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Ethnopharmacological Survey of Medicinal Plants in Malaysia, the Kangkar Pulai Region

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Abstract: The medicinal plants play an important role in rural health care system throughout the world in remedying and preventing various kinds of diseases. This study documented the use of plants as traditional herbal medicine in the Kangkar Pulai region Johor, Malaysia. It also identified the homogeneity of informant knowledge on medicinal plants suitable for different ailments and types of plants most favored for the treatment of each ailment in the study. The information was gathered through semi-structured interviews, discussions with key informants and informal conversations with local people and herbal practitioners. The data was calculated based on informant consensus factor (Fic) and use value (UV). Information on 40 medicinal plants species from 29 taxonomic plant families used for traditional treatment of different diseases/ailments was documented. The informant consensus factor values (Fic) showed that the local people tend to agree more with each other in terms of the plants used to treat sexual weakness (0.95), blood pressure (0.94), diabetes (0.93), delivery and female problems (0.90), hair problems and dandruff (0.87), respiratory disorder (0.86) and kidney problems (0.85). By contrast, digestive problems (0.76) and skin problems (0.71) and inflammation pain (0.70) were found to have low Fic values. Calculated values of the UV and Fic indicate that this community is knowledgeable on healing and treatment using traditional herbal medicines.

Key words: Ethnopharmacological survey, medicinal plants, traditional medicine, informant consensus factor, Kangkar Pulai, Malaysia

INTRODUCTION

Traditional medicine as an alternative is now accepted all over world for health care. The World Health Organization (WHO, 1991) recognizes traditional medicine as an important contributor to its health care objectives. At the primary health care level, it is estimated that nearly 80% of the world population depends on traditional medicine for their healthcare needs (WHO, 1991). Indigenous medicine provides economic benefits (Azaizeh *et al.*, 2003). Herbal plants used as medicines in the forms of drugs, herbal and nutritional supplements play an important role in health care. However, many ethnic groups fail to maintain and preserve the collective knowledge on the use of medicinal plants (Panyaphu *et al.*, 2011).

Despite the availability of modern medicine, herbal medicines are popular in developing countries for cultural and historical reasons. Information on the use of herbal plants for treatment of specific diseases from all over the world is available, however, the use of these plants must be investigated, correlated and documented (Alzweiri *et al.*, 2011).

Malaysia is one of the countries in South-East Asia with an estimated population of 26 million. It is located in the tropical rain forest region which is rich with natural resources comprising plants of medicinal value as well as other plants. Besides that, Malaysia is the world's oldest and fourth largest biodiversity rich country in Asia after India, China and Indonesia (Muhammad and Awaisu, 2008).

There are three major ethnic groups comprising Malay, Indian, Chinese in Malaysia and the majority users of traditional medicines are Indians (45.2%) followed by Chinese (32.4%) and the Malays (22.4%) (Muhammad and Awaisu, 2008). Among the thirteen types of traditional medicines identified, medicinal plants considered a natural source of vitamins and supplements 48.2% of Malaysians who suffer from chronic diseases in Malaysia use these supplements. The next common traditional medicines used by Malaysians are herbal medicines (26.4%), ginseng (4.7%) and traditional Chinese medicine (4.0%) (Che Nor Din, 2010). This study aimed to gather and document traditional ethnobotanical knowledge from practitioners and users of traditional medicines in the

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Kangkar Pulai region. For which, the following questions had been answered: (1) What were the common types of diseases and species of plants used in the treatment of these diseases in the Kangkar Pulai region and (2) What were the methods used in the preparation of traditional herbal medicines?

MATERIALS AND METHODS

Study area: Kangkar Pulai whose original name is Kampung Kangkar Pulai with geographical coordinates 1°33'0" North, 103E36'0" East is situated in Johor, Malaysia (Fig. 1) (http://media.web.britannica.com/eb-media/50/62450-004-1F0D36C7.jpg). It is located in the southern part of Peninsular Malaysia. This region has a tropical rainforest climate that has an annual monsoon rainfall coming from the South China Sea beginning in November until February. The average annual rainfall is 1778 mm with average temperatures ranging between 25.5°C (78°F) and 27.8°C (82°F). The humidity is between 82 and 86% in a year , with an average low of 22°C and a high of 31°C (Keenan *et al.*, 2003).

