Scientific Validation of Eight Medicinal Plants Used in Traditional Medicinal Systems of Malaysia: a Review

Mst. Afsana Khatun, Md.Harun-Or-Rashid, Mohammed Rahmatullah

ABSTRACT

Malaysia has a well-developed traditional system of medicine, which has been in practice from time immemorial. The traditional medicinal practitioners use a variety of medicinal plants for treatment of various ailments. Traditional medicinal system suffers from lack of acceptance by modern allopathic doctors in the belief that traditional uses lack appropriate scientific basis for use. On the other hand, scientific validation of traditional uses of medicinal plants can become an important means through which not only low-cost medical treatment can be provided but also such treatment can be available easily to poorer segments of the population and the people living in remote areas, and as such lacking accessibility to modern medical practices. This review discusses the use of eight medicinal plants in the traditional medicinal system of Malaysia and related scientific reports on their pharmacological activities, which validate their traditional uses. The plants reviewed are Aloe vera, Morinda citrifolia, Piper sarmentosum, Acorus calamus, Andrographis paniculata, Orthosiphon aristatus, Eurycoma longifolia, and Centella asiatica. It is concluded that strong scientific evidences have emerged, which justifies the traditional medicinal uses for the plants.

Key words: Traditional medicine, medicinal plants, Malaysia, ethnomedicine

Introduction

Traditional medicine, also known as complementary medicine or alternative medicine, even in the present age, provides the first line of primary health-care to major segments of the population throughout the world. Traditional medicine has been defined by the World Health Organization (WHO) as “health practices, approaches, knowledge and beliefs incorporating plant, animal and mineral-based medicines, spiritual therapies, manual techniques and exercises, applied singularly or in combination, to treat, diagnose and prevent illnesses or maintain well-being” WHO (2003).

Traditional medicine can offer several advantages over modern medicine, otherwise known as allopathic medicine. First, since traditional medicinal system has been practiced in various countries from time immemorial and still persists in the modern age, the people have both found it as well as believe that the system is efficacious in curing diseases. Second, a holistic way of treatment is the basis of all traditional medicinal systems throughout the world; as such, traditional medicine aims at curing the whole body instead of specific symptoms, which is often done in allopathic medicine. Third, it offers a cheaper alternative; since the traditional medicinal practitioner mostly uses simple decoctions of plants, animals or minerals, the medicine can be afforded by the poorer segments of the population, particularly of the developing countries. Fourth, since traditional medicinal practitioners are usually found in rural areas, people have better access to them than modern medical practitioners, who tend to converge in the bigger cities, and so are inaccessible to the rural communities.

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population lacking road and other communication facilities. Fifth, the close proximity of the traditional practitioners with the rural population generates in the rural people, particularly women, to disclose their illnesses to the traditional practitioners; such rural women may feel hesitancy to discuss their illnesses or symptoms with a city doctor, who to her, is an alien being. Sixth, allopathic medicine cannot provide any cure for common diseases like rheumatism or diabetes but merely treats and alleviates the symptoms, while traditional medicinal practitioners claim to have complete cure of these diseases in many parts of the world. And finally, the seventh advantage is that allopathic drugs are now increasingly associated with severe side-effects, and development of drug-resistant vectors. All these factors have contributed to a resurgence of interest in traditional medicine, and it has been estimated that in 1999 alone, worldwide herbal products sales amounted to US$ 80 billion Jamal, J.A. (2006).

Malaysia has a wide variety of plant species and existence of traditional medicinal systems, which goes back to centuries ago. It has been reported that there are over 1300 medicinal plant species in peninsular Malaysia alone Burkill, I.H. (1935). Although the Unani system of medicine (derived from Hellenic roots) form the main basis of Malaysian traditional medicine, this system is influenced by Indonesian, Chinese, Indian, and orang asli (indigenous people) traditional medicines Zakaria and Mohd, 1994). Herbal products form an important component of the Malaysian medicinal system; in 1999 alone, the Malaysian market for herbal products, medicinal and aromatic plants was estimated at RM 4.6 billion with an annual projected growth rate of 15-20 percent Jamal, J.A. (2006).

