015 was authored by Abdul Ghani Hussain. It was originally a concise text about a student's traditional Malay medical lessons from his teacher(s). However, the identity of the original writer and the related history was unavailable.
2. *Khazanah Perubatan Melayu Tumbuhan Ubatan Jilid 1* was documentation of traditional knowledge retrieved from Malay traditional medicine practitioners in Peninsula Malaysia. arranged by Nik Musa'adah Mustapha, Nik Zanariah Nik Mahmood, Nor Azah Mohd Ali and Norini Haron under the grant project under *Institut Penyelidikan Perhutanan Malaysia*. This project was published in 3 volumes under the same book title.
3. *Kitab Tib Ilmu Perubatan Melayu* was rearranged and translated by the late Dr. Harun Mat Piah in 2016 under Institut Penyelidikan Perhutanan Malaysia. This book tried to present a complete discussion that fell under the traditional Malay medicine niche where various text materials and traditional manuscripts were referred to.
4. *Kitab Perubatan Melayu Khazinat Al-Insan Perbendaharaan Manusia* was written in 1951 by Hakim Abdullah, originally in Jawi handwriting. It was transcribed by Sarah Syazwani Shaifuddin and republished by Akademi Jawi Malaysia – Klasika Media in 2017. The book discussed traditional medical practice and some skills for everyday use.
5. *Kitab Tib Muzium Terengganu* was originally a collection of manuscripts from Muzium Terengganu, namely *Ubat Tradisional* (MS 1998.400). It was transcribed and described further by the late Dr. Harun Mat Piah in 2017 and published by *Institut Penyelidikan Perhutanan Malaysia*.
6. *Kitab Tib MSS 2515* was republished in 2014 under Penerbit Universiti Kebangsaan Malaysia. It was rearranged by the late Dr. Harun Mat Piah and Zawiyah Baba. This book discussed a variety of diseases and was considered the best in terms of the content and representing a typical Kitab Tib.
7. *Kitab Perubatan Melayu al-Rahmah Fi al-Tibb wa al-Hikmah* was originally written in Arabic by Shaykh Muḥammad Al-Maqrī Al-Subayrī (d. 1508M). Shaykh 'Abbas Kuta Karang then improved the book with some local value and translated it to Jawi Acheh-Malay in 1849/53M. Latest, it was transcribed into Roman Malay in 2017 by Mohd Affendi Mohd Shafri and Hermansyah Muhammad Yahya under Akademi Jawi Malaysia – Klasika Media.

DISEASES FOUND IN SELECTED MANUSCRIPTS

All seven manuscripts contained traditional remedies to treat various diseases and illnesses in narrated formulations, with all the required materials, processes, and treatment methods. It was also observed that Quranic verses, prayers, incantations, and spells were used in the healing process. In Malay medical practice, diseases can be categorized into illnesses related to physical illness and mental, emotional, or supernatural disorders, known as inner illness. Over 100 formulations containing agarwood were found in the selected manuscripts to treat both internal and physical diseases. Examples of internal illnesses were '*lemah tenaga batin*' (weak sexual desire), '*asuhan syaitan*' (possessed by the devil), and '*gila pusaka*' (greed for inherited wealth). Some formulations were also used to make '*minyak atar*' (a type of perfume) and '*makjun*' or '*jamu*' (Malay traditional herbal medicine). Meanwhile, the physical illnesses treated were listed as follows:

1. *Kepialu/ kepialu angin/ demam kepialu*: Several types of fever/ typhoid fever
2. *Angin/ kembung perut/ senak perut/ sakit perut/ sawan senak/ sawan agung/ angin perut/ mising/ medu/ cirit/ sapan*: Stomach-related illness such as gastric and diarrhoea
3. *Mulut berbau/ bau tubuh/ bau ketiak*: mouth and body odor
4. *Wasir*: hemorrhoids
5. *Serawan*: rashes skin
6. *Angin besar*
7. *Resdung/ restung/ sedung/ sinusitis akut*: Allergic rhinitis
8. *Senggugut/ tiada datang haid*: Menstrual-related illness
9. *Lenguh badan*: bodyache
10. *Sakit karang/ al-hasiyah*: Gallstone/ dysuria
11. *Bengkak batu pelir*: inguinal hernia
12. *Seriawan*: Disease in mouth or tongue, caused by lack of consumption of fiber
13. *Rabun*: myopic

