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Malaysian Herbs in Snake Bite: A Review

***Abstract*—**Snake bite is a well-known life threatening menace that is commonplace in rural areas. Most of the rural people seem to prefer the use of medicinal plants/herbs to treat snake bites due to two major reasons; one that these herbs have been traditionally considered effective and the other that access to modern health services are limited. This review presents the current scenario on the use of such medicinal plants/herbs found in Malaysia with main focus on a few species that have been identified as traditionally chosen viz. *Clinacanthus nutans* (*C. nutans*), *Acanthus ilicifolius* (*A. ilicifolius*), *Mimosa pudica* (*M. pudica*), *Andrographis paniculata* (*A. paniculata*), *Pogostemon cablin* (*P. cablin*) and *Murraya koenigii* (*M. koenigii*). The leaves of *C. nutans* and *P. cablin*, leaves, fruit pulp, shoots and roots of *A. ilicifolius*, leaves and roots of *M. pudica*, leaves, roots and whole plant of *A. paniculata* and the leaves and bark of *M. koenigii* have been traditionally used in the treatment of snake bites.

***Keywords*—snake bite, medicinal plants, herbs, Malaysia.**

1 INTRODUCTION

Snake bites are quite common especially in the rural areas. Earlier publications have estimated that there are about 400–650 snake bites and a mortality rate of 0.2 per 100000 population per year [1,2]. According to Guideline, Management of Snakebite, Ministry of Health, Malaysia (2017), a total of 15798 snake bite cases were reported for the years 2010 to 2014 with an average of 3 to 4 deaths per year [3]. Snake bites can also become life threatening as a result of local or systemic envenomation if the snakes are venomous. The symptoms of snake bite include swelling, local pain, vomiting, discoloration, weakness, sweating, headache, breathing difficulty, convulsions, paralysis and death [3]. Inadequate health services and delay in administration of antisnake venoms attribute to high mortality. Also, adverse reaction of drugs and inadequate conditions of storage limit the use of antisnake venom [4]. Currently, the only specific treatment that exists for snake bite is through the administration of antisnake venom. However, the limitations of using antisnake venom is that it may lead to adverse reactions like pruritus, urticaria to fatal anaphylaxis [5]. Moreover, the diversity in geography and taxonomy that prevails in species leads to variation in the reactivity of antigen and composition of the venom [6,7].

Félix-Silva and colleagues reported that many studies on vegetal species have provided pharmacological evidence of benefits against local effects caused due to snake venoms like inhibitory potential against hyaluronidase, phospholipase, haemorrhagic, proteolytic, myotoxic and oedematogenic activities [8]. World Health Organisation (WHO) has included envenomation since 2009 in the list of neglected tropical diseases [9]. Populations in rural tropics face high morbidity and mortality due to poor access to health services and like other neglected tropical diseases associated with poverty [9,10].

Medicinal plants could act as an alternative to antisnake venom as they have been used traditionally in the treatment of snake bites attributed to many reasons such as safety, cultural preference, effectiveness, being inexpensive, and obtainable from the neighbouring forests [4]. Tribal people and those living in rural remote areas depend on traditional medicines for treating bites from venomous creatures [11]. Many plants have been reported to have antisnake venom activity [12,13]. This warrants exploration of medicinal plants used by traditional healers that have been claimed to be used in snake and insect bites. This review aims to highlight the potential of Malaysian herbs that show promise for use in snake bites (Figure 1). Table I presents the different Malaysian plants

and their parts used against snake bites. Despite the widespread use of medicinal plants in the treatment of snake bites, yet, understanding the scientific basis of the claims need to be ascertained to prove its efficacy.

