

Medicinal Plants for Diabetes by the Orang Asli in Selangor, Malaysia

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ABSTRACT Diabetes is one of the most prevalent chronic diseases in Malaysia and the world. The aim of this study is to document the plant species used by the Orang Asli in Selangor to treat diabetes. Thirteen Orang Asli villages in Selangor comprising of four Mah Meri tribe villages and nine Temuan tribe villages were involved in this study. A total of 24 species of plants from 20 families were mentioned. Half of these species were cultivated, 10 species were wild, and two species of plants were both cultivated and obtained in the wild, that is, *Acanthus ilicifolius* and *Eurycoma longifolia*. Seven species of plants on the other hand possibly have not been studied its ability in treating this disease. The highest Relative Frequency of Citation (RFC) among the species recorded was *Parkia speciosa* with 0.33, followed by *Archidendron bubalinum* with 0.26.

INTRODUCTION

Remedies made from medicinal plant species are highly sought after these days. This was especially with the realization in the scientific and modern medicine world of the unexplored possibilities of medicinal plant species' capabilities, used in traditional medicine. Nowadays, the traditional (folk) medicines are studied and used as a base in finding the novel compounds to treat various diseases around the world.

The Orang Asli or aborigines in Peninsular Malaysia are categorized into three ethnics, that is, Proto-Malays, Senoi and Negritos (Mohd Fauzi Nor Aini 2009). Different views were shown from previous studies on their places of origin and; disputation whether they were originally from this area and archipelagos, or migrated (Hamilton 2005; Mohd Fauzi Nor Aini 2009). Today, the Orang Asli communities in Selangor are among the most urbanized communities of Orang Asli in Malaysia. Four of the Orang Asli villages in Selangor are located in urban areas while another 69 villages are in suburban areas. These villages are equipped with tarred roads, electricity and infrastructure such as community hall, brick houses and schools (in some villages) (Jabatan Kemajuan Orang Asli (JAKOA) 2008). In addition, all of these villages also have

access to hospitals, clinics, towns and markets. Despite the introduction to modernization, some of the Orang Asli still possessed their traditional medicinal knowledge. However, only a handful of them truly applied this knowledge.

There are two different tribes of Orang Asli, which can be found in majority in Selangor namely the Mah Meri tribe (Senoi ethnicity) and the Temuan tribe (Proto-Malays ethnicity) (JAKOA 2008). The Mah Meri tribe lived in the coastal areas in Selangor, while the Temuan tribe is mainly found in hill areas. In terms of their economy, the Mah Meri tribe depends on coastal fishing, wood carving and working in government and private sectors. The Temuan tribe on the other hand relies on agriculture, rubber tapping, collecting forest products and working in government and private sectors (Carey 1976).

According to the National Health Morbidity Survey (NHMS III) in Amal et al. (2006) (as cited in Nantha 2014), diabetes was placed as the second most prevalent chronic disease in Malaysia. World Health Organization (WHO) meanwhile has estimated about 347 million people suffered from diabetes around the world. This disease is generally related to high glucose levels in the blood from the lack of insulin production; or usage in the body (WHO 2012). During the resettlement period, after World War II, diabetes was not known to occur among the Orang Asli. This was due to its absence in the list of diseases suffered by the Orang Asli, published by Polunin in 1953. It may be assumed that this disease might occur from their changing of lifestyle and food intake since then. However, it may also be possible that the lack of examina-

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tion or symptoms of the disease spotted during the resettlement period that affects the result of that study. Today, the Orang Asli is exposed to modern medicine and; terms and symptoms of diseases that affect them through programmes conducted by government bodies such as JAKOA and Malaysia Ministry of Health. This helps them to identify and confirm the symptoms of diabetes. Although some rely on modern medicine, some of the Orang Asli still opts for traditional medicine to treat diabetes.

