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# Ethnomedicinal Uses of Some Common Malaysian Medicinal Plants

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## Abstract

Historically, natural products have always been a rich source of novel pharmacological leads, thus, making the ethnobotanical and ethnopharmacological knowledge an important and major asset of the medicinal plant-based drug discovery in providing hints for effective and safe chemotherapeutic compounds. Such knowledge, however, requires a thorough review and documentation of the ethnomedicinal and indigenous uses of local plants of every part of the world. Malaysia is a global hub for natural products which contributes to its GDP. Malaysia is also one of the 12 most diverse Megabiodiversity countries. Its rainforest is ranked 4th on the list of biodiversity hotspots in Asia after India, China, and Indonesia and is also acknowledged as the world's oldest rainforest. Natural products are relevant to both Malaysian health care and agriculture which are parts of the national key economic areas (NKEA) under the Government's Economic Transformation Plan as well as parts of the United Nations' 17 Sustainable Development Goals (SDGs). Though the quality, efficacy, and safety of herbal products require global and international standardization, herbal products should be made accessible to low-income and rural communities across the globe. The proper documentation of the ethnopharmacological important plants in addition to their preservation and cultivation would enhance the sustainable use of the various indigenous plants. This work is unique in the sense that it is meant to review some of the most important high-value herbal products in Malaysia. Though it covers only a few representatives of Malaysian medicinal plants.

**Keywords:** *Boesenbergia rotunda*, *Orthosiphon aristatus*, *Morinda citrifolia*, *Polyalthia bullata*, *Hylocereus polyrhizus*, *H. undatus*, *Vitex trifolia*

## 1. Introduction

The Malaysian rainforest is not only acknowledged as the world's oldest rainforest but also ranked 12th in the world as well as 4th on the list of biodiversity hotspots in Asia after India, China, and Indonesia. Malaysia has an estimated 12,500 species of seed plants with about 1200 species of medicinal plants [1]. Malaysia is also endowed with more than 3000 species of medicinal plants among its over 15,000 flowering plants [2, 3]. The Malaysian herbal industry, which is fully supported by the government, is also enjoying rapid development in line with the growing global herbal industry owing to the increasing demand for healthy

functional food, herbal supplements, herbs-based energy drinks, and cosmetics. Malaysia, in addition to its vast biodiversity, is also endowed with multi-ethnic cultures offering a unique combination of folk and traditional medication such as Ayurveda, the Traditional Chinese Medicine (TCM), Kampo, and Jamu for the development of the herbal industry [4]. Despite the advancement in synthetic chemistry, the use of Complementary and alternative methods (CAM) to support medical treatment, reinforce the immunity system, prevent relapses in cancer, reduce disease symptoms, and maintain health is also increasingly becoming more popular worldwide with almost 80% (about two thirds) of the population in developing countries still depending on herbal supplement products to meet their healthcare needs, according to the World Health Organization [5]. On the other hand, most of the conventional pharmaceutical drugs under development and those already in the market today owe their origins to natural products, though the products derived from virtually all-natural sources do not necessarily represent the final form of the active ingredients [6]. Similarly, about 84% of approved drugs for the treatment of CNS diseases, for instance, are either natural products or natural products inspired by over 400 clinically approved CNS drugs traceable to 20 natural product scaffolds [7].

Furthermore, the cost and adverse reactions of pharmacotherapy have lent immense support for the adoption of safe alternatives using various herbal formulations. The World Health Organization (WHO) defines herbal products or herbal preparations as herbal medicines containing active ingredients derived from the plants' parts or other plant materials, or their combinations. Breastfeeding mothers, especially, prefer herbal products to manage post-natal depressive symptoms. According to the literature, the percentages of women using at least one herbal product during the breastfeeding period in the US, China, Australia, and Italy are 16%, 20%–45%, 59.9%, and 97%, respectively. Herbal products are known to enhance milk supply and are thus commonly used as a traditional prophylactic during insufficient milk production to meet the child's nutritional needs. Herbal products, as a general health supplement, also offer self-empowerment, self-reassurance, and other psychological benefits during lactation, in addition to other general ailments such as colds, constipation, coughs, headaches, and depressive symptoms [5, 8]. Admittedly, the lack of standardization and heterogeneity of regulatory standards for herbal products between, and within countries and regions have made it quite difficult to generalize about the quality, efficacy, and safety of herbal products [1, 8]. Nevertheless, this study is aimed to review some of the most important high-value herbal products in Malaysia. Admittedly, the work covers only a few representatives of Malaysian medicinal plants. The taxonomic classifications of the few plants discussed in this study are itemized in **Table 1**.

