

## Herbal plant formulations used by the Malay ethnic traditional practitioners in the management of diabetes

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### Abstract

Diabetes is a serious and chronic ailments affecting millions of people worldwide with high rates of morbidity and mortality including Malaysia. The used of ethno-medicinal plants among the traditional practitioners are still reliable to treat diabetes. Hence, this study aimed to collect information regarding polyherbal formulations used by the traditional practitioners in the management of diabetes via ethnobotanical survey. An ethnobotanical survey was conducted from February 2022 to March 2022 to discover the potential herbal plant formulations used by the practitioners in Peninsular Malaysia. Information was gathered from the informal semi-structured interview session with the selected herbal practitioner informants. The respondents were comprised of old or experience persons, traditional healers and medicinal herbal sellers who practice and have experience in the use of medicinal plants to treat the diabetes. A total of sixteen polyherbal formulations were gathered from the ethnobotanical survey conducted. The leaves are the most commonly used plant part, usually in the fresh form and mainly prepared through decoction method as well as administered orally for the diabetes remedies. This study has revealed sixteen potential polyherbal plant formulation remedies used by Malay practitioners in Peninsular Malaysia as diabetes remedies which could be beneficial as a guide in the development of plant-based medication in pharmaceutical or nutraceutical industries.

## 1. Introduction

Diabetes mellitus (DM) is a chronic non-communicable disease affecting millions of people across the globe with an estimated 25% of the world population (Arumugam *et al.*, 2013). DM is considered as the third 'killer' of mankind's health along with cancer, cardiovascular and cerebrovascular disease and nowadays it is becoming a global health pandemic (Elavarasi and Saravanan, 2012; Kasali *et al.*, 2021). In Malaysia, the prevalence of diabetes has escalated from 11.2% in 2011 to 18.3% in 2019, with an increment of 68.3%. Its prevalence is significantly higher than in neighbouring countries such as Indonesia and Singapore (Akhtar *et al.*, 2022). DM occurs due to defects in either insulin secretion insulin resistance or both that could lead to the persistence of high glucose levels and glucose intolerance (Prasanna *et al.*, 2019). In general, DM can be categorized into three main types which are type 1 DM (insulin-dependent), type 2 DM (non-insulin-dependent) and gestational DM (commonly affects

pregnant women) but most people worldwide are diagnosed with type 2 DM up to 90% (Salehi *et al.*, 2019).

Current management of diabetes is complex and multidisciplinary, particularly in the use of orthodox drugs that have many shortcomings, including safety, tolerability issues and inconvenience of the given medication dose (Durmuskahya and Ozturk, 2013). Moreover, diabetes has caused a massive economic burden on public healthcare services as it cannot be cured completely (Skalli *et al.*, 2019). Hence, this led society to practice natural remedies that are derived from medicinal plants as it contains various phytochemical contents which may have antidiabetic properties (Salehi *et al.*, 2019). According to the World Health Organization (WHO), around 80% of developing-country populations are still relying on medicinal plants to fulfil the healthcare needs due to inexpensive, easily available and has minimal side effects (WHO, 2019). In

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Malaysia, there are several ethnic groups with different medicinal solutions for the management of diabetes. However, the use of medicinal plant remedies is poorly described and documented which may be as a result of changing lifestyles, the strict secrecy of traditional healers, and the carelessness of young people (Singh *et al.*, 2012).

In order to utilize and conserve the usage of medicinal plants, an ethnobotanical survey is highly recommended to be conducted to discover new sources of antidiabetic drugs. The information gathered during the survey such as local names, scientific names, plant parts, preparation and administration method of the medicinal plants need to be documented. This approach may lead to the standardization of best practices that can spread throughout communities in developing countries (Buwa-Komoren *et al.*, 2019). In addition, ethnobotanical survey can facilitate future researches on efficacy of medicinal plants in treatment of various ailments especially diabetes (Tugume *et al.*, 2016). Therefore, it is crucial to document the natural remedies practised by the traditional healers before they diminish with the knowledgeable persons. Hence, this study aims to conduct an ethnobotanical survey of herbal plant formulations used by the Malay ethnic traditional practitioners in the management of diabetes.