The main objective of this study is to record the medicinal plant species used by the Orang

Asli in Selangor in treating diabetes as a way to preserve the knowledge before it is forgotten and disappear. Additionally, further studies could be conducted based on the results obtained to verify the species' medicinal capabilities.

MATERIAL AND METHODS

This study was conducted from 2008 to 2010 in 13 Orang Asli villages in Selangor. These villages consists of Broga Orang Asli Village, Bukit Lagong Orang Asli Village, Gurney Orang Asli Village, Hulu Tamu Orang Asli Village, Kolam Air Village, Hulu Tamu Orang Asli Village, Kolam Air

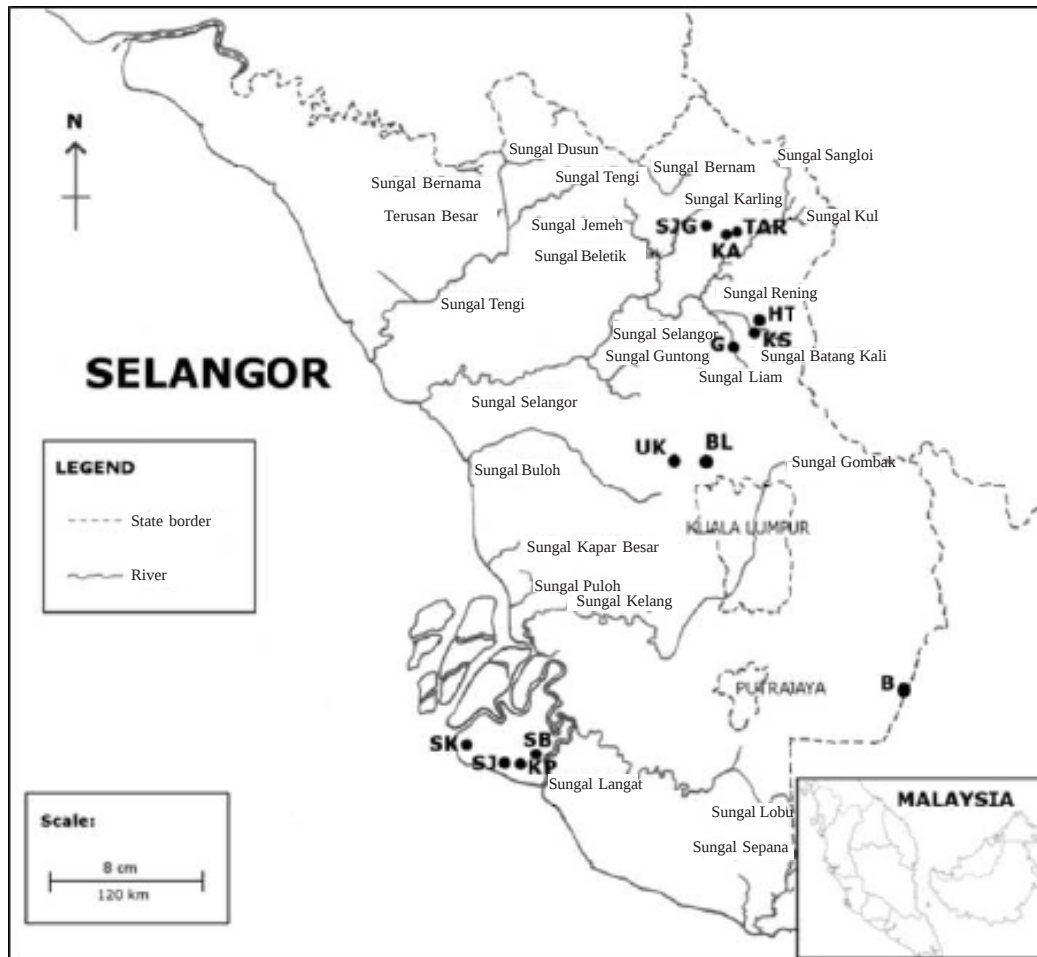


Fig. 1. Locations of study sites (refers to Figure1 Locations of study sites.jpg)
 (B: Broga Orang Asli Village; BL: Bukit Lagong Orang Asli Village; G: Gurney Orang Asli Village; HT: Hulu Tamu Orang Asli Village; KA: Kolam Air Orang Asli Village; KP: Kepau Laut Orang Asli Village; KS: Songkok Orang Asli Village; SB: Sungai Bumbun Orang Asli Village; SJ: Sungai Judah Orang Asli Village; SJG: Sungai Jang Orang Asli Village; SK: Sungai Kurau Orang Asli Village; TAR: Tun Abdul Razak Orang Asli Village; UK: Ulu Kuang Orang Asli Village)

Orang Asli Village, Kepau Laut Orang Asli Village, Songkok Orang Asli Village, Sungai Bumbun Orang Asli Village, Sungai Judah Orang Asli Village, Sungai Jang Orang Asli Village, Sungai Kurau Orang Asli Village, Tun Abdul Razak Orang Asli Village and Ulu Kuang Orang Asli Village (Fig. 1). Four of these villages, that is, Kepau Laut Orang Asli Village, Sungai Bumbun Orang Asli Village, Sungai Judah Orang Asli Village and Sungai Kurau Orang Asli Village are populated by the Mah Meri tribe, while the rest of the nine villages by the Temuan tribe. The study locations cover from N 02° 49' 27.4" to N 03° 34' 40.8" and E 101° 17' 49.5" to E 101° 54' 42.4".

The informants consist of the head of the village known as *Batin* or *Ketua Kampung*, traditional medicine practitioners and villagers with traditional medicinal knowledge. These informants were recommended by *Batin* (or *Ketua Kampung*) and the officers of the Department of Orang Asli Development or *Jabatan Kemajuan Orang Asli* (JAKOA). Forty-two persons were interviewed during the study.