Interviews and collection of plants: The survey was conducted in 2011-2012. A total of 25 traditional medicine practitioners (13 women and 12 men) from 23 households participated in the study. The ages of the informants ranged between 40 to 70 years, with the average age being 55 years. The ethnobotanical data were collected through Participatory Rural Appraisal (PRA), which was based on interactions with indigenous people and direct observations by being in the field (Rokaya *et al.*, 2010). The selection of the individual informant interviewed was fundamentally important to ensure credibility of the information collected. The informants are practitioners who are considered as professionals because they treat patients outside the circle of their own family and friends and used medicinal plants in all or part of the therapeutic activity.

These informants were aware of their rights to refuse to answer any question, to stop the interview at any time, or simply refuse to correspond completely (Alzweiri *et al.*, 2011). For this study, scientific names of species of plants have been identified based on the International Plant Name Index (IPNI: www.ipni.org) and Tropics (http://www.tropicos.org/Home.aspx) (Lee *et al.*, 2008).

Data analysis
Use value (UV): The relative importance of each plant type known locally to be used as herbal treatment is reported as Use value (UV) (Gazzaneo *et al.*, 2005).

The use value is calculated as follows:

$$UV = \sum U/n$$

Fig. 1: Location of Kangkar Pulai in Malaysia

Where:
UV = Use value of a species
U = No. of uses per species
n = No. of informants

The UV is useful in identifying plants with the highest use (most frequently mentioned) in the treatment of a disease with a given informant consensus factor value.

Informant consensus factor: To know if there was a consensus in the use of plants in the disease categories between the plant users in the study area, the informant consensus factor (Fic) was calculated using the following formula (Heinrich *et al.*, 1998; Gazzaneo *et al.*, 2005):

$$Fic = \frac{(Nur - Nt)}{(Nur - 1)}$$

Where:
Nur = No. of use reports per each category
Nt = N. of taxa used

Informant consensus factor (Fic) is used to deduce the homogeneity in the information on the use of a specific plant to treat a certain diseases. All citations placed according to the type of ailment for which the plant is claimed to be used with products of this factor ranging from 0 to 1. A high value (close to 1) shows that it is used in comparative species (common species) by a large proportion of the informants. This is an indicator of a more consistent use of this medicine resource. On the contrary a low value shows that the informants dissent on the taxa used in the treatment of the disease within a class (Hudaib *et al.*, 2008).

RESULTS AND DISCUSSION

Survey results and discussion: The results of the ethnopharmacological survey on a total of 40 species of plants were documented and found to belong to 29 families. Other findings such as conventional use of these plants, methods of preparation and route of administration are shown in Table 1. The main reported families of the species of plants are Malvaceae (4 species) and Zingiberaceae (3 species). Besides these main families, Apiaceae, Arecaceae, Rubiaceae, Rutaceae and other species are also presented in the Table 1.

The results of the study showed that people in the Kangkar Pulai region still employ medicinal plants as part of their health care system. This might not be the case in the future with modern medicines becoming continuously easily obtainable to them. This might result in habitat degradation causing several kinds to become less available or not available within walking distance

(Ong *et al.*, 2011a, b). Knowledge of medicinal plants itself could become reduced or lost and young citizens could be less keen to learn and utilize medicinal plants (Ong *et al.*, 2011a, b; Ong and Nordiana, 1999; Ong and Norzalina, 1999). Previous studies conducted by researchers in Malaysia have been concerned only on mentioning the plant species and method of using it but they did not mention the importance of using the use value or informant consensus factor (Che Nor Din, 2010; Khatun *et al.*, 2011; Norhayati *et al.*, 1998; Ong *et al.*, 2011a, b, 2012; Ong and Nordiana, 1999; Ong and Norzalina, 1999).