## 2. Materials and methods

### 2.1 Study design

The Malaysian polyherbal ethno-medicinal plant formulations were accessed via documented and established data from books, journals or internet sources before conducted the ethnobotanical survey to ensure the information gathered are not scientifically proven yet. Then, an ethnobotanical survey was conducted to discover the new potential herbal plant formulations used by the practitioners in certain states of Peninsular Malaysia. This survey was done from February 2022 to March 2022 by an informal semi-structured interview session with the selected herbal practitioner informant as referring to the method described by Onjalalaina *et al.* (2021).

### 2.2 Informants and data collection

The selected informants were included rural people, old or experience persons, traditional healers and medicinal herbal sellers who practice and have experience in the use of medicinal plants to treat diabetes as the documented data. The informants approached were Malay ethnic in the age group of 30 to 70 years old. The selected informants were explained the objectives of the survey to obtain their consent and willingness to participate before any ethnobotanical data were

documented.

The questionnaire was divided into two parts; A) demographic profile of the informants such as name, gender, age, religion, marital status, ethnicity, level of education, occupation and how long they had practised with medicinal herbs, part B) on the information of the plant they used which consists of botanical information such as local name of the plants, part of the plants used, traditional uses related to diabetes remedies, method of preparation and administration, quantity of plant used, where inherited this prepared knowledge and also source of the plant either wild or cultivated. The content of this semi-structure questionnaire was verified by the two experts in the field. A few items were revised according to the comments and suggestions of the experts (Shawarb *et al.*, 2021). During the interview session, all information was recorded on a data sheet. Moreover, the audio recordings and photos were also taken with the permission of the other party as an additional document to support the documentation of ethnobotanical knowledge.

### 2.3 Plant collection and identification

The ethnomedicinal plants gathered from the survey were collected, dried and mounted for herbarium specimen preparation. The plant specimens were authenticated by Dr Ab Rasip Ab Ghani, a senior research officer in Forest Research Institute Malaysia (FRIM). The voucher specimens were deposited in the herbarium of Universiti Tun Hussein Onn Malaysia (UTHM) with the given voucher specimen numbers for plant identification.

## 3. Results and discussion

### 3.1 Characteristics of the respondents

This present study aimed to document the use of Malaysian polyherbal ethno-medicinal plant formulations by Malay ethnic practitioners in the management of diabetes via an ethnobotanical survey. The potential respondents were selected from established information on books, journals or internet sources and a total of five respondents were interviewed after received their consent during the survey. This study is focusing in Malay ethnicity as it is the biggest population in Malaysia about 54.6% of the overall population. In addition, the prevalence of type 2 diabetes among the Malays is the second highest as compared to other ethnicities in this country (Neblett *et al.*, 2019). Moreover, a previous study revealed that old people in the Malay ethnicity were the primary keepers of traditional herbal medicinal plants (Abdulrahman *et al.*, 2018).

Table 1 presents the demographic characteristics of the respondents. The demographic features showed that male is dominated which agreed with a previous study that reported the prevalence of type 2 diabetes is higher in men than females due to the amount of visceral fat mass (Nordström *et al.*, 2016). This study also found that the elderly are more knowledgeable on the usage of medicinal plants as diabetes remedies. This may be because younger generation have had exposure to modern education and hence lacking desire in acquiring and practicing ethnomedical knowledge that would preserve medicinal plants (Tugume *et al.*, 2016). Also, most of the informants were inherited from the elderly who had knowledge and experience in diabetes treatment. Majority of respondents have attained higher education level which indicate that they aware of modern medication. The findings also displayed that the majority of respondents are diabetic patients.

Table 1. Demographic characteristics of the respondents

Profile	Group	Number of informants
Gender	Male	5
	Female	0
Age	40 and below	1
	41 – 60	2
	60 and above	2
Marital status	Single	0
	Married	5
	Widowed	0
Occupation	Herbal educator	1
	Medicinal plant sellers	1
	Traditional practitioners	3
Education level	Primary school	1
	Secondary school	2
	Higher education level	2
Experience or period of practice	1-10 years	2
	11-20 years	1
	30 years and above	2
Learn or inherit the knowledge	Old people	3
	Self-learning	2
Diabetes history	Diabetic patient	3
	None patient	2

### 3.2 Polyherbal formulation of antidiabetic remedies gathered during the ethnobotanical survey

The survey proposed that Malaysian people particularly Malay ethnic is still using herbal plants as a medication to treat diabetes. According to ethnobotanical knowledge, there are about 1200 plants are believed to have been employed in traditional medicine for their purported hypoglycemic effect that relates with diabetes.