Figure 1: Malaysian herbs in snake bite

2 *CLINACANTHUS NUTANS*

Clinacanthus nutans (*C. nutans*) belongs to the species of plant in the family *Acanthaceae*. *C. nutans* finds use as a traditional herbal medicine in Malaysia, Indonesia, Thailand, and China [14,15]. It is an herbaceous plant growing in low shrubs for up to 2.5 meters high. The stems are found to be green, woody, upright and cylindrical. The leaves of *C. nutans* are simple, green, lanceolate having pointed tips with rounded bases the length of which are 8-12 mm and width of 4-6 cm. *C. nutans* flowers are red and panicle-shaped having 3.5 cm long tube-shaped elongated petals [16]. *C. nutans* is used in the treatment of skin rashes, snake and insect bites in Malaysia, Indonesia, Thailand and China [14,15,17].

An alcoholic extract of the fresh leaves from this plant is used externally for the treatment of snake bites [18] which has been attributed to its anti-cell lysis property. *C. nutans* has also been traditionally used in case of envenomation snakes in north-western Malaysia [15]. Tuntiwachwuttikul et al. [19] and Sakdarat et al. [20] have also reported its use in treating snake bites. Sakdarat et al. in 2009 [21] reported that in Thailand, the extract of fresh leaves of this plant was used externally in treating snake bites. However, it has been reported that the aqueous extract of *C. nutans* leaves did not have any effect on the inhibition of neuromuscular transmission caused by purified *Naja naja siamensis* neurotoxin in isolated rat phrenic-nerve diaphragm preparation [22]. They also reported that oral or intraperitoneal administration of extract of *C. nutans* was also ineffective in prolonging the survival time of mice which received lethal doses of *Naja naja siamensis* crude venom [22] and hence concluded that the extract of *C. nutans* was unable to antagonize the action of cobra venom.

3 *ACANTHUS ILICIFOLIUS*

Acanthus ilicifolius (sea holly) is found in tropical Asia, Africa and Malaysia. *Acanthus ilicifolius* (*A. ilicifolius*) is either a tiny shrub or a tall herb of up to a height of 1.5 m. This plant is seldom woody, bushy, has a very dense growth with shallow tap roots, but stilt roots are also seen occasionally. The leaves of this plant are simple, opposite, cauline, decussate, exstipulate, with short petiole, and flattened, glabrous, pulvinous to sheathing base. Flowers of *A. ilicifolius* are bisexual, zygomorphic, erect, complete, sessile, hypogynous and fruits are kidney shaped, green in colour with a length of 2.5-2.0 cm long, with the seeds being 0.5-1.0 cm long [23].

In Malaysia, it is known as *Jeruju*, *Jeruju puteh* (Peninsular) [24], *Jeruju putih*, *neruju* [25]. In Malaysia, chewing the leaves of *A. ilicifolius* is believed to protect against snake bite among the mangrove dwellers [26]. It has been reported that the fruit pulp,shoots or roots of this plant are used in the treatment of snake bites by people living near mangrove swamps [27]. The leaves of *A.ilicifolius* have been reported in the treatment of asthma, rheumatism, snake bite and paralysis [28]. According to Kumaravel and colleagues, the powder of *A. ilicifolius* leaves can be used as a dressing for snake bite [29]. According to Patra and colleagues, mangrove plants like *A. ilicifolius* were utilized as a blood purifier and used to treat snake bite, skin disease, diabetes, and stomach pain [30]. Meanwhile, other researchers also claimed that the leaves and shoots of *A. ilicifolius* have been used as an antidote in snake bite [31].

4 *MIMOSA PUDICA L.*

Mimosa pudica Linn (*M. pudica*) is a creeping annual or perennial herb belonging to family Mimosaceae [32]. It is native to Brazil [33] but now *M. pudica* is a pan tropical weed [34]. *M. pudica* is commonly known as *Pokok semalu* (shy plant) in Malaysia, while in Indonesia, it is known as *Putri - malu* (shy princess), in Hindi *Lajwanti*, *Chhui-mui* (that which dies upon touch) and touch me not, because *M. pudica* has a unique property

which when touched will droop or collapse and then will open up again after a while [32,34]. *M. pudica* possesses certain biological properties such as antidiabetic, antitoxic, antihepatotoxic, antioxidant and wound healing properties [32]. *M. pudica* also has been found to have antibacterial, antivenom, antifertility, anticonvulsant and antidepressant properties [35].