The major objection against traditional medicine by allopathic doctors is that the use of herbal or natural products have not undergone rigorous clinical trials, as is done with any modern medicine before it is put up in the market. On the other hand, traditional medicines have a history of long usage, which sometimes go back even thousands of years ago. Obviously, to serve this long period of time, the natural medicine has to be efficacious or otherwise would have been rejected by the people. That traditional medicine is still considered of value by the people has been shown by an estimate that about 64% of the total global population still remains dependent on traditional medicine for their healthcare needs Cotton, (1996). Also historical evidence clearly demonstrates that a number of modern drugs have been discovered through observation of medicinal practices of indigenous peoples. Modern drugs like aspirin, atropine, ephedrine, digoxin, morphine, quinine, reserpine and tubocurarine are examples, which were or iginally discovered through observations of traditional practices of indigenous peoples Gilani and Rahman, (2005).

Some examples of clinically useful drugs obtained from Malaysian medicinal plants include bromelain from Ananas comosus (L.) Merr. (Bromeliaceae), bergenin from Ardisia japonica Bl. (Myrsinaceae), arecoline from Areca catechu L. (Palmae), chymopapain from Carica papaya L. (Caricaceae), and ouabain from Stropanthus pratus Baill. (Apocynaceae) Jamal, J.A. (2006).

Under the circumstances, it is important to scientifically validate the use of a number of traditional medicinal plants of Malaysia. The objective of this study is to review the scientific literature on eight medicinal plant species used in traditional Malaysian medicinal system to find out whether such traditional uses can be validated by available scientific evidence.

2.1. List of some medicinal plants used in Malaysian traditional system of medicine;

The list of the plants on which the scientific literature was surveyed is given in Table 1 along with their family, local name(s), and traditional uses. Information on the local names of the plants and their traditional medicinal uses were collected from traditional medicinal practitioners and herbal medicine sellers at Kuala Lumpur. Available scientific information on the plants was obtained through perusal of different scientific databases and available scientific literature. The eight traditional Malaysian medicinal plants are Acorus calamus L. (family: Acoraceae, local name: jerangau), Aloe vera L. (family: Liliaceae, local name: lidah buaya), Andrographis paniculata (Burm.f.) Wall. ex Nees (family: Acanthaceae, local name: hempedu bumi), Centella asiatica (L.) Urb. (family: Apiaceae, local name: pegaga), Eurycoma longifolia Jack (family: Simaroubaceae, local name: tongkat ali), Morinda citrifolia L. (family: Rubiaceae, local name: mengkudu), Orthosiphon aristatus (Blume) Miq. (family: Lamiaceae, local name: misai kucing), and Piper sarmentosum Roxb. (family: Piperaceae, local name: kaduk, daun sirih).

2.2. Plants – local uses and their scientific validation:

2.2.1. Aloe vera L.:

Gel prepared from macerated pulp of leaves is used locally in health drinks to treat stomach upsets and to aid poor digestion. Although direct evidence for treatment of gastrointestinal upsets in humans is not available for the plant, aqueous leaf extract of a related species, Aloe ferox Mill. has been shown to be
effective against loperamide-induced constipation in Wistar rats. Wintola et al., (2010) Aloe vera has been reported to be the most commonly used plant for treatment of gastrointestinal parasites in goats in Eastern Cape Province, South Africa Maphosa and Masika, (2010). A plant combination preparation containing extract of the plant has been shown to increase weight and frequency of stools, and decrease transit time for stools in healthy women Matzkies and Webs, (1983). Overall, the scientific evidence suggests that the plant is useful in the treatment of gastrointestinal disorders caused by helminthic infections, and also useful in causing effective bowel movements.

2.2.2. Morinda citrifolia L.:

The leaves, roots, fruits, and flowers are taken to treat menstrual cramps, bowel irregularities, urinary tract infections, infant diarrhea, and nasal congestion in traditional medicinal system of Malaysia. The antinociceptive and antiinflammatory action of the chloroform-soluble phase and its main active component, damnacanthal, isolated from roots of the plant has been reported Okusada et al., 2011. Such activities can have alleviating effects during menstrual cramps and urinary tract infections, when administered. Analgesic effects have been described for both fruits and roots (Basar et al., 2010; Younos et al., 1990). Such relief of pain can be beneficial during menstrual cramps, pain due to bowel irregularities, as well as urinary tract infections, which is known to cause lower abdominal pain.