### 1.1 Agarwood (gaharu)

Agarwood otherwise known as gaharu (**Figure 1**) is a highly valuable fragrant heartwood and resinous wood mainly produced through changes in the chemical and physiological compounds of woods through natural or artificial damage like injury, cutting wound, insect disturbance, microorganism (fungi), and other non-pathological processes from *Aquilaria* or *Gyrinops* species (family Thymelaeaceae). It is also one of the most valuable non-timber forest products throughout the world. It is a protected tropical tree species used as incense for perfumery, religious ceremonies, and traditional medicine through the ages globally [9–11]. Though natural agarwood is very precious owing to its extreme rarity, nevertheless, it is very popularly used in medicines, high-grade perfumes, and several other products [12].

Categories	Names	Names	Names	Names	Names	Names	Names
Kingdom	Plantae	Plantae	Plantae	Plantae	Plantae	Plantae	Plantae
Subkingdom	Viridiplantae	Viridiplantae	Viridiplantae	Viridiplantae	Viridiplantae	Viridiplantae	Viridiplantae
Infrakingdom	Streptophyta	Streptophyta	Streptophyta	Streptophyta	Streptophyta	Streptophyta	Streptophyta
Superdivision	Embryophyta	Embryophyta	Embryophyta	Embryophyta	Embryophyta	Embryophyta	Embryophyta
Division	Spermatophyta	Spermatophyta	Spermatophyta	Spermatophyta	Tracheophyta	Tracheophyta	Tracheophyta
Subdivision	Angiospermae	Angiospermae	Angiospermae	Angiospermae	Spermatophytina	Spermatophytina	Spermatophytina
Class	Dicotyledonae	Monocotyledonae	Monocotyledonae	Magnoliopsida	Magnoliopsida	Magnoliopsida	Magnoliopsida
Superorder		Commelinids	Eudicots	Asteranae	Liliane	Eudicots	Asteranae
Order	Thymelaeales	Bromeliales	Caryophyllales	Lamiales	Zingiberales	Lamiales	Gentianales
Family	Thymelaeaceae	Bromeliaceae	Cactaceae	Lamiaceae	Zingiberaceae	Lamiaceae	Rubiaceae
Genus	<i>Aquilaria</i>	<i>Ananas</i>	<i>Hylocereus</i>	<i>Vitex L. – chastetree</i>	<i>Boesenbergia</i>	<i>Orthosiphon</i>	<i>Morinda</i>
Species	<i>A. malaccensis</i>	<i>A. comosus</i>	<i>H. undatus</i>	<i>Vitex agnus-castus L. – chaste tree</i>	<i>B. rotunda</i>	<i>O. aristatus</i>	<i>M. citrifolia</i>
Common name	Agarwood	Pineapple	Dragon fruit	Vitex	Fingerroot	Cat’s whiskers	Indian mulberry

**Table 1.**  
*Taxonomic classification of the reviewed plants.*



**Figure 1.**

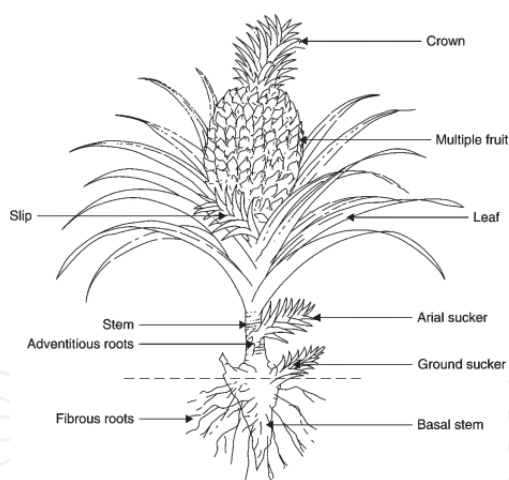
Agarwood (gaharu). Source: [https://yxinenergy.com/wp-content/uploads/2020/12/agarwood\\_v4.png](https://yxinenergy.com/wp-content/uploads/2020/12/agarwood_v4.png)