14. *Lelah/ esak*: asthma
15. *Al-Khanazir*: swollen lymph node
16. *Al-'irq al-madiyyin*: illness related to tendon
17. *Sakit pinggang dan sendi*: Back and joint pain
18. *Batuk*: cough
19. *Strok*: stroke

The inclusivity of illness treated in TMM was attributed to the strong supernatural or religious influence in Malay society since the yore days. Malay people showed a strong need for spiritual dependence; even before the advent of religion, they worshipped the spirit of nature, known as Animism. The arrival of faith in Nusantara or Malay world was welcomed, starting with Hinduism and Buddhism around the 13th century, and Islam in the 15th century. Each belief and religion have its worldview on the spiritual world and supernatural things; hence, acknowledging unnatural illnesses and treating them was common and crucial in society (Ngadeni 2017).

THE APPROACH TO EXPLICATE THE REMEDY IN THE FORMULATIONS

The formulation in a manuscript refers to the know-how to treat illness until the patient recover. All the formulations in the manuscripts consist of instructions from different components to produce a specific remedy and a complete treatment. The components were identified as follows:

1. name of the illness
2. symptom of illness
3. name and parts of materials
4. quantity of materials
5. extraction process
6. treatment method
7. taboo
8. Quranic verse or Hadith

All the formulations were observed to possess a similar flow of instructions. Figure 1 shows the typical flow of instructions observed in the formulations.

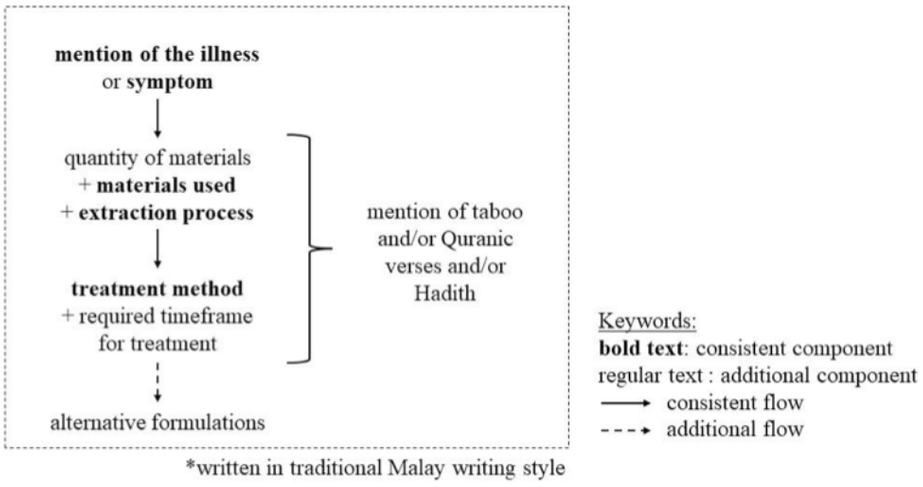

FIGURE 1. The flow observed in the formulations.

Unlike the additional components, the consistent components were found in all formulations in the same flow, even in the alternative formulation. Different formulations were provided as alternatives when the former formulation did not give the intended healing effect or if the former was unsuitable for the patient. Taboo and Quranic verses or Hadith were usually found during the extraction process or the treatment. The complete process flow shows that the practitioners were well-versed in the potential of each material, the effects of using different extraction methods, and the overall treatment. **Formulation A** shows the example of a formulation with all the components; meanwhile, **Formulation B** shows the instance of a formulation with taboo and Quranic verses.

Formulation A to treat '*ubat angin*' (stomach-ache) from *Kitab Tib Muzium Terengganu:*

*"Sebagai lagi **(1)** ubat angin, ambil **(2)** cabai **(3)** berat sepaha dan kemukus tiga emas dan buah pala sepaha dan kayu manis berat sepaha dan jemuju karsani berat sepaha dan khalambak tengah tahil, sedelinggam berat dua emas, apiun berat sepaha*

*dan air bunga raya dan pijar berat seemas, sekalian itu **(4)** giling lumat-lumat, bubuh air madu maka **(5)** gentel, **(6)** makan **(7)** tiap-tiap hari, insya-Allah taala, afiat."*

In English: Other medicine for bloated stomach, take chili weighing *sepaha* and *kemukus* weighing three golds (a type of weighing system) and nutmeg weighing *sepaha* and cinnamon weighing *sepaha* and jemuju karsani (a kind of herbs) considering *sepaha* and *khalambak* half tael, *sedelinggam* (a sort of red paint) weighing two golds, apiun weighing *sepaha* and hibiscus water and *pijar* weighing a gold, all of these are ground finely, add honey water and then shape it into small grains (using fingertips), then eat (it) every day, with God's will, (the patient) will recover.