Bowel irregularities can be caused by a number of factors including indigestion, low volume of stool (constipation), multiple emptying of bowels (diarrhea, dysentery), helminthic infections, microbial infections, gastro-esophageal diseases, and gastric ulcer. Aqueous extract of fruits of the plant and its constituent scopoletin has been shown to be beneficial as a potential preventive and therapeutic agent for gastro-esophageal inflammatory diseases, including gastric ulcer Mahattanadul et al., (2010). The antioxidative and antiinflammatory effects, described for fruits of the plant, may also turn out to be beneficial in this aspect. Dussossoy et al., (2011). The root extract reportedly has antispasmodic activity, which can be of relief, when administered, during diarrhea Gilani et al., (2010) The anthelmintic activity of aqueous and ethanolic extracts of fruits on Ascaridia galli infections in chickens have been reported (Brito et al., 2009). Enhanced bactericidal activity against Escherichia coli (which can cause gastrointestinal upsets in humans, including diarrhea) in calves has been shown with fruit puree Schäfer et al., (2008).

2.2.3. Piper sarmentosum Roxb.:

Traditional medicinal uses of this plant in Malaysia include relief of coughs and mouth odor. Regular use has also thought to be beneficial for treatment of acne, gum diseases, as well as to reduce white discharge in the menstrual cycle of women. Ethanol extracts of leaves of the plant have been found to be effective against four oral pathogens, namely, Streptococcus mutans, Lactobacillus sp., Aggregatibacter actinomycetemcomitans, and Candida albicans Taweechaisupapong et al., (2010), suggesting that the plant may be really useful in eliminating mouth odor causing bacteria as well as microbial infections of gums. Aqueous extract of the leaves reportedly also has antinociceptive and antiinflammatory activities, which can prove beneficial during any swelling and pain in the gums (Zakaria et al., 2010 ).

2.2.4. Acorus calamus L.:

In general, the whole plant is used for treatment of arthritis, diarrhea, dyspepsia, and hair loss. It is also used as a sedative in traditional medicines of Malaysia. The anthelmintic property of essential oils from rhizomes of the plant as well as its major component, b-asarone has been described Kumar et al., (2009). Antiinflammatory activity of aqueous extract of leaves has been reported; such activity can play a beneficial role during arthritis and diarrhea (Kim et al., 2009). Crude extract of the plant reportedly demonstrated anti-spasmodic activity, when examined in isolated rabbit jejunum preparation, thus validating its traditional use for diarrhea (Gilani et al., 2006).

Asarone, a component of the plant, has been reported to have tranquilizing action Menon and Dandiya, (1967), which validates the traditional medicinal use of the plant as a sedative. Hypnotic potentiating principles have been separated from the essential oil of the plant (Baxter et al., 1960). Taken together, the plant appears to contain phytochemical constituents, notably one of which is asarone with strong sedative properties.

2.2.5. Andrographis paniculata (Burm.f.) Wall. ex Nees:

In the traditional medicinal system of Malaysia, almost all parts of the plant are used to treat hypertension
and diabetes. The plant is also used for treatment of bacterial and viral infections. Hypotensive effects of crude extract of the plant, as well as an isolated component, 14-deoxy-11,12-didehydroandrographolide, has been demonstrated in conscious rats and their isolated aortas and right atria as test models Yoopan et al., (2007). Aqueous extract of the plant reportedly exhibited hypotensive effect on the systolic blood pressure of spontaneously hypertensive rats Zhang and Tan, (1996).