Agarwood is mainly obtained from tree trunk as well as other parts of the tree such as tree branches and collected in the wood form and then traded as wood dust or powder, wood chips, and Agar-oil [13]. According to Wyn and Anak [14], About 19 plant species that are native to Malaysia are thought to produce agarwood (Peninsula: 13 spp., Sabah: 11 spp., Sarawak: 13 spp. The five most common types of oleoresin-producing *Aquilaria* in Peninsular Malaysia are *A. beccariana*, *A. hirta*, *A. malaccensis*, *A. microcarpa*, and *A. rostrata* [15]. However, *Aquilaria crassna*, *A. malaccensis*, and *A. sinensis* are the most popular plantation species. Agarwood leaves are also characterized with beneficial pharmacological properties like acetylcholinesterase (AChE) inhibitory, analgesic, antidiabetic, antioxidant, antibacterial, anti-inflammatory, anticancer, anti-arthritic, antitumor, anti-depressant, antifungal, antihistaminic, cytotoxic, hepatoprotective, laxative, and lipid-lowering owing to their various bioactive constituents such as 2-(2-phenylethyl) chromones, benzophenones, fatty acids, flavonoids, phenolic acids, steroids, xanthonoids, terpenoids, and alkanes [16–18]. According to the literature [12], over 130 2-(2-phenylethyl) chromone derivatives have been identified from different kinds of agarwood. Hagaru as well as derivative products are common in traditional medicine practices throughout the Southeast Asian communities, such as the Ayurvedic, Chinese, Japanese, Malaysian, Tibetan, and Unani medicines. Its essential oil has also been reported to possess anticancer and anti-inflammatory activities [17, 19, 20].

## 1.2 Pineapple (*Ananas comosus*)

Pineapple (*Ananas comosus* [L.] Merr.) is the third most important tropical succulent fruit, after banana and citrus. It is seasonal and highly perishable [21, 22] and majorly produced in Latin America and Southeast Asia. It has several health benefits due to the high contents of bioactive compounds including carbohydrates, glycosides, organic acids, proteins, polyphenols, vitamins, and other compounds [23–25]. It is an herbaceous perennial monocotyledonous plant belonging to the family Bromeliaceae (Annonaceae) and subfamily Bromelioideae with about 2000 species and an annual global production of over 14 million tons. The aroma, color, flavor, juiciness, texture, sweetness, and overall appearance of the pineapple flesh are among the most important contributing factors to its acceptance by consumers [22]. Pineapple is very rich in bioactive and volatile compounds, phenolic compounds, dietary fiber, minerals (such as calcium, potassium), nutrients, and vitamins (such as vitamin C, and vitamin A), thus, offering several health benefits such as antioxidant and anti-inflammatory activities, anti-obesity and dyslipidemia functions, monitoring of nervous system function as well as healing of bowel movement [26]. The pineapple fruit and the other various parts of the plant





**Figure 2.**  
 Various parts of Pineapple (*Ananas comosus* [L.] Merr.). Source: <https://ars.els-cdn.com/content/image/3-s2.0-B978085709090450010X-f10-01-9780857090904.gif>

(**Figure 2**) such as the leaf, skin, rhizome, root, stem, and latex have been used in various native cultures as medicine [27, 28]. Both the stem and the fruit extracts, for instance, are rich sources of cysteine proteases (bromelain). *A. comosus* extract is very rich in both proteolytic enzymes (such as bromelain) and nonproteolytic enzymes [28, 29] which are considered a phytotherapeutic drug owing to their characteristics anti-edematous, anti-inflammatory, fibrinolytic, and anti-thrombotic activities [30]. The inedible pineapple peel is also a rich in polyphenols [24]. Its crude extract possesses various medicinal qualities in addition to being a rich source of bioactive compounds and nutrients such as proteins, lipids, minerals, vitamin C, carotenoids, and flavonoids [27]. Pineapple leaves are also used for many applications in folk medicines such as anti-diabetic, antidyslipidemic, emmenagogue, anti-oxidant, vermicide, wound healing, and antimicrobial activity [28]. The leaf extract has inhibitory effects on protein denaturation and proteinase activity in addition to its remarkable anti-inflammatory activity through controlled secretion of tumor necrosis factor- $\alpha$ , interleukin-1 $\beta$ , and prostaglandins in a carrageenan-induced inflammatory rat model [25].