However, only a few plants have undergone scientific and medical investigation to determine their efficacy. For instance, the common antidiabetic drugs which is metformin that derived from natural product called galegine, is isolated from the plant *Galega officinalis* (Novoa and Silva, 2024).

Particularly in underdeveloped countries like Malaysia, medicinal plants are used to cure diabetes in order to alleviate the strain of the high cost of conventional medications on the populace. Besides that, conventional medications often lose their effectiveness over time with proven more than 50% of diabetic patients do not meet current glycemic targets (Durmuskahya and Ozturk, 2013). The antihyperglycemic effects of plant therapy are typically linked to their potential to boost pancreatic tissue function, which is accomplished by elevating insulin outputs or inhibiting intestinal glucose absorption (Salehi *et al.*, 2019).

In this study, the ethnobotanical survey was performed to gather information on the use of polyherbal formulation by practitioners in the management of diabetes. Polyherbal formulations are defined as a mixture or combination of two or more herbs which had been widely practised since ages ago. However, their therapeutic benefits are still poorly proven scientifically. A polyherbal formulation is considered to be more efficient than a single plant formulation as it contains a large number of bioactive compounds that interact with one another in a synergistic way to provide the intended therapeutic effect (Karole *et al.*, 2019). Prior research proposed that polyherbal formulations are more efficient than the metformin group at lowering postprandial blood sugar and glycated haemoglobin as well as fasting blood sugar. This indicates its potential hypoglycemic effect is as good as other oral hypoglycemic agents (Suvarna *et al.*, 2021). To the best of our knowledge, there are no documented data on the ethnobotanical survey that uses polyherbal formulations as antidiabetic remedies among the Malay ethnic in Peninsular Malaysia.

Table 2 shows the information gathered on polyherbal formulation remedies to treat diabetes. Based on Table 2, shows that a total of 16 polyherbal formulation remedies in the management of diabetes were collected. The polyherbal formulation gathered included a mixture of two to six plants. Previous research has reported that employing a combination of various plants or plant parts to treat an illness is more effective than using a single plant (Jima and Megersa, 2018). This is proven in a study by Sukalingam *et al.* (2015) that reported the intake of polyherbal formulations had beneficial effects on type 2 diabetes when no after-

Table 2. Information on polyherbal formulation remedies to treat diabetes.