The traditional medicinal uses of the plant for treatment of diabetes, has also been validated by several scientific reports. The antioxidant properties with consequential beneficial effects of aqueous leaf extract of the plant has been demonstrated in streptozotocin-induced diabetes. Oral administration of plant extract led to significant reductions in blood glucose levels and increase in the activities of superoxide dismutase and catalase Dandu and Inamdar, (2009). The plant reportedly showed insulin-releasing actions in vitro, when tested on pancreatic b-cells Wibudi et al., (2008). In vitro a-glucosidase and a-amylase inhibitory effects have been shown for extract of the plant and its component, andrographolide, which suggests that the plant can be a potential candidate for the management of type 2 diabetes mellitus Subramanian et al., (2008). Anti-hyperglycemic action in streptozotocin-induced diabetic rats has been shown by an herbal preparation ‘Illogen-Excel’, containing extract of the plant, among other constituents. Umamaheswari and Mainzen Prince., (2007).

A decoction of the plant has been found to restore impaired estrous cycle in alloxan-induced diabetic rats Reyes et al., 2006. Significant reductions in blood glucose level have been observed when hyperglycemic rats were treated with aqueous extract of the plant grown in Malaysia Husen et al., (2004). Andrographolide, an active principle found in the leaves of the plant, reportedly demonstrated antihyperglycemic effects when administered to streptozotocin-induced diabetic rats Yu et al., (2003). Crude ethanol extract of the plant has been shown to possess antidiabetic activity, which has been attributed to increased glucose metabolism. The extract, additionally, has been shown to possess hypotriglyceridemic activity, which can be beneficial for diabetic patients Zhang and Tan, (2000). Ethanolic extract of the aerial parts of the plant reportedly showed antioxidant and antihyperglycemic properties in diabetic rats; notably, oxidative stress is considered an important factor in the development of diabetic complications Zhang and Tan, (2000).

The analgesic, antipyretic, and antiinflammatory activities of andrographolide (a constituent of the plant) and its derivatives has been described Suebsasana et al., (2009); these pharmacological activities can be of relevance during bacterial and viral infections with associated pain, fever, and inflammation. Ethanolic extract of the plant, as well as andrographolide, has been shown to effectively inhibit the expression of Epstein-Barr virus (EBV) lytic proteins, thus demonstrating that andrographolide can be of use as an anti-EBV drug Lin et al., (2008). Andrographolide, neoandrographolide, and 14-deoxy-11,12-didehydroandrographolide, isolated from the plant all showed viricidal activity against herpes simplex virus type 1 (HSV-1) Wiart et al., (2005). Anti-human immunodeficiency virus (anti-HIV) activities have been reported for various components isolated from aerial parts of the plant Reddy et al., (2005). Andrographolide, obtained from the plant, has also been shown to inhibit HIV-induced cell cycle dysregulation in a phase I trial on human patients 40. Calabrese et al., (2000). A derivative of andrographolide, namely dehydroandrographolide succinic acid monoester has further been shown to inhibit the human immunodeficiency virus in vitro Chang et al., (1991).

2.2.6.Orthosiphon aristatus (Blume) Miq.:

The whole plant apart from roots is used in Malaysia for controlling high blood pressure, rheumatic fever, gout, arthritis, and diabetes. The plant is found throughout Southeast Asia and Australia. In Taiwan, the plant is used in traditional medicine for treatment of renal inflammation, kidney stones and dysuria. Antioxidant and antiinflammatory effects have been reported for the plant Hsu et al., (2011). These pharmacological effects can be beneficial during rheumatic fever, gout, arthritis, high blood pressure, and diabetes. Oxidative stress has particularly been implicated in the pathological symptoms of diabetes, and the plant, through its antioxidant effect, can relieve this pathogenic stress. At the same time, antiinflammatory effects can be useful in the treatment of gout and arthritis.

An anti-hypertensive substance, methylripariochromene A, obtained from water decoction of leaves of the plant, reportedly exhibited continuous decrease in systolic blood pressure after subcutaneous administration in conscious stroke-prone spontaneously hypertensive rats Ohashi et al., (2000). The compound furthermore reportedly demonstrated in rodent models a vasodilating action, a decrease in cardiac output, and diuretic action, which are all related to causing decrease in blood pressure Matsubara et al., (1999).