In this study, as shown in Table 1, the use value of each plant was calculated. This is very important for pharmaceutical studies because it shows the importance of each plant. The current use value of medicinal plants shows that they are actively used as conventional medicine. There could also be a number of plants which are not currently employed for medicinal purposes, but can have implications in the medical reality (Kaya, 2006).

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Parts of plants used as medicines: The parts of plants used to make herbal preparation are roots, fruits, leaves, sepals, bulbs and flowers. The roots were the most frequently used (32%), followed by fruits (28%), leaf (24%), sepals and bulbs and flowers (4%) each (Fig. 2).
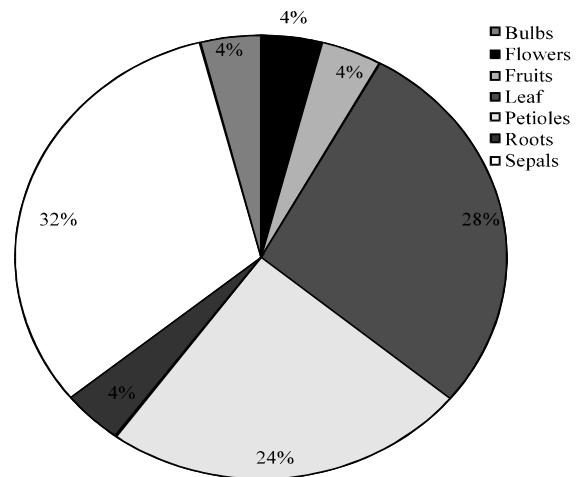

Fig. 2: Parts of plants used as medicines

Table 1: Plants used for treatment of various human ailments in Kangkar Pulai region