No	Polyherbal formulation	Method Preparation	Antidiabetic recipe	Mode of administration	Remarks
1	<i>Manilkara zapota</i> + <i>Psidium guajava</i> + egg yolk	Decoction	7 pieces of young fresh <i>P. guajava</i> fruits (big toe size) with 7 pieces of young fresh <i>M. zapota</i> fruits are mashed until they break into smaller pieces and put into a pot. Then, filled it with 40 glass of water (approximate 10 L). The remedies are boiled until it reduced to around 28 glass of water (approximate 7 L). Cool it down for a few mins (5-10 mins) and filter the extract.	Orally - The remedies must be mixed with one or two egg yolks before drinking it. Drink one or two glasses every morning and evening on an empty stomach	None
2	<i>Mitragyna speciosa</i> + <i>Strobilanthes crispus</i> + <i>Zingiber officinale</i> + <i>Cinnamomum verum</i>	Decoction	21 pieces of fresh <i>M. speciosa</i> leaves, 10 pieces of fresh <i>S. crispus</i> leaves, <i>Z. officinale</i> (5 cm size), and <i>C. verum</i> (4 cm size) are mixed together and boiled with 3 L of water at 100°C for about 5 mins. Then, left it cool for a while (5 -10 mins) and then re-boiled again for another 5 mins. Left it cooled again and filtered the extract.	Orally - Drink the remedies two glasses in the morning and before go to sleep in an empty stomach if no side effects	May cause nausea and headache because of <i>M. speciosa</i> leaves
3	<i>Moringa oleifera</i> + <i>Strobilanthes crispus</i> + <i>Zingiber officinale</i> + <i>Cinnamomum verum</i>	Decoction	Around 20 g of fresh <i>M. oleifera</i> leaves and stem, 10 pieces of fresh <i>S. crispus</i> leaves, <i>Z. officinale</i> (5 cm size), and <i>C. verum</i> (4 cm size) are mixed together and boiled with 3 L of water at 100°C for about 5 mins. Then let it cool for a while (5 -10 mins) and then re-boiled again for another 5 mins. Left it cooled again and filtered the extract.	Orally - Drink the remedies two glasses in the morning and before going to sleep on an empty stomach	None
4	<i>Ardisia elliptica</i> + <i>Orthosiphon aristatus</i> + <i>Eurycoma longifolia</i>	Decoction	The roots of <i>A. elliptica</i> and <i>E. longifolia</i> are cut into smaller pieces and dried together with <i>O. aristatus</i> leaves for a couple of days until achieved a desired moisture. Then, the plants are boiled with 3 glasses of water for 5 to 10 mins. Let it cool for a while and then filter the extract.	Orally - Drink the remedies two glasses per day (morning and night)	None
5	<i>Orthosiphon aristatus</i> + <i>Phyllanthus niruri</i> + <i>Corchorus capsularis</i>	Decoction	All of these plants are dried for a couple of days and then take a handful of each plant (about 10 g each) and mix it with 3 glasses of water. Boil it for about 5 to 10 mins and filter the extract.	Orally - Drink the remedies two glasses per day (morning and night)	None
6	<i>Ficus deltoidea</i> + <i>Orthosiphon aristatus</i> + <i>Andrographis paniculata</i>	Decoction	All of these plants are dried for couple of days and then take a handful of each plant (about 10 g each) and mix with 3 glasses of water. Boil it for about 5 to 10 mins and filtered the extract.	Orally - Drink the remedies two glasses per day (morning and night)	None
7	<i>Orthosiphon aristatus</i> + <i>Andrographis paniculata</i> + <i>Catharanthus roseus</i>	Decoction	All of these plants are dried for a couple of days and then take a handful of each plant (same quantity each) and mix with 3 glasses of water. Boil it for about 5 to 10 mins and filter the extract.	Orally - Drink the remedies one or two glasses per day	None
8	<i>Orthosiphon aristatus</i> + <i>Andrographis paniculata</i> + <i>Catharanthus roseus</i>	Infusion	All of these plants are dried and soaked in a glass of warm water for a few mins (around 10 mins) and filtered	Orally - Drink the remedies one glass per day	None

Table 2 (Cont.). Information on polyherbal formulation remedies to treat diabetes.