### 1.3 Pitaya (dragon fruit)

*Hylocereus undatus* (white pitaya) is an economically-important antioxidant-rich fruit. The fruit (**Figure 3**) is also rich in fiber and vitamins [31]. It belongs to the Cactaceae family and originated in the Americas [32]. Similarly, red-purple pitaya (*Hylocereus polyrhizus*) is also very rich in red-violet pigments known as betacyanins which offer health-promoting effects and protective benefits against degenerative diseases, such as cardiovascular diseases, cancer, diabetes, heart diseases, and obesity [33]. The white-flesh of *H. undatus* fruits with its red peel have characteristics sensorial properties as well as huge economic importance. Both the pulps and peels of *H. undatus* are very rich in antioxidants, fiber, vitamins, free from toxic and thus safe for consumption as well other medicinal uses for the treatment of degenerative diseases such as arteriosclerosis, arthritis, brain dysfunction, cancer, diabetes, inflammation, and heart diseases [31]. The seed oil of *H. undatus* and *H. polyrhizus* are also rich in linoleic, oleic, and palmitic acids, in addition to other phytosterol compounds (such as campesterol, cholesterol, stigmasterol, and  $\beta$ -sitosterol) and phenolic acid compounds (such as caffeic, gallic, protocatechuic, p-coumaric, p-hydroxybenzoic, syringic and vanillic acids) [34]. The remarkable antibacterial activity of both *H. undatus* and *H. polyrhizus* is attributed to their



**Figure 3.**  
Dragon fruit (*Hylocereus undatus*). Source: <https://i.pinimg.com/originals/f5/0e/29/f50e2953a7a249b1baf6a11a96c6c2a7.jpg>

presence of various antioxidant compounds and essential fatty acids such as linoleic and linolenic acids [35]. The essential oils of *H. undatus* fruits have outstanding antifungal activity [32].

#### 1.4 *Vitex* spp.

The *Vitex* spp., with over 270 species globally, is the largest genus in the family Lamiaceae (Verbenaceae) and consists of deciduous shrubs and trees which are majorly distributed in the tropics and subtropics. About 12 species of *Vitex* are found in India, 14 species in China, and 30 species in the Malesian region. They are used as ornamental plants, in addition to their unique ethnobotanical, medicinal, and pharmacological uses for the treatment of many health problems, such as dermatitis, herpes, itching, malaria, and menstruation control [36–38]. The genus *Vitex* is a small deciduous shrub, about 3–6 m high and commonly found on the banks of channels, ponds, and rivers. Its fruits are used traditionally for the treatment of cold, nervous headache, migraine, rheumatism, and wind-heat while the leaves reportedly exhibit antitubercular, cytotoxic, and trypanocidal activities. Other common uses of the plant include amenorrhea, memory enhancement, pain relief, removal of a bad taste in the mouth, fever cure, hair loss treatment, antibacterial anti-cancerous, anti-diabetes, anti-inflammation, as well as treatment of dysentery, mouth infections, respiratory infections, and premenstrual problems [39, 40]. The hepatoprotective activity of the genus *Vitex* has also been reported and attributed to its rich iridoids contents [41]. Other major classes of compounds that have been isolated from the genus *Vitex* are flavonoids, steroids, and terpenes. More p-hydroxybenzoic acid and agnuside were, however, obtained in the leaves' extracts than bark samples [42]. Furthermore, several diterpenoids such as abietane, clerodane, labdane, halimane, and norlabdane have also been isolated from the *Vitex* genus [40].

#### 1.5 Temu kunci (*Boesenbergia rotunda*)

Temu kunci (*Boesenbergia rotunda*) otherwise referred to as fingerroot belongs to the Zingiberaceae family. It is one of the most prominent ginger and medicinal plants in South East Asia [43]. The vernacular names of temu kunci are shown in

**Table 2** [44] while its other common botanical names are *Boesenbergia rotunda* Linn. Mansft, *Curcuma rotunda* L., *Gastrochilus panduratum* RIDL., *Kaempferia pandurata* Roxb., *Boesenbergia cochinchinensis*, *Boesenbergia pandurata*, *Curcuma rotunda*, *Gastrochilus panduratus*, *Gastrochilus rotundus*, *Kaempferia cochinchinensis*, and *Kaempferia ovate* [45]. The genus *Boesenbergia* comprises about fifty genera and over 1000 species distributed throughout tropical and subtropical regions [44, 46].

The ginger family (Zingiberaceae) contains about 1500 species and 50 genera globally. Several species of Zingiberaceae consisting mainly of herbaceous perennial plants are used in food (as spices), as well as ornamental plants, in cosmetics, and dyes. The rhizomes and leaves (**Figure 4**) are characterized by the presence of essential oils, flavones, flavonoids, and cyclohexenyl chalcone derivatives [47, 48]. The rhizome is traditionally used, in Indonesia, for the treatment of several diseases in folk medicine owing to its diverse pharmacological and biological activities such as antibacterial, antifungal, antioxidant, anti-inflammatory, and anti-cancer [46].