In the above formulation, each component was numbered to show it clearly, as follows:

a. '*..ubat angin,*' (medicine for bloated stomach); was the disease, in some formulations; symptom
b. '*..cabai.. dan kemukus.. dan buah pala..*' (..chili.. and cubeb.. and nutmeg..); were the materials needed
c. '*..berat sepaha.. tengah tahil..*' (..weighing *sepaha*.. half tael..); was the measurement or quantity for each material
d. '*..giling lumat-lumat*,' (..grind finely,); was one of the extraction methods
e. '*..gentel,*' (..make small grains with fingertips..); was the finalization process that determined the final product
f. '*..makan..*' (..eat..); was the treatment method
g. '*..tiap-tiap hari*,' (..every day..); was how the remedy is to be taken.

Formulation B to cure '*batu karang'* (gallstone) can be found similar in both *Kitab Tib Perubatan Melayu* and *Kitab Tib MSS 2515*:

*"Sebagai lagi ubat orang sakit karang maka tiada berasa ke sungai seni atau sahaja sakitnya, maka ambil gaharu maka dikikis segenggam erat dan cendana pun dikikis demikian juga sama banyak dan sirih dan akar limau purut yang menikam ke bumi; tatkala mengambil dia **jangan dilintas bayang-bayang**; panjangnya sejengkal telunjuk; semuanya dimasukkan ke dalam periuk baharu maka apabila sudah masak rempah-rempah itu maka bacakan **Qulhuallahu Ahad** hingga akhirnya tiga kali jangan bernafas kemudian maka ketang pula ubat itu maka minum tujuh hari atau empat puluh hari jangan diminum air yang lain, afiat."*

In English: Other medicine for the gallstone disease where the patient cannot go to 'the art river' (as an allusion to not being able to defecate), take agarwood then scrap a handful and scrap the equal amount of sandalwood and betel and Kaffir lime's root that poked into the ground; **do not cross the shadow** when taking it; the length is an index finger long; put all the materials into a new pot and after all the spices are cooked then read ***Qulhuallahu Ahad*** until the end (of the Surah) three times without taking a breath then tie the medicine tightly and then drink it for seven days or forty days without drinking other drink, (the patient) will heal.

From the formulation, the first bolded phrase, '***Jangan dilintas bayang-bayang;***' literally means do not cross the shadow. It can be understood as a means which serves as a taboo; do not cross any shadow while acquiring the materials needed for the formulations. However, when read contextually, it somehow can be understood as do not acquire the materials when the sun is out; take them during the night instead. The second bolded phrase, '***Qulhuallahu Ahad***,' is a Quranic verse, specifically the first verse from *Surah al-Ikhlas*. The taboo and Quranic verses were included in the formulation, strongly showing the influence of Malay culture and Islamic teachings in the Malay medical traditional efforts.

Sources of other materials/ excipients used in the formulations

In the manuscripts, most agarwood-related formulations also contain other materials from plants, animals, and minerals.

1. The most used sources were from plants and herbs, as around 150 species and more were mentioned in the formulations. The most mentioned ones were *cendana* (sandalwood), *jintan* (caraway), and *buah pala* (nutmeg). Some plants were hard to recognize and were likely to no longer exist to date. The critical part of the herbs, such as sticks, leaves, roots, or even shoots, was precisely mentioned. Different names were called for some parts of the herbs, but a thorough observation can still standardize them. The herbs used in the traditional manuscripts also can be identified using scientific names.
2. Materials from animal parts such as deer's horn, hedgehog's thorns, and elephant's ivory were also mentioned but not as abundant as plants
3. Albeit rare, mentioned sources were mineral or natural products such as *belerang* (sulfur) and salt.
4. In specific formulations, they included materials that can be found from daily tools such as '*kayu'* (stalk), '*debu'* (dust), and '*pinggan tembikar'* (pottery plate).

