

Review Paper

A Literature Review on Medicinal Plants utilized for the Management of the Snake bites in Traditional Medicine

ABSTRACT

Background: Traditional Medicine is time tested and still caters to the health needs of the society and provides health care through prophylactic treatment and rejuvenation. Today poisonous snake bites are life threatening problems resulting in high morbidity and mortality as morbidity all over the world including Sri Lanka. The medicinal plants available locally and used widely by Traditional traditional healers, therefore they need attention in this aspect.

Aim: The main aim of this study was to do a literature review on important characteristics of medicinal plants which are being used for the management of snake bites in Traditional Medicine.

Place and duration of the study: Unit of Siddha Medicine, University of Jaffna from April to June 2018.

Methodology:

Data for the literature review on 94 medicinal plants from 41 families was collected from relevant books and research articles. The characteristics of these the medicinal species that were identified for the review were morphology, habitat, parts used; Siddha properties such as taste, potency and efficacy; pharmacological action; number of plants used for dietary purposes; poisonous plants, phytochemical contents and mode of transmission.

Results:

From the 94 medicinal plants, 9 (9.6%) of the species were found in Fabaceae and followed by 6 (6.38%) in Cucurbitaceae and Apocynaceae families. Based on the morphology 24 (25%) plants were herb and shrub; 42 (45%) were found in the natural habitat. From these plants 31 species (26%) were used as root and 29 (24%) as leaves. These plants that contain: Siddha properties such as bitter taste [52 (48.14%); hot potency [64 (70.32%)], pungent efficacy [68 (72.34%)]. Pharmacological actions such as diuretic [36 (38.3%); tonic [35 (37.23)]; astringent [33 (35.1%)] and stimulant [32 (34.04%)]. Phytochemicals such as flavonoids 88 (93.61%) and saponin 81 (86.17%) were highly found in these medicinal plants. Fifty (53.19%) of these species were used as external and internal medication in the management of snake bites.

Conclusion:

This literature review provides useful documented evidence on the management of snake bites in Traditional Medicine. However there is a need for further extensive scientific studies to be carried out to justify its clinical potential in management of snake bites.

Keywords: Medicinal plants; management; snake bite; traditional medicine.

1. INTRODUCTION

Traditional Medicine comprises medical aspect of Traditional traditional knowledge that developed over generations within various societies before the era of modern medicine [1]. It is termed as Alternative medicineMedicine, Complementary Medicine, and Indigenous Medicine in many countries [2]. The World Health Organization (WHO) defines traditional medicine as "the sum total of the knowledge, skills and practices based on theories, beliefs and experiences indigenous to different cultures, whether explicable / not, used in the maintenance of health as well as in the prevention, diagnosis, improvement or treatment of physical and mental illness" [2].

Snake envenomation is an important global health issue. It constitutes an occupational hazard mainly in the field of agriculture [3]. Universally Higher than 5 million numbers of snake bites that occurs in each year. They result in about 2.5 million cases of poisoning and 20,000 to 125,000 deaths in the worldglobally [4]. Sri Lanka has a great diversity of snake species. Around 294 species of snakes are

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found in the world and 96 species are live found in Sri Lanka, of these 50 species are endemic to the Island. There are also 13 species of sea snakes and 10 species are of blind snakes found in Sri Lanka [5]. Around 5 species of land snakes are venomous such as King Cobra, Common Cobra, Common Krait, Russell's viper and Saw Scaled Viper [6, 7]. These poisonous snakes are dangerous as they are responsible, and these are very dangerous for 98% of the human deaths in Sri Lanka [5].

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All In the traditional healing system, the plant kingdom has been a favorite main source of medicine. In this region In the world 70%-80% of the people region has used use herbal treatment for primary health care [2]. The plant kingdom provides an a good alternative to anti snake venom. Traditionally Medicinal plants have been used as folk medicine for the management of snake bites [3].

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Traditional knowledge on snakebite treatments has been passed on from generation to generation within families. Globally Traditional Physicians are practicing herbal medicine to for the treatment of snake envenomation; however the practice is not really recognized by modern medicine [3]. There are few scientific studies are done forthat have evaluating evaluated the use of medicinal plants against in the treatment of the snake bites. Commonly in Sri Lanka, there is only limited update information related toon this this topic. This present literature review is an attempt to produce documentation and awareness of the numerous herbal materials which are being utilized ing for the management of snake bites in Sri Lanka.

2. METHODOLOGY

2.1. Study Design

It is a review of relevant and current literature review related studyon herbal treatment of snake bites.

2.2. Place and Duration of the study

Unit of Siddha Medicine, University of Jaffna from April to June 2018.