Scientific name (family) [voucher specimen No.]	Vernacular names (Bahasa)	Part used	Preparation method	Recommended use	UV	Benefits
Allium sativum L. (Alliaceae) [A.sat-009]	Bawang putih	Bulbs	Pounded bulbs	To get rid of headache	0.24	Regain loss of appetite and get rid of head lice (Ong and Norzalina,1999)
Aloe vera L.(Aloaceae) [A.ver-009]	Lidah buaya	Leaf	Rubbed	Treatment of dandruff and skin complaints	0.56	Cure dandruff and other skin complaints (Ong and Norzalina, 1999)
Ananas comosus L.(Merr.) (Bromeliaceae) [A.com-009]	Nenas	Fruits	Fruit juice is applied on head every day for 10 min	Treatment of dandruff and skin sensitive	0.24	Cure for dandruff (Ong and Norzalina, 1999)
Annona muricata L. (Annonaceae) [A.mur-009]	Durian Belanda	Fruits	Eaten the fruits	Sexual tonic for men	0.64	Treatment for fainting (Ong and Norzalina, 1999)
Apium graveolens L. (Apiaceae) [A.gra-009]	Seladri	Roots	Decoction taken Orrally	To treat of the liver problems	0.12	Induce immunoglobulin E (Bublin et al., 2003)
Averrhoa bilimbi L. (Oxalidaceae) [A.bil-009]	Belimbing buluh	Fruits	Juice taken orally	To treat diabetes	0.12	Treat pimples and diabetes (Ong and Norzalina, 1999)
Carica papaya L. (Caricaceae) [C.pap-009]	Betik	Leaf	Decoction	Reduce of hyperacidity	0.16	Treat malarial fever (Ong et al., 2011a ,b)
Centella asiatica L. Urban (Apiaceae) [C.asi-009]	Pegaga	Leaf and root	The juice is drunk	A remedy of asthma	0.24	Reduce the high blood pressure (Ong and Nordiana, 1999; Ong and Norzalina, 1999)
Citrus aurantifolia (Christm.) (Swingle) (Rutaceae) [C.aur-009]	Limau nipis	Fruits	The fruit juice is rubbed	To treat dandruff	0.12	Use as a skin care and treat dandruff (Ong and Nordiana, 1999; Ong and Norzalina, 1999)
Cinnamomum mollissimum Hk.f. (Lauraceae) [C.mol-009]	Medang rawang	Root	Decoction	Reduce the internal heat (fever)	0.12	Treat fever, body heat (Ong and Nordiana, 1999; Ong and Norzalina, 1999)
Citrus hystrix DC.(Rutaceae) [C.hys-009]	Limau purut	Fruits	Fruits juice	To get rid of dandruff and skin diseases	0.12	To get rid of body smell (Ong and Nordiana, 1999)
Cocos nucifera L. (Arecaceae) [C.nuc-009]	Kelapa	Young fruit	Coconut water taken orally	To treat chicken pox and asthma	0.48	Treat fever (Ong and Nordiana, 1999)
Curcuma domestica Valeton. (Zingiberaceae) [C.dom-009]	Kunyit	Rhizomes	Juice	Flatulence and accelerate recovery of health and strength	0.12	To protect the skin against the sun rays (Scartezzini and Speroni, 2000)
Eurycoma longifolia Jack (Simaroubaceae) [E.lon-009]	Tongkat Ail	Roots	Decoction	Aphrodisiac for men	0.32	Use as aphrodisiac for men (Scartezzini and Speroni, 2000)
Garcinia mangostana L. (Clusiaceae) [G.man-009]	Manggis	Leaf	Boiling the leaf	To cure of pains	0.12	To be tied with cloth on to sprains (Scartezzini and Speroni, 2000)
Hibiscus rosa-sinensis L. (Malvaceae) [H.ros-009]	Bunga raya	Flowers	Decoction	To treat the fever	0.32	Used as a remedy for fainting (Ong et al., 2011a, b)
Hibiscus sabdariffa L. (Malvaceae) [H.sab-009]	Roselle	Sepals	Decoction	To reduce high pressure	0.24	Increase urination (Olaleye, 2007)
Kaempferia galanga L. (Zingiberaceae) [K.gal-009]	Cekur	Roots	Decoction	Digestive system	0.12	Use as a diuretic and for stomachache (Ong et al., 2011a, b)
Lawsonia inermis L. (Lythraceae) [L.ine-009]	Inai	Leaf	Decoction	Wound healing and skin problems	0.16	To grow healthier hair and have smooth skin (Ong et al., 2011a, b)
Mentha arvensis L. (Lamiaceae) [M.are-009]	Daun pudina	Leaf	Juice	To treat sore throats and bad breath	0.12	To heal sore throats (Ong et al., 2011a, b)
Momordica charantia L. (Cucurbitaceae) [M.cha-009]	Peria	Fruits	Juice	To cure diabetes	0.24	To treat high blood pressure (Ong et al., 2011a, b)
Morinda citrifolia L. (Rubiaceae) [M.cit-009]	Mengkudu	Leaf	Decoction	Respiratory diseases	0.12	To purify the blood (Ong et al., 2011a, b)
Moringa oleifera Lamk. (Moringaceae) [M.ole-009]	Remunggal	Leaf	Pounded	To cure swollen breasts	0.12	To promote contraction of the uterus (Ong et al., 2011a, b)
Musa paradisiaca L. (Musaceae) [M.par-009]	Pisang tanduk	Petioles	Juice	Expulsion the pus and skin diseases	0.32	To treat fever (Ong et al., 2011a, b)
Nothopanax scutellarium Merr. (Araliaceae) [N.scu-009]	Pokok puding mangkuk	Leaf	Decoction	To treat high blood pressure and kidney problems	0.12	To treat constipation (Ong et al., 2011a, b)