No	Polyherbal formulation	Method Preparation	Antidiabetic recipe	Mode of administration	Remarks
9	<i>Tithonia diversifolia</i> + <i>Clinacanthus nutans</i> + <i>Acalypha indica</i> + <i>Staurogyne merguensis</i> + <i>Trigonella foenum-graecum</i>	Decoction	Fresh plants of <i>T. diversifolia</i> (15 to 20 pieces), <i>C. nutans</i> (around 40 pieces), <i>A. indica</i> (3 to 4 pieces), <i>S. merguensis</i> (a handful) and seeds of <i>T. foenum-graecum</i> (one tablespoon) are mixed and boiled with 5 L of water until the water is reduced for about 2 L. Filtered the extract.	Orally - Drink half glass, five times per day	None
10	<i>Tithonia diversifolia</i> + <i>Clinacanthus nutans</i> + <i>Acalypha indica</i> + <i>Staurogyne merguensis</i> + <i>Trigonella foenum-graecum</i>	Juice	Fresh plants of <i>T. diversifolia</i> (15 to 20 pieces), <i>C. nutans</i> (around 40 pieces), <i>A. indica</i> (3 to 4 pieces), <i>S. merguensis</i> (a handful) and seeds of <i>T. foenum-graecum</i> (one tablespoon) are mixed with 2 L of water and blend into juice.	Orally - Drink half glass, five times per day	None
11	<i>Tithonia diversifolia</i> + <i>Clinacanthus nutans</i> + <i>Acalypha indica</i> + <i>Staurogyne merguensis</i> + <i>Moringa oleifera</i> + <i>Trigonella foenum-graecum</i>	Decoction	Fresh plants of <i>T. diversifolia</i> (15 to 20 pieces), <i>C. nutans</i> (around 40 pieces), <i>A. indica</i> (3 to 4 pieces), <i>S. merguensis</i> (a handful), <i>M. oleifera</i> (a handful) and seeds of <i>T. foenum-graecum</i> (one tablespoon) are mixed and boiled the mixture until it gives a slimy texture. Then, filter the extract	Orally - Drink half glass, five times per day	None
12	<i>Tithonia diversifolia</i> + <i>Clinacanthus nutans</i> + <i>Acalypha indica</i> + <i>Staurogyne merguensis</i> + <i>Artocarpus altilis</i> + <i>Trigonella foenum-graecum</i>	Decoction	Fresh plants of <i>T. diversifolia</i> (15 to 20 pieces), <i>C. nutans</i> (around 40 pieces), <i>A. indica</i> (3 to 4 pieces), <i>S. merguensis</i> (a handful), <i>A. altilis</i> (10 pieces) and seeds of <i>T. foenum-graecum</i> (one tablespoon) are mixed and boiled the mixture until the water is reduced to half pot. Then filtered the extract.	Orally - Drink half glass, five times per day	None
13	<i>Staurogyne merguensis</i> + <i>Moringa oleifera</i> + <i>Artocarpus altilis</i> + <i>Trigonella foenum-graecum</i>	Juice	Fresh plants of <i>S. merguensis</i> (a handful), <i>A. altilis</i> (10 pieces) and seeds of <i>T. foenum-graecum</i> (one tablespoon), are boiled with 5 L of water until it is reduced to 2 L of water. Filtered the extract. The boiled water from the extract is mixed with a fresh plant of <i>M. oleifera</i> (a handful) and blend as a juice.	Orally - Drink half glass, five times per day	None
14	<i>Phyllanthus niruri</i> + <i>Moringa oleifera</i> + <i>Trigonella foenum-graecum</i>	Decoction	Fresh plants of <i>P. niruri</i> (around 30 g), <i>M. oleifera</i> (around 30 g) and seeds of <i>T. foenum-graecum</i> (one tablespoon) are mixed and boiled with 5 L of water until it reduced to 2 L of water. Then, filtered the extract.	Orally - Drink half glass, five times per day	None
15	<i>Scorodocarpus borneensis</i> + <i>Cinnamomum verum</i> + <i>Pandanus amaryllifolius</i> + <i>Zingiber officinale</i> + <i>Trigonella foenum-graecum</i>	Decoction	4-5 pieces of <i>S. borneensis</i> fruit is blend with one tablespoon of <i>T. foenum-graecum</i> until it become powder. Then, take a small piece of <i>C. verum</i> , 7 pieces leaves of <i>P. amaryllifolius</i> with 3 inches of <i>Z. officinale</i> . Mix all of them with 5 L of water and boiled until it reduced to 2 L of water. Then, filtered the extract.	Orally - Drink half glass, five times per day	None
16	<i>Morinda citrifolia</i> + <i>Ganoderma lucidum</i> + honey	Decoction	The ripe fruit of <i>M. citrifolia</i> is blended into fine powder, the seed is removed. Then, cooked with <i>G. lucidum</i> and honey	Orally - Consumed two tablespoon per day (morning and night) in an empty stomach	Drink a plenty of plain water after consumed

effects were perceived with serum glucose, lipid profile and hematological parameters. Another study also revealed the mixtures of two plants (*Blumea balsamifera* and *Coccinia grandis*) had potential as antidiabetic agents (Kusumawati *et al.*, 2022). However, antidiabetic recipes made from polyherbal formulation remedies should be carefully utilized because of the infinite compounds that can exist in one plant (Karou *et al.*, 2019).