The data regarding their knowledge of traditional medicines in treating diabetes were collected through semi-structured questionnaire. The questions involved which plant species were used to treat diabetes, its vernacular names and the specific preparation and administration. The interviews were conducted using Malay language. The objective and subjects of the study were mentioned to the informants and their consents were obtained prior to the interviews. The data were recorded in a notebook and voice recording device (only when allowed by the informant). Available plant species to treat diabetes were collected with the guide from informants and deposited in University of Malaya Herbarium.

Relative Frequency of Citation (RFC) for each plant species was calculated using the formula:

$$RFC = FC / N$$

FC refers to frequency of citation of a species mentioned by the informants in this study, while N refers to the total number of informants involved in this study. This index is used to determine whether the species mentioned by the informants are frequently used or known by informants in the study locations. It ranges from 0 to 1 with the former value indicating zero citation of a species and the latter value indicating that a species had been cited by all informants (Tardío Pardo-de-Santayana 2008).

RESULTS AND DISCUSSION

Twenty-four species of plants from 20 families were used by the Orang Asli in Selangor (Table 1). Among these species, the most commonly used family was Fabaceae, with four species of plants. Fifty percent of the species listed in Table 1 were cultivated and 42 percent were wild. Two species (8%), namely *Acanthus ilicifolius* and *Eurycoma longifolia* were both cultivated and obtained in the wild. *Acanthus ilicifolius* was mentioned by Mah Meri tribe informants whereas *E. longifolia* by Temuan tribe informants.

The Relative Frequency of Citation (RFC) of plant species in Table 1 shows a range from 0.02 to 0.33. The highest was shown by *Parkia speciosa* with 0.33, followed by *Archidendron bubalinum* with 0.26 and *Imperata cylindrica* with 0.12 (Table 1). *Parkia speciosa* and *A. bubalinum* were used in four out of 13 villages, each. Both species were cited by the Temuan tribe informants. *Parkia speciosa* has been found to possess compounds that posed hypoglycaemic effect. One of them is known as Stigmast-4-en-3-one, which was derived from the bean pod of this species (Kamisah et al. 2013). The Orang Asli in this study, however, took the root decoction or the raw seed and/or bean pod to treat diabetes (Table 1). The root decoction of this species were also taken orally by the Orang Asli from Temuan and Semai tribes in Negeri Sembilan and Perak, for the same medicinal purpose (Ong et al. 2011; Ong et al. 2012). This species was among the cultivated and sold plant species by the Temuan tribe in this study.