2.2.7. Eurycoma longifolia Jack:

Locally known as Tongkat ali in Malaysia, the plant is known as Malaysian Ginseng. Roots, root barks and leaves are frequently taken by males as an effective aphrodisiac. It is also taken as a supplement by bodybuilders.
The effect of administration of the plant or plant extract has been extensively studied in a number of animal systems regarding its ability to increase libido. The plant, when administered to sexually experienced male rats, produced a dose-dependent increase in mounting frequency of treated animals Ang and Sim, (1997). Administration of the plant to sexually experienced male rats also reportedly led to more frequent and vigorous mounting, licking and anogenital sniffing towards the receptive females besides increased grooming of the genitals Ang and Sim, (1998). The plant has also been shown to increase sexual motivation in sexually naive male rats Ang and Sim, (1998). A dose-dependent increase in sexual performance of inexperienced castrated male rats has been reported following administration of the plant Ang, et al., (2000). The butanol, methanol, water and chloroform extracts of roots of the plant reportedly produced a dose-dependent, recurrent, and significant increase in the episodes of penile reflexes in male rats Ang, et al., (2001). Extracts of the plant had an aphrodisiac effect on noncopulator male rats in decreasing the hesitation time Ang, et al., (2001). Various fractions of the plant also reportedly increased libido and sexual qualities in middle-aged male rats (Ang and Lee, 2002; Ang et al., 2003) Oral administration of the plant reportedly led to sexual arousal in sexually sluggish old male rats Ang et al., (2004). An herbal combination, “Etana”, containing extract of the plant, has been shown to enhance erectile function in male rats Qinna et al., (2009). The root powder of the plant, when administered to adult male Sprague-Dawley rats considered as sexually sluggish or impotent, significantly reduced ejaculation latencies, and increased the percentage of mounting and ejaculatory animals; the root powder further reduced post-ejaculatory interval Zanoli et al., (2009) A standardized methanol extract of the plant containing the major quassinoid constituents of 13α(21)-epoxyeurycomanone, eurycomanone, 13α,21-dihydroeurycomanone, and eurycomanol, when administered to male Sprague-Dawley rats, contributed towards improvement of sperm quality and has been hypothesized to be potentially suitable for management of male infertility Chan et al., (2009). In adult male Sprague-Dawley rats, the plant extract reportedly reversed the effects of estrogen by increasing spermatogenesis and sperm counts after fourteen days of treatment Wahab et al., (2010) A study conducted with 350 male human patients with idiopathic male infertility found significant improvement in sperm quality, when administered with the water soluble root extract of the plant Tambi and Imran, (2010). An increase in libido and improvement in semen quality was observed in boars when fed a commercial feeding mixture enriched with extracts of *Eurycoma longifolia*, *Tribulus terrestris*, and *Luzea carthamoides* Frydrychová et al., (2010). The plethora of scientific reports on the aphrodisiac qualities of *Eurycoma longifolia* strongly validates its traditional medicinal use in Malaysia.

2.2.8. *Centella asiatica* (L.) Urb:

The leaves and stems of the plant are used as a soothing agent for treatment of various skin irritations. It is also believed that regular use of the plant can prevent mental weakness, as well as control high blood pressure.

That the plant can be useful in various types of neurodegenerative disorders (which can produce mental weakness) has been widely demonstrated. The efficacy of the plant in ameliorating symptoms of Alzheimer’s disease has been reviewed Campos et al., (2010). The neuroprotective effects of the plant extract has been shown in experimentally induced Parkinsonism in aged Sprague-Dawley rats Haleaghrara and Ponnusamy, (2010). The neuroprotective effects of the plant extract has also been shown against intracerebroventricular colchicine-induced cognitive impairment and oxidative stress; oxidative stress, notably, is an early event in the pathogenesis of Alzheimer’s disease Kumar et al., (2009). Extract of the plant reportedly also selectively decreased amyloid-b levels in hippocampus of Alzheimer’s disease model Dhanasekaran et al., (2009). Protective antioxidant effect of bioflavonoids from the plant has been reported for lead acetate induced neurotoxicity in mice Ponnusamy et al., (2008). In neonatal rat pups, fresh leaf juice of the plant showed enhancement of amygdaloid neuronal dendritic arborization suggesting that it can be used for enhancing