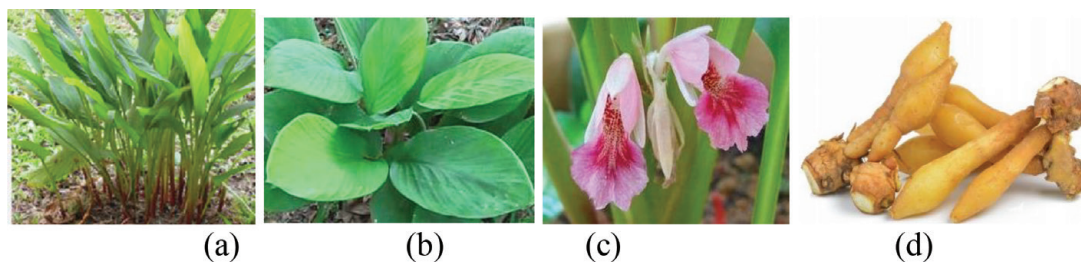
The essential oils of *B. rotunda* are directly used in the preparation of Ayurvedic drugs, cosmetics, perfumery, and spices in India [49]. Similarly, in Thailand's primary health care system, *B. rotunda* rhizome is recommended for the treatment of abscesses, leukoplakia, leukorrhea, and stomachache [50]. It is also used as a flavoring agent or eaten as a vegetable, in Thai cuisine, owing to its rich bioactive compounds such as boesenbergin, cardamonin, pinocembrin, pinostrobin, panduratin A, and 4-hydroxypanduratin A [51]. *B. rotunda* essential oils usually contain both oxygenated and non-oxygenated monoterpenes such as  $\gamma$ -terpinene,  $\beta$ -ocimene, 1,8-cineole, myrcene, borneol, camphene, camphor, methyl cinnamate, citral, terpineol, geranial, geraniol, neral, nerolidol, limonene, and 11-dodecen-1-ol [46].

*B. rotunda* is commonly and locally consumed in many Asian countries such as China, Indonesia, India, Malaysia, and Thailand. It is mostly cultivated as small home ranches and used as a food condiment due to its aromatic flavor [45]. The aphrodisiac activity of *B. rotunda* has also been greatly explored due to its richness in boesenbergin, krachaizin, pinostrobin, and panduratin [44].

Names	Origin
Chun jiang, Soh Shi	Chinese
Temoe koentji	Dutch
Petits doigts	French
Fingerwurz, Runde Gewurzlilie	German
Chekkur	India
Temu kunci	Indonesian
Gajutu	Japanese
Khchiey	Khmer
Neng kieng	Lao
Temu kunci	Malay
Kae-aen, Kra Chai, Wan-phraa-thit	Thai
Ngai num kho, Bong nga truat, Cu ngai	Vietnamese

**Table 2.**  
The vernacular names of *B. rotunda*.





**Figure 4.**

(a) *B. rotunda* plant, (b) *B. rotunda* leaf, (c) *B. rotunda* flower, and (d) *B. rotunda* rhizome.

Traditionally, *B. rotunda* is used to treat several disorders such as colic disorder, dental caries, diarrhea, dry cough, fungal infection, mouth irritation, leukorrhea, stomach discomfort, rheumatism. It is also commonly used as an antiseptic for wounds, anti-insecticidal, anti-mutagenic, anti-tumor, and anti-inflammatory. Both its extracts and compounds, especially panduratin derivatives, have reportedly shown several interesting biological activities such as antibacterial, antioxidant, anti-inflammatory, anti-cancer; antiviral; anti-aging; anti-obesity; skin hydration, barrier function [46, 52]. *B. rotunda* ethanolic extract and its panduratin A has also been reported to remarkably inhibit SARS-CoV-2 infection at both pre-entry and post-infection phases. Panduratin A also suppresses viral infectivity in the human airway epithelial cells [53].

### 1.6 Misai Kucing (*Orthosiphon aristatus*)

Misai kucing (*Orthosiphon aristatus*) (Blume) Miq. locally called “Kumis Kucing (Java tea)” and “Misai kucing”, “cat’s whiskers” in Indonesia and Malaysia, respectively belongs to the family Lamiaceae [2, 3, 54].