For *A. bubalinum*, its root was decocted and drunk in Broga Orang Asli Village, Bukit Lagong Orang Asli Village, and Kampung Songkok Orang Asli Village. Its seed meanwhile was eaten raw in Bukit Lagong Orang Asli Village and Tun Abdul Razak Orang Asli Village. In Tun Abdul Razak Orang Asli Village, the raw seeds of *A. bubalinum* were eaten with fish or other food source. The informants believed that by consuming the raw seed by itself could stop urination that will lead to fatality. Over-consumption of the seeds could give the same effect as well. This situation might be related with the effect of djengkolic acid, a sulphur-containing amino acid in *A. jiringa* (Bunawan et al. 2013). No evidence of this compound, however, was present in *A. bubalinum* in previous studies. Other than *A. bubali-*

num, two species of plants in Table 1 should not be consumed in excess. These species were *E. longifolia* and *Polyalthia bullata*. According to an informant in Ulu Kuang Orang Asli Village, excess consumption of the root from both species could cause redness or yellowish of eyes.

In general, the most commonly used plant part in treating diabetes by the Orang Asli in this study is root followed by leaf and; fruit and stem with 12 species (54.2%), six species (25.0%) and four species (16.7%), respectively (Fig. 2). Most often, the parts of plant especially leaf, stem, shoot and seed were eaten raw; and taken as salad or *ulam*. Mainly, the Orang Asli believed that any plant species (parts especially the fruit or seed) that has a bitter taste are able to treat or suppress diabetes.

The most commonly applied method of preparation involving the plant species recorded in this study is decoction with 65.7 percent of formulations. This is followed by raw and infusion with 20.0 percent and 5.7 percent formulations, respectively (Fig. 3). Decoction is mainly a method of extracting the substance from natural resources via boiling, while infusion involved steeping the plant part(s) in water, in the form of tea. No specific duration, however, was men-

tioned for the preparation for each decoction or infusion made by the Orang Asli. All of the formulations prepared using the plant species listed in Table 1 were taken orally since this disease affects an individual internally.

Among the species listed in Table 1, two species of plants were decocted with another plant species in preparing the formulation, that is, *I. cylindrica* and *Morinda citrifolia*. While the addition of *Labisia pumila* to the decoction of *I. cylindrica* was used to increase the efficacy of the formulation, the addition of *Pandanus amaryllifolius* with *M. citrifolia* was to suppress the latter's fruit pungent aroma.

The Temuan tribe clearly used a higher number of plant species in treating diabetes with 14 species of plants, in comparison to the Mah Meri tribe with eight species of plants. Two species of plants namely *I. cylindrica* and *Orthosiphon aristatus* were similarly prepared and applied by Mah Meri and Temuan tribes in treating this disease, where both species were decocted (separately) and taken orally (Table 1). While *O. aristatus* was cultivated based from its fame and effectiveness in treating various diseases including diabetes, *I. cylindrica* is a weed species that could be found almost anywhere in the villages.