2.3. Data Collection

Data for the literature review were collected from the related past and recent text books, websites, proceedings, research articles and other documents from Jaffna/ Sri Lanka. This information was used in order toto identify the relevant information's on the medicinal plants which are usingthat are being used in the on management of snake bites in the Traditional Medicine [8-56]. For this purpose 94 medicinal plants from 41 families which were mentioned in the text books were reviewed. The characteristics of these identified medicinal plant species were identified for the review were taxonomic positions (Scientific, Sanskrit, English, & Tamil), families, morphology of the medicinal plants (herb, shrub, climber, tree, creeper & aquatic), habitats (natural, cultivated, & ornamental), the specific parts used, Siddha properties such as taste, potency and efficacy, specific pharmacological action, number of plants which are using used as diet, poisonous plants phytochemical contents of poisonous plants and modes of transmission action (internal & external). These were recorded for the 94 selected medicinal plants were recorded. Most of the information's were was obtained from the text books which were available in the Library/ Unit of Siddha Medicine, University of Jaffna.

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2.4. Statistical Analysis

Collected data were processed and statistically analyzed by simple statistical method using Ms. Excel 2010.

3. RESULTS AND DISCUSSION

3.1. Taxonomic Position of the Medicinal plants

Ninety four (94) Selected 94 plant species belonging to 42 plant families were which had been documented as remedies for the management of snake bites was used for the review. The taxonomic positions position of the individual plants which are using for the management of the snake bite are, are summarized in the Table 1. Plant taxonomy is the science that finds, identifies, describes, classifies, and names of the plants [57].

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Table 1. Taxonomic Position of the Medicinal plants