Table 1: Countinue

Scientific name (family) [voucher specimen No.]	Vernacular names (Bahasa)	Part used	Preparation method	Recommended use	UV	Benefits
Olea europaea L. (Oleaceae) [O.eur-009]	Minyak zaitun	Oil and leaf	Decoction	To treat of hair fall	0.12	To release pressure, remove renal stones and reduce muscle contraction (Alzweiri *et al.*, 2011)
Orthosiphon grandiflorus (Blume) Bold. (Lamiaceae) [O.gra-009]	Misai kucing	Leaf	Decoction	To reduce diabetes and to treat of fever	0.32	To treat fever (Ong and Norzalina, 1999)
Paederia foetida L. (Rubiaceae) [P.foe-009]	Sekentut akar bukit	Roots	Decoction	General tonic for the body of the woman after child birth	0.40	To assist in physical recovery (Ong and Norzalina, 1999)
Parkia speciosa Hassk. (Mimosaceae) [P.spe-009]	Petai	Fruits	Eaten	To treat the diabetes	0.12	To ease toothache (Ong *et al.*, 2011a, b)
Phoenix dactylifera L. (Arecaceae) [P.dac-009]	Kurma	Fruits	Eaten	To cure of digestive system	0.12	Use as general tonic and purgative for stomach (Zeid, 2010)
Piper betle L. (Piperaceae) [P.bet-009]	Sireh	Leaf	Infusion	To treat bad breath	0.24	To treat pus discharge (Ong and Nordiana, 1999)
Polyalthia bullata King. (Annonaceae) [P.bul-009]	Tongkat Ali Hitam	Roots	Decoction	To treat of kidney problems	0.12	To help men with low sexual energy (Ong *et al.*, 2011a, b)
Polygonum minus Huds. (Polygonaceae) [P.min-009]	Daun kesum	Leaf	Pounded	To treat of skin problems	0.12	To treat skin infection (Ong and Norzalina, 1999)
Psidium guajava L. (Myrtaceae) [P.gua-009]	Jambu batu	Leaf	Decoction	To treat of diarrhea	0.24	To treat diarrhea, stomach ache (Ong *et al.*, 2011a, b)
Punica granatum L. (Punicaceae) [P.gra-009]	Delima	Leaf	The burned leaf	To treat stomachache	0.12	To treat stomach ache (Ong and Norzalina, 1999)
Rourea rugosa Planch. (Connaraceae) [R.rug-009]	Akar pelasan	Roots	Decoction	To treat respiratory disease (asthma)	0.24	To treat kidney disease, lung tumor, stomach tumor (Ong *et al.*, 2011a, b)
Senna alata (L.) Roxb. (Caesalpiniaceae)[S.ala-009]	Gelenggang besar	Leaf	Rubbed	To treat fungal infection	0.12	To treat ringworms or sore (Ong and Norzalina, 1999)
Sida acuta Burm.f. (Malvaceae) [S.acu-009]	Kelulut	Roots	Pounded	To treat boils and skin diseases	0.12	To treae boils (Ong and Nordiana 1999)
Sida rhombifolia L. (Malvaceae) [S.rho-009]	Seburi	Roots	Decoction	To treat uterus problems	0.24	To help with the contraction of the abdomen and uterus (Ong and Norzalina, 1999)
Zingiber officinale Rosc. (Zingiberaceae) [Z.off-009]	Halia	Rhizome	Decoction	Respiratory problems, stomach ache and abdominal swelling	0.64	To treat influenza (Ong *et al.*, 2011a, b)

Traditional healers believe that the roots are more effective than the other parts of the plant. Other studies have shown that the roots and other parts of plants which are under the ground have high concentrations of biologically active compounds (Maroyi, 2011).

Harvesting the whole plant or roots or excessive use of the fruit or seeds of a drug has a negative effect on plant population, which may lead to a strong reduction in the growth of many of these medicinal plants (Ayyanar and Ignacimuthu, 2011).

Medicinal plants and remedies: Many people living in Kangkar Pulai used herbal plants for the treatment of various ailments. It is worth mentioning that the usual complaints mainly deal with minor digestive disorders, colic, kidney stones, constipation, abdominal pain, cough and asthma. In certain circumstances, the herbal plants are used for treating more serious diseases such as diabetes and heart disease (Alzweiri *et al.*, 2011; Ong *et al.*, 2011a, b). Twenty-seven plant families from the list of plants have been found to be of medicinal importance (Table 1).