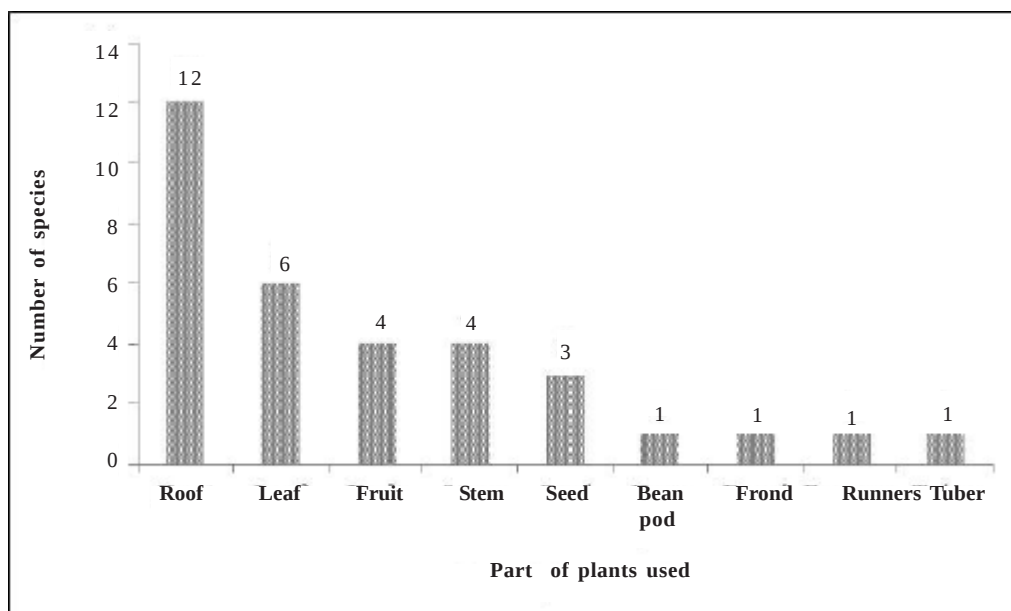


Fig. 2. Part of plants used as medicine to treat diabetes according to the number of species (refers to Figure 2 Part of plants used as medicine to treat diabetes according to the number of species.jpg)

Table 1: Plant species used in treating diabetes by the Orang Asli in Selangor

Botanical name	Local name	Cultivated or wild	Part(s) used	Preparation	Application	Village(s)	FC	RFC
<i>Acanthus ilicifolius</i> L. (Acanthaceae)	Pokok nuju	Cultivated and wild	Fruit	Pounded, mixed with water and sieved	Oral	KP	2	0.05
<i>Andrographis paniculata</i> (Burm.f.) Wall. ex Ness (Acanthaceae)	Hempedu bumi	Cultivated	Leaf	Infusion Decoction Raw	Oral Oral Oral	UK UK, SJG SIG	4	0.10
<i>Archidendron bubalinum</i> (Jack) I. C. Nielsen (Fabaceae)	Akar cerita Kerdas	Wild	Root Root Seed	Decoction Decoction Raw	Oral Oral Oral	BL B, BL, KS TAR	11	0.26
<i>Archidendron jiringa</i> (Jack) I. C. Nielsen (Fabaceae)	Pokok jering	Cultivated	Unripe seed Root	Raw Decocted (in 2 cups of water until 1 cup left)	Oral Oral	BL KA	4	0.10
<i>Averrhoa carambola</i> L. (Oxalidaceae)	Jering Belimbing besi	Cultivated	Seed Root	Decoction Raw Decoction	Oral Oral Oral	UK UK UK	1	0.02
<i>Centella asiatica</i> (L.) Urban (Apiaceae)	Pegaga	Cultivated	Leaf, stem	Decocted and root	Oral	KP	2	0.05
<i>Cnestis</i> sp. (Connaraceae)	Akar sembelit	Wild	Twining stem	Decoction	Oral	UK	1	0.02
<i>Durio zibethinus</i> Murray (Bombacaceae)	Pokok durian	Cultivated	Root	Decoction	Oral	UK	1	0.02
<i>Eurycoma longifolia</i> Jack (Simaroubaceae)	Tongkat ali	Cultivated and wild	Underground stem and root	Decoction	Oral	G, UK	3	0.07
<i>Imperata cylindrica</i> (L.) Beauv (Poaceae)	Lalang	Wild	Root and runners	Decoction Decocted with <i>Labisia pumila</i> leaf	Oral Oral	SK HT	5	0.12
<i>Leucaena leucocephala</i> (Lam) de Wit. (Fabaceae)	Pokok petai belalang	Cultivated	Root	Decoction	Oral	B	1	0.02
<i>Monordia charantia</i> L. (Cucurbitaceae)	Peria katak	Cultivated	Fruit	Raw or fried	Oral	SJ	2	0.05
<i>Morinda citrifolia</i> L. (Rubiaceae)	Pokok mengkudu	Cultivated	Fruit	Raw Cut or blended, decocted with <i>Pandanus amaryllifolius</i> and sieved	Oral Oral Oral	KP SJ	3	0.07
<i>Muntingia calabura</i> L. (Muntingiaceae)	Daun cere	Cultivated	Leaf	Decoction	Oral (two spoonful, daily)	UK	1	0.02
<i>Nypa fruticans</i> Wurmbe (Arecaceae)	Nipah	Wild		Young fruit cluster	Dried, cut and Oral decocted	SK	1	0.02