The findings revealed that most of the polyherbal formulation remedies were prepared through the decoction method (81%) as shown in Figure 1 and oral administration was found to be the established route for antidiabetic remedies consumption. This outcome is in agreement with other ethnobotanical survey that reported decoction as the most commonly method for the preparation of herbal remedies. This is because decoction is easy to prepare and boiling process is effective in extracting plant compounds and at the same time retains the herbal remedies for a longer period compared to cold extraction. However, this procedure does not provide the preparations with a lengthy shelf life (Tugume *et al.*, 2016). The choice of oral administration may be influenced by the usage of specific solvents or additives, such as water and food, which are frequently thought to act as a vehicle for the medications (Tugume *et al.*, 2016).

formulation remedies was found to be leaves with 36% as shown in Figure 2. The high usage of leaves part is due to the easy collection in vast quantities as compared to other plant parts. Also, primary production of secondary metabolites occurs in the leaves where the photosynthesis takes place and then transferred to other plant parts (Abdulrahman *et al.*, 2018). The polyherbal formulation remedies are mainly prepared from fresh part of the plants and the remaining is in dried form. Traditional healers are reliance on fresh materials is mostly due to the effectiveness of fresh plants in treating diseases as the contents are not lost before use compared to the dried forms (Jima and Megersa, 2018). This survey also found that most of the plants practised by the informants are locally available.

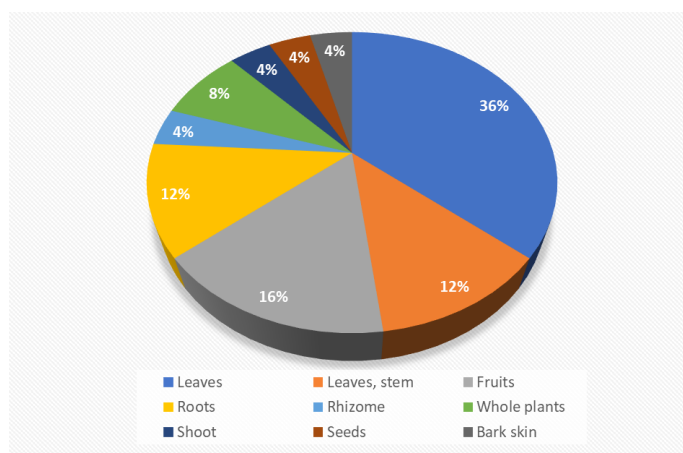


Figure 2. The frequent part of plants used in the polyherbal remedies.

#### 4. Conclusion

This study has established important information on potential herbal plant formulations used by the Malay ethnic in Peninsular Malaysia in the management of diabetes. A total of 16 formulations were discovered its potential as diabetes remedies that comprises with a total of 25 types of medicinal plant which may be due to their active metabolites' presence in each plant. The survey summarized that the most common plant part used is leaves, prepared through the decoction method and consumed by oral administration. However, future research should be conducted to confirm the antidiabetic properties of the newly reported polyherbal formulation remedies. This will help in the development of new plant-based medications in the pharmaceutical and nutraceutical industries.

#### Conflict of interest

The authors declare conflicts of interest.

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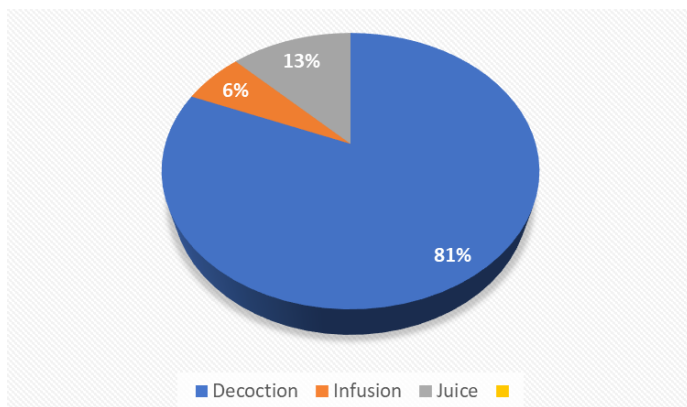


Figure 1. Preparation method of polyherbal formulation remedies.