According to the calculation of the use-value (UV), *Annona muricata, Zingiber officinale* Rosc. and aloe vera were reported to have the highest use values (Table 1). It was found that *Annona muricata* is being used to treat sexual weakness diseases and *Zingiber officinale* Rosc is used to treat respiratory problems and abdominal swelling, stomachache. These plants are reported to have UVs of up to (0.64). Besides that, the aloe vera is used to treat skin diseases and dandruff and reported to have a UV of (0.56).

Table 2 summarizes the informant consensus factor (Fic) for 10 types of ailments: inflammation and pain, digestive problems, diabetes, blood pressure, respiratory problems, kidney problems, skin problems, delivery, female problems, hair problems, dandruff and sexual weakness. The highest (Fic) value (0.95) was cited for sexual problems. It was found that *Annona muricata* L (UV: 0.64) and *Eurycoma longifolia* (UV: 0.32) were the plants most frequently used to treat sexual problems. The second highest (Fic) value (0.94) was recorded for blood pressure and vascular system. *Hibiscus sabdariffa* L (UV: 0.24), the plant with the highest UV has been used for the treatment of blood pressure.

For diabetes problems (Fic: 0.93), *Orthosiphon grandiflorus* (Blume) Bold (UV: 0.32), *Momordica charantia* L. (UV: 0.24) and *Orthosiphon grandiflorus* (Blume) Bold (also used to treat the fever) are the plants most frequently used for this ailment. Delivery and female problems were ranked as the fourth type of ailment with (Fic) value of (0.90) used *Paederia foetida* L. (UV: 0.40) and *Sida rhombifolia* L (UV: 0.24) as the plants mostly

Table 2: Informant consensus factor value of different types of ailments

Type	Species	All species (%)	Use citation	All use citation (%)	Fic
Sexual weakness problems	2	5.0	4	8.57	0.95
Blood pressure	3	5.0	36	12.85	0.94
Diabetes	4	10.0	48	17.59	0.93
Delivery and female problems	2	5.0	12	4.28	0.90
Hair problems and dandruff	5	12.5	34	12.14	0.87
Respiratory problems	7	17.5	46	16.42	0.86
Kidney problems	2	5.0	8	2.85	0.85
Digestive problems	6	15.0	22	7.85	0.76
Skin problems	7	17.5	22	7.85	0.71
Inflammation and pain	9	22.5	28	10.00	0.70

used to treat the ailments. Treatment of Hair problems and dandruff, recorded as the fifth category with (Fic) value of (0.87) would include Aloe *vera* L. (UV: 0.56). This is the best plant used as anti-dandruff and treatment for scalp problems (by rubbing the leaves and applying them on the scalp), (Table 1). The sixth ailment is respiratory problems (Fic: 0.86), which include common cold, cough, asthma and influenza. For the treatment of blood pressure, *Zingiber officinale* Rosc (UV: 0.64) as the plant with the highest UV (Table 2) is used.

Kidney problems as the seventh ailment, include kidney stones and urinary tract infections with (Fic) value of (0.85), *Polyalthia bullata* King has a (UV: 0.12) is principally imputed to its effects under the latter category. Digestive problems cited as the eighth category includes relief of symptoms such as spasm, indigestion, stomachache, flatulence, nausea and abdominal pain with the use of *Psidium guajava* L (UV: 0.24) and (Fic: 0.76). The ninth category (Fic: 0.71) was recorded for the skin problems and infections including acne. *Musa paradisiaca* L. (UV: 0.32) is one of the plants used for the treatment of skin problems.

The last type of ailment is inflammation and pain with value of (Fic: 0.70) and it was reported that *Cocos nucifera* L with (UV: 0.48) (Table 2) was the most commonly used plant.

CONCLUSION

The current study showed that traditional medicines are still commonly used by the people in the Kangkar Pulai region. Moreover the interviews showed that the traditional knowledge of medicinal plants was limited to traditional healers and elders in this region. The medicinal plants with the highest (UV) in the current study may point to a possible occurrence of valuable phytochemical compounds, but this would require further research of these herbal plants as potential new drugs to treat different diseases.

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