Table 1: Contd....

Botanical name	Local name	Cultivated or wild	Part(s) used	Preparation	Application	Village(s)	FC	RFC
<i>Orthosiphon aristatus</i> (Blume) Miq. (Lamiaceae)	Pokok misai kucing	Cultivated	Leaf	Decoction	Oral	B, SB	3	0.07
				Infusion (5 – 6 leaf per glass of water)	Oral	SJ		
<i>Parkia speciosa</i> Hassk. (Fabaceae)	Petai	Cultivated	Root Seed Bean pod and seed	Decoction Raw Raw	Oral Oral Oral	B, SJG, UK TAR UK	14	0.33
<i>Pereskia bleo</i> (Kunth) DC. (Cactaceae)	Pokok jarum tujuh bilah Pokok tujuh jarum	Cultivated	Leaf	Decoction	Oral	BL, SJG UK	4	0.10
<i>Phyllanthus amarus</i> Schumacher and Thonn. (Phyllanthaceae)	Pokok dukung anak	Wild	Leaf	Decoction	Oral	SJ	1	0.02
<i>Polyalthia bullata</i> King (Annonaceae)	Tongkat ali hitam	Wild	Root and underground stem Tuber	Decoction	Oral	UK	2	0.05
<i>Smilax myosotiflora</i> A. DC. (Smilacaceae)	Ubi jaga	Wild	Tuber	Decoction	Oral	B	2	0.05
<i>Stenochlaena palustris</i> (Burm.f.) Bedd. (Blechnaceae)	Paku merah	Wild	Frond	Cooked in soup	Oral	SJ	1	0.02
<i>Tetracera indica</i> Merr. (Dilleniaceae)	Akar mempelas Akar mempelas	Wild Wild	Root Root	Decoction Decoction	Oral (three times, daily – morning, afternoon and evening) Oral	B KP	1 2	0.02 0.05
<i>Tinospora crispa</i> (L.) Hook. f. and Thomson (Menispermaceae)	Patawali	Wild	Stem	Decoction and sieved	(one glass a day)			