Using different materials in a formulation suggests that the remedy was based on synergistic effects. The treatments were mainly formulated by mixing various materials to realize a common therapeutic goal (Mat Piah 2015). In some studies, a single compound turns out to be toxic (Yang et al. 2014); however, they were safe when used with other compounds. It has been reported that combinations of agents can effectively reduce side effects and improve adaptive resistance, synergistically increasing the likelihood of conquering complex diseases, such as cancer (Yuan et al. 2017). Different materials can also enhance the potential of some materials, and some are used to increase the value of the overall remedy by acting as the binding or stabilizing agent (Mas'oad, Mohammad & Mohd Shafri 2020).

Formulation C to treat '*demam kepialu*' (typhoid fever) is a formulation containing agarwood from Kitab Tib MSS 2515. Table 1 shows the medical potential of each material found in the formulation.

Formulation C:

"Sebagai lagi ubat minum demam kepialu ambil gaharu dan cendana dan bonglai dan halia dan lada dan cabai dan jintan kedua dan bawang kedua, giling lumat-lumat, bubuh dalam kain putih maka masukkan ke dalam periuk baharu maka rebus, setelah masak maka minum, afiat."

In English: Other drinking medicine for typhoid fever, take agarwood and sandalwood and oroxylum and ginger and pepper and chili and both (white and black) caraway and both *bawang* (onion and garlic), grind finely, put onto the white cloth, and put it in a new pot and then boil it after it is cooked then drink it, (the patient) will heal.

TABLE 1. The medical potentials of each material found in Formulation C.

No.	Material	Scientific name	Medical potentials
1.	*Gaharu* (agarwood)	*Aquilaria* spp.	Anti-allergic, anti-inflammatory, anti-diabetic, anti-cancer, anti-oxidant, anti-ischemic, anti-microbial, hepatoprotective, laxative, mosquitocidal properties, and effects on the central nervous system. (Hashim et al. 2016)
2.	*Cendana* (sandalwood)	*Santalum* spp.	Anti-hyperglycemic, anti-oxidant (Misra and Dey 2013), anti-cancer (Santha and Dwivedi 2015), anti-aging (Francois-Newton et al. 2021), etc.
3.	*Bonglai* (oroxylum)	*Oroxylum indicum*	Anti-bacterial, anti-inflammatory, hepatoprotective activity, and immunomodulatory activity (Ahad et al. 2012), anti-diabetic and anti-oxidant (Biswas et al. 2022)
4.	*Halia* (ginger)	*Zingiber officinale*	Anti-cancer (Hassan and Ramakrishnan 2013), anti-oxidant, anti-microbial, (El-Baroty et al. 2010, Yang & Rahmawati 2022), anti-emetic (Palatty et al. 2013), etc.
5.	*Lada* (pepper)	*Piperaceae sp.*	Hypoglycemic, anti-inflammatory, analgesic activity (Paul et al. 2013), etc.
6.	*Cabai* (chili)	*Capsicum sp.*	Anti-cancer, anti-inflammatory, anti-diabetic, anti-microbial, anti-cholesteremic, anti-clotting, and anti-oxidant activities (Chamikara et al. 2016)
7.	*Jintan* (caraway/cumin)	*Carum carvi*	Anti-tubercular activity, anti-cancer, anti-colitis activity, anti-obesity activity, anti-microbial activity, anti-hyperglycemic activity, anti-oxidative stress activity, (Miraj and Kiani 2016) wound healing (Salari Rafsanjani et al. 2022).
8.	*Bawang merah* (onion)	*Allium cepa*	Anti-cancer (Zamri and Hamid 2019)
9.	*Bawang putih* (garlic)	*Allium sativum*	Anti-cancer (Nouroz et al. 2015), anti-fungal and anti-microbial (Sharma et al. 2022)

The usage of flora and fauna in the treatment came from the close relationship between Malay people and nature. This relationship can be found in medicine and other aspects of life, such as spoken language and art. Among the reasons was the richness of the land with flora and fauna; Malaysia has at least 17 631 recorded flora and 5 661 recorded fauna (Jabatan Penerangan Malaysia 2017). The recent research shows the medical potential of the materials used, manifesting the scientific value in traditional medicine.

PROCESSING AND DOSING TERMS USED IN THE FORMULATIONS

The formulations in the manuscripts were written along with the specific instructions that include the dosing terms used to show quantity, weight, and time. For the amount, most of the traditional terms are hardly used nowadays, such as '*dirham*'. As for the terms for process, some formulations used familiar words that are still used nowadays, such as 'masak' (cook) and 'selimutkan' (cover), and some used traditional terms that were no longer custom.