Table 3 presents the summary for each plant used in the listed polyherbal formulation remedies. It showed that Acantheceae family is the major botanical family. Acantheceae is reported as one of the families with the largest number of genera and species in Peninsular Malaysia and has significant medicinal values (Zakaria *et al.*, 2020). However, a survey conducted on the herbs used for diabetes remedies established Fabaceae, Euphorbiaceae, Apocynaceae and Loganiaceae are the most representative botanical families (Amuri *et al.*, 2018). The findings also recorded that the most frequent utilize of plant part used in the preparation of polyherbal

Table 3. Summary on the information of the plants used in the listed polyherbal formulation remedies.

No	Scientific name	Common name	Local name	Family	Part used	Form	Domestication status
1	<i>Manilkara zapota</i>	Sapodilla	Ciku	Sapotaceae	Young fruit	Fresh	Wild-cultivated
2	<i>Psidium guajava</i>	Guava	Jambu batu	Myrtaceae	Young fruit	Fresh	Wild-cultivated
3	<i>Mitragyna speciosa</i>	Kratom	Ketum, biak	Rubiaceae	Leaves	Fresh	Wild-cultivated
4	<i>Strobilanthes crispus</i>	NA	Pecah beling, pecah kaca	Acanthaceae	Leaves	Fresh	Wild-cultivated
5	<i>Zingiber officinale</i>	Ginger	Halia	Zingiberaceae	Rhizome	Fresh	Cultivated
6	<i>Cinnamomum verum</i>	Cinnamomum	Kayu manis	Lauraceae	Bark skin	Dried	Wild-cultivated
7	<i>Moringa oleifera</i>	Drumstick tree	Kelor, merungai, kacang kelor	Moringaceae	Leaves, stem	Fresh	Wild-cultivated
8	<i>Ardisia elliptica</i>	Seashore Ardisia	Mata pelanduk, cempenai	Primulaceae	Root	Dried	Wild
9	<i>Orthosiphon aristatus</i>	Cat's whiskers, java tea	Misai kucing	Lamiaceae	Leaves, stem	Fresh	Wild-cultivated
10	<i>Eurycoma longifolia</i>	NA	Tongkat ali	Simaroubaceae	Root	Dried	Wild
11	<i>Phyllanthus niruri</i>	Gale of the wind	Dukung anak, amin buah	Phyllanthaceae	Whole plant	Fresh	Wild
12	<i>Corchorus capsularis</i>	White jute	Kancing baju	Malvaceae	Leaves, stem	Dried	Cultivated
13	<i>Ficus deltoidea</i>	Fig	Mas cotek, ara	Moraceae	Leaves	Dried	Wild
14	<i>Andrographis paniculata</i>	Green chireta	Hempedu bumi	Acanthaceae	Leaves	Dried	Wild-cultivated
15	<i>Catharanthus roseus</i>	Madagascar periwinkle	Kemunting china, bunga tapak dara	Apocynaceae	Root	Dried	Wild-cultivated
16	<i>Trigonella foenum-graecum</i> L.	Fenugreek	Halba	Fabaceae	Seed	Dried	Wild
17	<i>Tithonia diversifolia</i>	Mexican sunflower	Pokok insulin	Asteraceae	Leaves	Fresh	Wild-cultivated
18	<i>Clinacanthus nutans</i> (Burm.f.) Lindau	Sabah snake grass	Belalai gajah	Acanthaceae	Leaves	Fresh	Wild-cultivated
19	<i>Acalypha indica</i>	Indian nettle	Kucing galak	Euphorbiaceae	Leaves	Fresh	Wild-cultivated
20	<i>Staurogyne merguensis</i>	NA	Lemba batu	Acanthaceae	Whole plant	Fresh	Wild
21	<i>Artocarpus altilis</i>	Breadfruit	Sukun	Moraceae	Leaves	Fresh	Cultivated
22	<i>Scorodocarpus borneensis</i>	Garlic nut	Buah kulim, bawang hutan	Olacaceae	Fruit	Fresh	Wild
23	<i>Pandanus amaryllifolius</i>	Fragrant pandan	Pandan	Pandanaceae	Leaves	Fresh	Wild-cultivated
24	<i>Morinda citrifolia</i>	Noni	Mengkudu	Rubiaceae	Fruit	Fresh	Wild-cultivated
25	<i>Ganoderma lucidum</i>	Reishi mushroom	Lingzhi, Cendawan merah	Ganodermataceae	Shoot	Fresh	Cultivated

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