* FC = frequency of citation; RFC = relative frequency of citation

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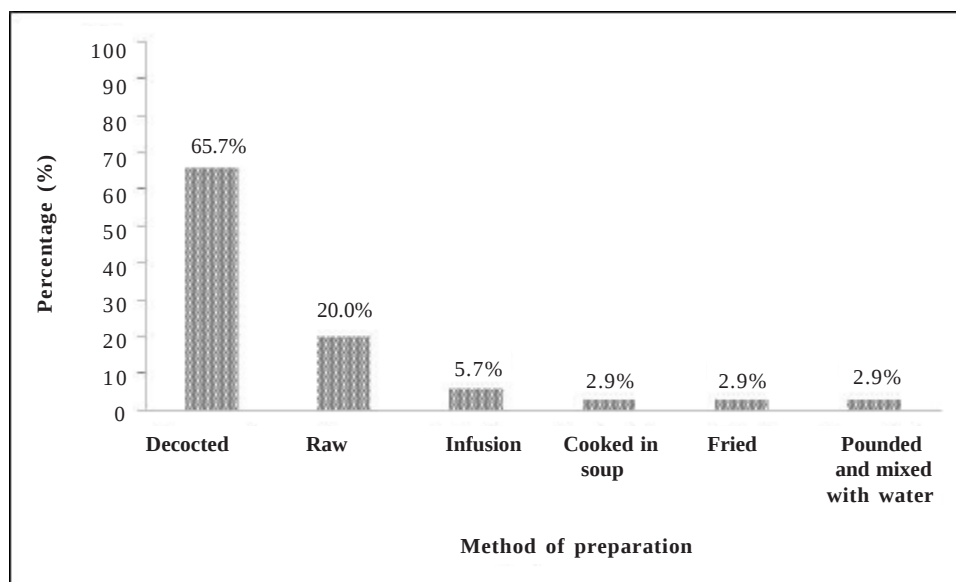


Fig. 3. Method of formulations' preparation and percentage of its applications
(refers to Figure 3 Method of formulations' preparation and percentage of its applications)

In addition, both have been proven their capabilities in treating diabetes (Mohamed et al. 2013; Jiang 2014).

The differences of plant species used by both tribes in treating diabetes may due mainly to the differences of vegetation around the Mah Meri and Temuan tribes' settlement. Living on the coastal areas, the Mah Meri tribe has access to mangrove and coastal forest, whereas the Temuan tribe has access to lowland and hill forest. This study however will not dwell further either on the differences of traditional knowledge between both Mah Meri and Temuan tribes or on the comparison of informants' numbers interviewed in each village. This was due to the fact that varied numbers of informants were involved in each village and that they were recommended by the *Batin* (or *Ketua Kampung*) and officer of JAKOA, instead of fixed (in terms of numbers of informants) or randomly chosen.

Out of 24 species of plants listed in Table 1, seven species (29.2%) have yet to be scientifically proven or confirmed their ability and chemical constituents to treat diabetes. These species are *A. ilicifolius*, *A. bubalinum*, *Cnestis* sp., *Pereskia bleo*, *P. bullata*, *Smilax myosotiflora* and *Stenochlaena palustris*. However, not all of the species that has been proven their capabilities to treat diabetes in previous studies used

the same plant part as the Orang Asli. *Nypa fruticans* for example, has been proven in lowering glucose level in the blood (Reza et al. 2011). Nevertheless, the parts used in the study were stem and leaf, instead of young fruit cluster as used by the Orang Asli in Selangor, specifically by the Mah Meri tribe from Sungai Kurau Orang Asli Village (Table 1).

Overall, low number of species recorded and RFC calculated might be due to several possibilities. The selection of informants based from the recommendation from *Batin* (or *Ketua Kampung*) and the officers from JAKOA shows that the informants possessed reliable traditional knowledgeable among the villagers. However, these selected informants were low in numbers. According to the informants and *Batin* (or *Ketua Kampung*), the generation today lack the eagerness to learn traditional knowledge and only a handful of elders with the traditional knowledge are left. In addition to this, access to towns and hospitals or clinics made them more dependent on modern medicine. Furthermore, due to modernisation, the Orang Asli also suffers from the loss of forested areas and pollution. This situation made them unable to fully practice traditional medicine, with the lack of the natural resources needed to prepare the medicine.

The plant species used in treating diabetes by the Orang Asli in this study might be able to suppress if not treat the disease entirely, possibly by inducing the production of insulin or lowering the glucose level in the blood. The mechanism of the species' compound or the plant parts utilized by the Orang Asli should be observed, if studies are to be conducted in proving these species ability in treating diabetes or any other diseases. The methods of preparation, additional ingredients, time of intake or application and their belief should also be taken into consideration since it might prove to increase the efficacy of the medicine or ridding any harmful substance from the plant species.

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