Either way, the formulation still needs to be observed thoroughly and translated with help from experts and written references or documents. This is because even though the term used is expected, the contextual understanding can be confusing as it depends on the lifestyle and culture of the specific time and place. A single dosing term can have different meanings when written in other areas. Hence, it is crucial to always refer to original manuscripts and relevant traditional practitioners to empirically understand the instructions before designing modern scientific research on the traditional remedy.

Some of the processing and dosing terms found in the agarwood-related formulations found in the selected manuscripts were as follows:

1. *Emas* (*berat empat emas*): A type of currency
2. *Kupang* (*berat dua kupang*):
    a. A type of ancient currency with a different value (depending on respective places); 10 cents (in North of Peninsular Malaysia), 12.50 cents (in Kelantan), 50 cents (in Pahang, etc.)
    b. A type of gold weight measurement (equivalent to 161 taels)
3. *Paha* (*berat sepaha*): A quarter of something
4. *Dirham* (*sepuluh dirham berat*): Silver coins
5. *Tahil* (*setengah tahil*):
    Weight measurement is equivalent to
    a. Katiati or 37.8g (for goods)
    b. 16 *mayam* (for gold)
    c. 10 ci or 3.8g (for candu, rubber)
6. *Gantang* (*segantang*): Measurement or quantity equal to 4 cups or 4.54 liter (usually for rice)
7. *Iris* (*tujuh iris*): Slice(s)
8. *Cekak* (*secekak*): A measurement in which the size is determined by a circle made by bringing together the thumb with another finger
9. *Cawan* (*lima cawan*): Small, stemmed bowl made with pottery and others; as drinking container; cup
10. *Genggam* (*segenggam erat*): A handful of many that can be held in the fist
11. *Jengkal* (*sejengkal telunjuk*): The distance between the tip of the thumb and the tip of the other finger
12. *Ruas* (*seruas jari telunjuk*): The section between one segment to another (bamboo, fingers, sugar cane, etc.)
13. *Pengapit* (*sepengapit*): The tool to flank, pinch (with finger)
14. *Asah* (*diasah dengan air didih, asah minum, asah pada pinggan yang tajam, asah pangkah*): Rubbing (to sharpen, levelling, smoothing, and others)
15. Pipis: Thinning out, crushing, or refining (pepper, spices, or others) using a millstone
16. *Pudi* (*dipudi, pudi mesra-mesra*): Making small grains
17. *Dibedak:* Powdering, applying something as powder
18. *Dibembam* (*setengah dibembam dan setengah mentah*): Burning in warm embers or ashes (tubers, fish, etc.)
19. *Tangas* (*bertangaslah*): Warming the body with steam (to remove sweat etc., to sweat); warm up with smoke, evaporate, steam
20. *Hisap* (*hisapkan*): Inserting something (into the mouth or nose) by pulling air, inhaling (into the nose or mouth), sucking, sipping
21. *Beburahkan: Bura*: spraying, exhaling (hard), spraying out of something (about fire, water, and so on)
22. *Dikhamir:* Mixing with yeast

From the data and observations, the overall idea of preparing the remedy was to use or extract the natural ingredients from the materials. This can be seen collectively from how the materials were treated in the overall process. Different methods during the processing show how the extraction of natural ingredients was unique and specific in each formulation. All the extraction processes used in TMM were doable and practical for empirical experiments. The examples of the extraction process involved in preparing the remedy were as follows.

1. Direct extraction processes.

Asah (sharpening), *tumbuk* (mashing), *pipis* (refining/ crushing), *pudi* (making into small grains), *giling* (grinding), *kikis* (scraping), *gentel* (thickening and forming using fingertips), *kikir* (grating), *hancur* (crushing), *dikhamir* (fermenting).

2. Extraction through heating or cooling processes.

Rendang (frying without oil, or frying until dry), *masak* (cooking), *rebus* (boiling), *bakar* (roasting), *embunkan* (dewing), *kukus* (stimming), *jerang* (boiling water), *bembam* (burning in ember), *hangatkan* (warming).

3. Maceration.

Rendam (soaking).