According to Ahuchaogu et al. [34], root parts of *M. pudica* are commonly used to treat various illnesses including snake bites. *M. pudica* has been used to treat snake bite by dissolving root paste in the water collected after washing raw rice followed by giving the paste orally [36]. According to research done by Mahanta and Mukherjee, roots of *M. pudica* have been used widely to treat cobra bite. The aqueous extracts of *M. pudica* root possess compounds that are able to neutralize the lethal effect of *Naja kaouthia* venom [37]. Study by Meenatchisundaram and Michael has reported that the aqueous root extracts of *M. pudica* showed antivenom activity by neutralizing the lethal activity of Russell's viper and Saw scaled viper venoms [38]. The aqueous extract showed a significant inhibitory effect on the phospholipase activity, lethality, oedema forming, haemorrhagic and fibrinolytic activities. The authors reported that 0.13 and 0.17 mg of *M. pudica* extracts were able to neutralize completely 2LD50 lethal activity of Russell's viper and Saw scaled viper venoms respectively and attributed this to the presence of bioactive compounds in aqueous root extracts of *M. pudica* [38].

Several studies reported that the roots of *M. pudica* possess antivenomic material and have been used as an antidote for snake bite [33,39-43]. Lenka and Mohapatra suggested that after removing the poison with *Osta* leaf, 25 gm of root powder of *M. pudica* should be given orally once a day [44]. The combination of roots paste of *M. pudica* with black pepper were bandaged onto the snake bite area [33]. The leaves of *M. pudica* also can be used to cure snake bites by applying paste of *M. pudica* to affected areas [45,46]. The whole plants are also made as an extract in drinking water, shaken well and then filtered and given two times a day on day 1 only [46].

4 *ANDROGRAPHIS PANICULATA*

Andrographis paniculata (Burm. f.) Nees (*Acanthaceae*) is an annual herbaceous plant native to Taiwan, Mainland China and India [47,48]. *Andrographis paniculata* (*A. paniculata*) commonly known as king of bitters (English) or *Hempedu bumi* (Malay) is widely cultivated in southern Asia, Scandinavia, China and some parts of Europe [49]. *A. paniculata* is mainly used to treat fever, liver diseases, diabetes, upper respiratory tract infection and snake bite [48,50]. Sanjutha and team claimed that the leaf and the whole plant of *A. paniculata* contains medicinal properties to treat various diseases [50]. Samy and team documented that the aqueous paste and decoction obtained from the leaves of *A. paniculata* are commonly used for the treatment of snake bite by native people of Southern part of Tamilnadu, India [51]. They dissolved 5 g of *A. paniculate* leaf extract in methanol and centrifuged at 2000 rpm for 25 min; placed the residue on top of silica gel column and eluted with petroleum ether:chloroform and chloroform:methanol. Then, the authors evaporated the fractions to dryness to test for venom neutralization in Swiss albino male mice. They concluded that the phytochemical constituent, terpenoids in *A. paniculata* extract was able to completely neutralize the neurotoxin of the venom of *Crotalus adamanteus* (snake venom). Traditional practitioners in Kallar region of southern Kerala used the whole plant of *A. paniculata* by making decoction or paste for the treatment of snake bites [11], while, traditional healers in Pachamalai hills treated snake bites using leaves of *A. paniculata* pastes by applying at the bitten site [52]. Gopi and colleagues reported that the methanol extract of *A. paniculata* possesses active compounds that can inhibit the symptoms and toxicity caused by Indian cobra (*Naja naja*) based on their study in which albino mice survived longer when injected with methanol extract of *A. paniculata* [53]. Apart from that, previous researchers have also claimed that the methanol extract of *A. paniculata* leaves and roots possess neutralizing properties against enzymes found in snake venoms including phosphomonoesterase, phosphodiesterase, acetylcholine esterase, phospholipase A2, hyaluronidase, L-amino acid oxidase, ATPase and fibrinolytic activity [53-55].