*O. aristatus* leaves are commonly used as a tea (java tea) in the Southeast Asia and Europe regions [55]. It is also a well-known medicinal plant in Southeast Asia and mostly cultivated both in Indonesia and Malaysia. Its leaves (**Figure 5**) have been used traditionally in Malaysia for the treatment of many infectious and chronic diseases such as angiogenesis-related diseases like eruptive fever, edema, inflammation, urinary lithiasis, influenza, hepatitis, jaundice, rheumatism, diabetes, and hypertension (owing to its richness in flavonoids, hexoses, saponins, organic acids, terpenoids, chromene, myo-inositol and polyphenols [54, 56, 57]. *Orthosiphon* tea is also commonly used as a diuretic for the removal of uric acid stones from the kidney as well as for abdominal pain, urinary disorders, edema, gout, menstrual disorders,



**Figure 5.**

*Misai kucing* (*Orthosiphon aristatus*). Source: [https://4.bp.blogspot.com/\\_-exY1vxyY6M/SsZ8dV-GfGI/AAAAAAAAAB1s/lj94bMIzk9U/s400/Floridian\\_1020275561\\_207.jpg](https://4.bp.blogspot.com/_-exY1vxyY6M/SsZ8dV-GfGI/AAAAAAAAAB1s/lj94bMIzk9U/s400/Floridian_1020275561_207.jpg)

and tonsillitis, in addition to other pharmacological properties such as antioxidant, antibacterial, anti-inflammatory, cytotoxic, hepatoprotective, and vasodilative [55]. Some of the compounds contained in the leaves of *O. aristatus* include acetovanillochromene, caffeic acid derivatives, flavonol glycosides, lipophilic flavones, oleanolic acid, orthochromene A, orthosiphol A, orthosiphol B, orthosiphonone A, orthosiphonone B, neoorthosiphols A, neoorthosiphols B, and ursolic acid [58]. Misai kucing is one of the most important and high-value herbal products in Malaysia. Others are tongkat Ali, kaci Fatimah, bumi, dukung anak, mengkudu, roselle, ginger, mas cotek, belalai, gajah, and pegaga [59].

### 1.7 Mengkudu (*Morinda citrifolia* L.)

Mengkudu (*Morinda citrifolia* L.) (Noni) is one of the most important traditional Polynesian herbal and medicinal plants as well as foodstuffs for over 2000 years which is grown widely throughout the Pacific. It is locally called 'mengkudu' in Malaysia. It belongs to the family Rubiaceae (coffee family) as well as the subfamily Rubioideae. It plays contains several electrolytes, phytochemicals, and vitamins, thus, playing an essential role in daily dietary intakes. The constituents of mengkudu have several biological activities such as antibacterial, antiviral, anti-tumor, and antifungal, thus playing a great role in the immune system [60, 61]. The various parts of the plant including the fruit, flower, leaves (Figure 6), bark, and root are used in many traditional medicine preparations [62–64]. *M. citrifolia* fruit has remarkable hepatotoxicity effects owing to the presence of anthraquinones in the seeds and skin which had potent quinone reductase inducer activity [64]. It is also used to treat various other ailments such as respiratory-tract and skin infections [62]. *M. citrifolia* has broad healing properties and thus used for the treatment of anxiety, cancer, colds, flu, diabetes, blood pressure, and depression owing to the fruit's richness in phenolic compounds such as caffeine, chlorogenic acid, ellagic acid, gallic acid, quercetin, rutin, and rosmarinic acid [61]. *M. citrifolia* leaf is rich in campesterol, oxalic acid, stigmasterol,  $\beta$ -sitosterol, (+)-catechin, (–)-epicatechin, rutin, quercetin, scopoletin, and kaempferol and commonly consumed by many cultural groups, in addition to the treatment of allergy, helminthic infections, hyperlipidemia, oxidative stress, and open wounds [65].



**Figure 6.**

Mengkudu (*Morinda citrifolia* L.) fruit, flower, leaves. Source: <https://www.makanabis.com/bima-content/2020/01/02/l-morinda-buah7e76d7f51fd414b6bbd998cf8fa74e7720200102143938-bimacms.jpg>

## 2. Conclusion


Malaysia is a global hub for natural products which contributes to its GDP. Malaysia is also one of the 12 most diverse Megabiodiversity countries. Natural products are relevant to both health care and agriculture which are parts of the national key economic areas (NKEA) under the Government's Economic Transformation Plan as well as parts of the United Nations' 17 Sustainable Development Goals (SDGs). It is worthy of note that the quality, efficacy, and safety of herbal products require standardization. Herbal products should also be made easy and accessible to low-income and rural communities across the globe. The proper documentation of the ethnopharmacological important plants in addition to their preservation and cultivation would enhance the sustainable use of the various indigenous plants.

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