TREATMENT METHOD

The final product varied depending on the extraction and the overall preparation of the remedy. It can be either in solid, liquid, or aqueous form and can be consumed either orally or used externally. The difference showed that the traditional practitioners were aware that some materials could be harmful to the body when taken orally, and the remedy was prepared to maximize the use before the treatment. The treatment type can be a clue on the route of administration used in the treatment for a further drug study. The treatment methods found in agarwood related formulations were as follows (with definitions from Pusat Rujukan Persuratan Melayu):

1. Remedy consumed orally: *Minum* (drunken), *makan* (eaten), *hisap* (inhaled), *telan* (swallowed)
2. Remedy used externally: *Burahkan* (spitted out), *bertangas* (steam), *bedakkan* (powdered), *bubuh dan barut* (put and wrap), *semburkan* (sprayed), *lumur* (lubricate), *sapu* (apply), *dicucur* (put)

CONCLUSION

Agarwood was used to treat various kinds of diseases in TMM. The remedy usually included other materials, prepared with detailed processes and specific extraction methods for different treatment types. The minute details and reliability shown in the traditional medicine, along with the current scientific data, demonstrated that the traditional medicine was based on sound scientific knowledge of that time. Research-wise, the remedies from TMM are within reach to be translated into current scientific language and existing experimentation methods. Hence, a serious effort towards producing new evident-based alternative medicine should be considered. Such would contribute to the ethnopharmacological discovery, while safeguarding traditional medical manuscripts as national heritage and paving the economic return from the potential pharmaceuticals developed from the native plants.

ACKNOWLEDGMENT

This research was funded by the Fundamental Research Grant Scheme of Malaysia (FRGS/1/2019/WAB11/UIAM//1). Thanks to International Institute for Halal Research and Training (INHART, IIUM) for providing the necessary facilities and support to carry out this work.

REFERENCES

Ahad, A., Ganai, A.A., Sareer, O., Najm, M.Z., Kausar, M.A., Mohd, M. & Siddiqui, W.A. 2012. Therapeutic potential of *Oroxylum indicum*: A review. *Journal of Pharmaceutical Research And Opinion* 2(10):163-72.

Biswas, S. K., Dana, S., Pathak, P.S. & Gupta, M. 2022. *In vitro* anti-diabetic and anti-oxidant activities of *Oroxylum indicum* (Kurtz): A potent wild medicinal plant North-Eastern region in India. *Journal of Pharmacognocy and Phytochemistry* 11(5): 38-44.

Chamikara, M.D.M, Dissanayake, D.R.R.P., Ishan, M. & Sooriyapathirana, S.D.S.S. 2016. Dietary, anticancer and medicinal properties of the phytochemicals in chili pepper (*Capsicum Spp*.). *Ceylon Journal of Science* 45(3): 5.

El-Baroty, G.S., Abd El-Baky, H.H., Farag, R.S. & Saleh, M.A. 2010. Characterization of antioxidant and antimicrobial compounds of cinnamon and ginger essential oils. *African Journal of Biochemistry Research* 4(6): 167-74.

Elias, M.F., Ibrahim, H. & Wan Mahamod, W.R. 2017. A review on the Malaysian *Aquilaria* species in karas plantation and agarwood production. *International Journal of Academic Research in Business and Social Sciences* 7(4): 1021-1029.

Francois-Newton, V., Brown, A., Andres, P., Mandary, M.B., Weyers, C., Latouche-Veerapen, M. & Hettiarachchi, D. 2021. Antioxidant and anti-aging potential of Indian sandalwood oil against environmental stressors *in vitro* and *ex vivo*. *Cosmetics* 8:53.

Hashim, Y.Z.H.Y., Kerr, P.G., Abbas, P. & Mohd Salleh, H. 2016. *Aquilaria* Spp. (agarwood) as source of health beneficial compounds: a review of traditional use, phytochemistry and pharmacology. *Journal of Ethnopharmacology* 189(2016): 331-360

Hassan, M. & Ramakrishnan, R. 2013. Anticancer properties of *Zingiber officinale*-ginger: a review. *International Journal of Medicine and Pharmaceutical Sciences (IJMPS)* 3:11-20.

Mas'oad, M.D., Mohammad, M. & Mohd Shafri, M.A. 2020. Rawatan kanser dalam beberapa manuksrip Melayu terpilih. In Mohd Shafri MA (ed). *Manuskrip Perubatan Melayu: Warithan Kebitaraan Melayu*, 29-59. Kuala Lumpur: Akademi Jawi Malaysia.

Mat Piah, H. 2015. Ilmu perubatan melayu tradisional dari naskhah-naskhah lama. *Jurnal Antarabangsa Alam Dan Tamadun Melayu* 3(3):3-17.