### Table 1: List of Eight Medicinal Plants Used in Traditional Malaysian Medicinal Systems and Surveyed as to Their Scientific Validity for Use

<table>
<thead>
<tr>
<th>Scientific name</th>
<th>Family</th>
<th>Local name(s)</th>
<th>Traditional uses</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Aloe vera</em> L.</td>
<td>Liliaceae</td>
<td>Licorice</td>
<td>Stomach upset, poor digestion</td>
</tr>
<tr>
<td><em>Morinda citrifolia</em> L.</td>
<td>Rubiaceae</td>
<td>Mengku</td>
<td>Menstrual cramps, bowel irregularities, urinary tract infections, infantile diarrhea, nasal congestion</td>
</tr>
<tr>
<td><em>Piper sarmentosum</em> Roxb.</td>
<td>Piperaceae</td>
<td>Kaduk, Daun sirih</td>
<td>Coughs, mouth odor, acne, gum problems, whitish discharge in the menstrual cycle of women</td>
</tr>
<tr>
<td><em>Acorus calamus</em> L.</td>
<td>Acoraceae</td>
<td>Jerangau</td>
<td>Arthritis, diarrhea, dyspepsia, hair loss, sedative</td>
</tr>
<tr>
<td><em>Andrographis paniculata</em> (Burm.f.) Wall. ex Nees</td>
<td>Acanthaceae</td>
<td>Hempedu buni</td>
<td>Hypertension, diabetes, bacterial and viral infections.</td>
</tr>
<tr>
<td><em>Orthosiphon aristatus</em> (Blume) Miq.</td>
<td>Lamiaceae</td>
<td>Misai kucing</td>
<td>Hypertension, rheumatic fever, gout, arthritis, diabetes.</td>
</tr>
<tr>
<td><em>Eurycoma longifolia</em> Jack</td>
<td>Simaroubaceae</td>
<td>Tongkat ali</td>
<td>Aphrodisiac, used as supplement for body building.</td>
</tr>
<tr>
<td><em>Centella asiatica</em> (L.) Urb.</td>
<td>Apiaceae</td>
<td>Pegaga</td>
<td>Skin irritations, mental weakness, hypertension.</td>
</tr>
</tbody>
</table>
neuronal dendrites in stress and other neurodegenerative and memory disorders Mohandas Rao, et al., (2009). Another study has shown that the aqueous extract of the plant has neuroprotective property against 3-nitropropionic acid induced oxidative stress and mitochondrial dysfunctions in brain regions of prepubertal mice Shinomol and Muralidhara, (2008). The neuroprotective effects of the plant extract has further been demonstrated against monosodium glutamate treated rats; notably, glutamate plays a role in epilepsy, stroke, and other neurodegenerative conditions Ramanathan et al., (2007). Enhancement of learning and memory has been reported for three months old Swiss albino mice, when administered with an aqueous extract of the plant Rao et al., (2005). Asiatic acid, a component of the plant, and its derivatives reportedly protected cultured cortical neurons from glutamate-induced excitotoxicity Lee et al., (2000).

A total triterpenic fraction obtained from the plant has been shown in patients with venous hypertension to significantly decrease capillary filtration rate, ankle circumference, and ankle edema tester time (De Sanctis et al., 2001; Incandela et al., 2001; Belcaro et al., 1990). Overall, the results obtained from various scientific studies strongly validate the use of this plant for mental weakness (which can take the form from neurodegenerative to memory disorders), as well as hypertension (high blood pressure).

Conclusion:

Malaysia is well known for its variety of medicinal plants and its various traditional systems of medicine. Eight plants used in the traditional medicinal system of Malaysia have been reviewed in this study for scientific validation of their traditional uses. The available scientific literature strongly points out that the traditional uses of the plants for treatment of various disorders can be corroborated by available scientific evidence. This not only adds to the rationale of traditional use, but also suggests that the plants can be sources of important and novel medicines. It is expected that the present review will open up possibilities of scientific validations of the thousands of medicinal plants used in the traditional medicinal systems of Malaysia.

References