5 *POGOSTEMON CABLIN*

Pogostemon cablin Benth is an aromatic herb known as Patchouli belonging to the family Lamiaceae [56]. *Pogostemon cablin* (*P. cablin*) is native to Philippines and grows widely in South Asian countries including Malaysia, India, Indonesia, China, Singapore, West Africa and Vietnam [57]. In Malaysia and Indonesia, *P.*

cablin is known as *Nilam* and this plant is known as *Guang hou xiang* in Chinese, *Tamala patra* in Sanskrit, *Patcholi* in Hindi, *Patche tene* in Kannada, *Pacchilai* in Tamil, *Patchilla* in Malayalam, *Patchapan* or *Patcha* in Marathi and *Phimsen* in Thailand [56]. *P. cablin* has been used widely to treat colds, headaches, nausea, vomiting, diarrhoea, abdominal pain, insect and snake bites in China, Japan and Malaysia [56,58]. Juice obtained from the crushed fresh leaves of *P. cablin* are used in the treatment of snake bites [59].

7 *MURAYYA KOENIGII*

Murraya koenigii (L.) Spreng is an aromatic pubescent or small perennial shrub commonly known as curry leaf in English. In Malaysia, it is known as *Daun kari*, and '*Curry patta*' in India. *Murraya koenigii* (*M. koenigii*) can be found throughout the tropics and sub-tropical East Asia, particularly in the South East Asian region [60-62]. *M. koenigii* is widely found in all parts of Malaysia, India, China, Australia, the Pacific Islands and East Asia. This plant originates from the Tarai regions of India [61]. Since *M. koenigii* is known for its aromatic leaves, it has been consumed for its unique flavour and aroma in Indian cookery for food flavouring [61,63]. The leaves of this plant are rich in antioxidants, tocopherol, β-carotene, lutein, and exhibit antioxidative and anti-lipid peroxidative activities [64]. Even in drying state, the aromatic *M. koenigii* leaves still retain their flavour which are slightly bitter, acrid, cooling, weakly acidic in taste and considered as a tonic [61]. Traditionally, folklores have used various parts of *M. koenigii* for the treatment of snake bites [61,65]. The leaves' paste of *M. koenigii* are applied at the affected area to treat the bites of poisonous animals including snakes [66]. All parts of *M. koenigii* are beneficial including its branches. However, the roots of *M. koenigii* are used as stimulants and the bark of *M. koenigii* is used in the treatment of snake bites [65].

Table 1: Malaysian plants used against snake bites

Name of the plant	Parts used	Use	References
Clinacanthus nutans	Leaves	External, internal, injected intraperitoneal (in mice)	[15,18,19,21,22]
Acanthus ilicifolius	Leaves, fruit pulp, shoots and roots	Internal, external	[26-31]
Mimosa pudica	Roots, leaves	Internal, external	[33,34,36-46]
Andrographis paniculata	Leaves, whole plant, roots	Internal, external, injected intraperitoneal (in mice)	[11,51-55]
Pogostemon cablin	Leaves	Not described	[56,58,59]
Murraya koenigii	Leaves, bark	External	[61,65,66]

8 CONCLUSION

This review has shown that the six herbs chosen for this study that are prevalently used for the treatment of snake bites are having beneficial effects. These benefits relate to those that are functional as well as pharmacological both of which seem to support the use of these plants as potential source for treating snake bite. A scientific report on the traditional uses of medicinal plants/herbs is not only advantageous for future researchers but is also seen to benefit individuals in rural areas when their life is in danger. However, to prove their efficacy and safety for treating snake bite, further in-depth scientific studies need to be carried out to understand the scientific basis of the claims.

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CONFLICT OF INTERESTS

The authors declare that they have no conflict of interests.

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