Miraj, S. & Kiani, S. 2016. Pharmacological activities of *Carum Carvi L*. *Der Pharmacia Lettre* 8:135-138.

Misra, B. & Dey, S. 2013. Evaluation of *in vivo* anti-hyperglycemic and antioxidant potentials of α-santalol and sandalwood oil. *Phytomedicine* 20(5): 409-416.

Ngadeni, N. 2017. *Falsafah Dan Prinsip Asas Perubatan Melayu.* Pulau Pinang: Baytul Hikma.

Ummu Athiyah Mohammad Tormizi
International Institute for Halal Research and Training,
International Islamic University Malaysia,
53100, Gombak, Selangor, Malaysia.
umm.athyh@gmail.com

Corresponding author
Nurhusna Samsudin
International Institute for Halal Research and Training,
International Islamic University Malaysia,
53100, Gombak, Selangor, Malaysia.
nurhusna@iium.edu.my

Yumi Zuhanis Has-Yun Hashim
International Institute for Halal Research and Training,
International Islamic University Malaysia,
53100, Gombak, Selangor, Malaysia.
yumi@iium.edu.my

Anis Najiha Ahmad
International Institute for Halal Research and Training,
International Islamic University Malaysia,
53100, Gombak, Selangor, Malaysia.
anisnajiha@iium.edu.my

Asmak Mutiah Mohd Nasir
Biochemistry Programme,
Institute of Biological Sciences,
Faculty of Science,
University of Malaya, Jalan Universiti,
50603, Kuala Lumpur, Malaysia

Nur Umisha Zainudin
Department of Biomedical Sciences,
Kuliyyah of Allied Health Sciences,
International Islamic University Malaysia (IIUM),
25710, Kuantan, Pahang, Malaysia

Nouroz, F., Mehboob, M., Noreen, S., Zaidi, F. & Mobin, T. 2015. A review on anticancer activities of garlic (*Allium Sativum* L.). *Middle-East Journal of Scientific Research* 23(6): 1145–1151.

Palatty, P.L., Haniadka, R., Valder, B., Arora, R. & Baliga, M.S. 2013. Ginger in the prevention of nausea and vomiting: a review. *Critical Reviews in Food Science and Nutrition* 53(7):659-669.

Paul, S., Sheikh, H., Sikder, S., Paul, S.K., Hasan, A.R., Rahaman, M. & Kundu, S.P. 2013. Hypoglycemic, anti-inflammatory and analgesic activity of *Peperomea pellucida* (L.) HBK (piperaceae). *International Journal of Pharmaceutical Science and Research* 4(1):458-463.

Rasool, S. & Mohamed, R. 2016. Understanding Agarwood formation and its challenges. In Mohamed R (ed). *Agarwood*. New York: Springer.

Salari Rafsanjani, M., Tabatabaei Naeini, A., Meimandi-Parizi, A., Nowzari, F., Mujtaba Wani, M. & Iraji, A. 2022. Wound healing effect of *Carum carvi* L. on the incised skin wound in male rats: Histopathology, total protein and biomechanical evaluations. *Veterinary Medicine and Science* 1-12.

Santha, S. & Dwivedi, C. 2015. Anticancer effects of sandalwood (*Santalum album*). *Anticancer Research* 35(6):145-150.

Sharma, S., Raj, K., Riyaz, M. & Singh, D.D. 2022. Antimicrobial Studies on Garlic Lectin. *Probiotics & Antimicrobial Protein.*

Yang, J.J. & Rahmawati, F. 2022. Antimicrobial effects of various red ginger (*Zingiber officinale*) extract concentrations on Escherichia coli bacteria. *European Journal of Biotechnology and Bioscience* 10(2): 63-67.

Yang, Y., Zhang, Z., Li, S., Ye, X., Li, X. & He, K., 2014. Synergy effects of herb extracts: pharmacokinetics and pharmacodynamic basis. *Fitoterapia* 92:133-147.

Yuan, H., Ma, Q., Cui, H. Liu, G., Zhao, X., Li, W. & Piao, G. 2017. How can synergism of traditional medicines benefit from network pharmacology?. *Molecules* 22:1135.

Zamri, N. & Abd Hamid, H. 2019. Comparative study of onion (*Allium cepa*) and leek (*Allium ampeloprasum*): identification of organosulphur compounds by UPLC-QTOF/MS and anticancer effect on MCF-7 cells. *Plant Foods for Human Nutrition* 74(4):525-530.