No	Botanical name	Sanskrit name	English name	Tamil name
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01	<i>Indigofera tinctoria</i>	Nilini	Indian Indigo Plant	Avuri
02	<i>Alangium salvifolium</i>	Amkolam	Sage leaved Alangium	Alingil
03	<i>Corallocarpus epigaeus</i>	Mahamulam	Broyoms	Aakasakerudan
04	<i>Aristolochia bracteolata</i>	Ajaspurisaha	Worm Killer	Aadutheendapalai
05	<i>Cinnamomum verum</i>	Twak	Cinnamon	Karuva
06	<i>Aristolochia indica</i>	Ishwari	Indian birth wort	Perumarunthu
07	<i>Purgularia daemia</i>	Pahala antaka	Dogs bane white low plant	Uthamakaani
08	<i>Acalypha indica</i>	Arittamanjarie	Indian acalypha,Catsstruggle	Kuppaimeani
09	<i>Calotropis gigantean</i>	Arka	Mudar, Gigantic swallow wort	Arukkan
10	<i>Piper nigrum</i>	Maricha	Black pepper	Milaku
11	<i>Tylophora indica</i>	Kondaichaali	Vomiting swallow wort	Nanjaruppan
12	<i>Polygala glabra</i>	Meradu	Milk wort	Sriyaalnangai
13	<i>Polygala elongate</i>	Periyankana	Snake root	Periyaalnangai
14	<i>Luffa acutangula</i>	Kosavathe	Ribbed luffa	Peaippeerku
15	<i>Acorus calamus</i>	Vacha	Sweet flag	Vasambu
16	<i>Allium cepa</i>	Pallandu	Onion	Vengaayam
17	<i>Pavatta indica</i>	Pappans	Indian pellet shrub	Pavattai
18	<i>Pongamia pinnata</i>	Karanja	Indian beech	Pungu
19	<i>Momordica charantia</i>	Karavalli	Bitter gourad	Paakal
20	<i>Croton tiglium</i>	Danthi	Purging croton	Nearvaalam
21	<i>Lagenaria siceraria</i>	Alabu	Bottle gourd	Surai
22	<i>Citrullus colocynthis</i>	Indra varuni	Colococynthal fruit of bitter	Aatruthummatti
23	<i>Phyllanthus amarus</i>	Bhumygmala	Indian phyllanthus	keelanelli
24	<i>Gynandropsis gynandra</i>	Vivitham	Spiderwisp	Thaivealai
25	<i>Datura metal</i>	Datura	Dhatura,Throne apple	Umathai
26	<i>Alternanthera sessilis</i>	Meenakshi	Sessile plant	Ponnankaani
27	<i>Leucas aspera</i>	Dronapush	Thumbe	Thumbai
28	<i>Nicotiana tabacum</i>	Tamarakuta	Tobacco	Pukaillai
29	<i>Allium sativum</i>	Lesuna	Garlic	Ulli
30	<i>Piper betel</i>	Nagavalli	Betel leaf	Vetrillai
31	<i>Sarcosemma brevistigma</i>	Somavalli	Moon plant	Kodikalli
32	<i>Albizia lebbek</i>	Shirisha	Srissa tree	Vaakai
33	<i>Azadirachta indica</i>	Nimba	Margose tree	Vembu
34	<i>Hemidesmus indicus</i>	Sariba	Indian sarasaparilla	Nannari
35	<i>Rhinacanthus nasuta</i>	Yathikapurni	-	Anichai
36	-	-	-	Ninnaartchinunki
37	<i>Moringa olifera</i>	Siguru valkalum	Horse radish	Murunkai
38	<i>Ocimum sanctum</i>	Thulasi	Holy basil , Sac red basil	Thulasi
39	<i>Zingiber officinale</i>	Nagaram	Dried ginger	Sukku
40	<i>Ziziphus oenoplica</i>	Kakoli	Jackal jujube	Surai
41	<i>Madhuca longifolia</i>	Madhuka vriskhaha	The narrowed leaved mohua , Mowa tree	Iluppai
42	<i>Curculigo orchoides</i>	Musali	Black musale	Nilappanai
43	<i>Cocus nucifera</i>	Narikela	Coconut tree	Thennai
44	<i>Cissampelos pareria</i>	Patha	Velvet leave	Ponmusuttai
45	<i>Prosopis spicigera</i>	Sami	Indian Mesquite	Vanni
46	<i>Cissus quadrangularis</i>	Asthisamhari	Bone selter	Pirandai
47	<i>Tacca pinnatifida</i>	Vana surana	Wild amorphophalus	Kaatu karunai
48	<i>Spheranthus indicus</i>	Mundi	East Indian Globe Thistle	Kottaikaranthai
49	<i>Clitoria ternatea</i>	Shankha pushpa	Butterfly pea	Kaakanavan
50	<i>Mimusops elengi</i>	Vakula	Pointed leaved ape flower	Makizh
51	<i>Ferula asafetida</i>	Hingu	Asafoetida	Perunkaayam
52	<i>Abutilon indicum</i>	Kanka tika	Indian mallow	Thuthi
53	<i>Punica granatum</i>	Shukhdana	Pomaganatum.	Maathulai
54	<i>Toddalia asiatica</i>	Kanchana	Forest pepper	Mulakaranai
55	<i>Tinosoera cordifolia</i>	Guduchi	Heart leaved moon seed	Seenthil
56	<i>Withania somnifera</i>	Aswagandha	Winter cherry	Amukkira
57	<i>Sesamum indicum</i>	Tilam	Gingili oil plant	Ellu
58	<i>Strychnos potatorum</i>	Kataka	Clearing nut tree	Theatraan
59	<i>Strychnos nux vomica</i>	Kulaka	Nux vomica	Etti
60	<i>Achyranthes aspera</i>	Apamarga	Rough chaff	Naayuruvi
61	<i>Physalis minima</i>	Tankari	Cape gooseberry	Thakkaali
62	<i>Musa paradisiaca</i>	Kadali	The Plantain tree	Vaazhai

63	<i>Cynodon dactylon</i>	Durva	Barmuda grass	Arukampul
64	<i>Catunaregum spinosa</i>	Maanda	Emetic nut tree	Marukkarai
65	<i>Gymnema sylvestre</i>	Sarpadarushtrik	Periploca of the woods	Sirukurinjaan
66	<i>Alstonia scholaris</i>	Sapthaparna	Devil tree, Shaitan wood	Eazhilaipaalai
67	<i>Terminalia bellirica</i>	Vebeethaki	Beleric myrobalans	Thaanri
68	<i>Calophyllum inophyllum</i>	Punnagaha	Alexandrian laurel	Punnai
69	<i>Caesalpinia bonduc</i>	Kuberakshi	Bonduc nut	Kazhtchi
70	<i>Psoralea corylifolia</i>	Baakuchi	Babchi	Kaarbogarisi
71	<i>Amaranthus tricolor</i>	Marisa	Chinese spinach	Sirukeerai
72	<i>Oldenlandia umbellata</i>	Rajana	Chaya root	Impooral
73	<i>Portulaca oleracea</i>	Lonica	Garden purslane	Paruppukeerai
74	<i>Abrus precatorius</i>	Gunja	Crabs eye ,Cocks eye	Kunrimani
75	<i>Solanum trilobatum</i>	Alarka	Purple fruited pea egg	Thuthuvazhai
76	<i>Cassia senna</i>	Swarnamukhi	Country senna	Nilavaarai
77	<i>Citrus limon</i>	Jambira	Lime	Elumichai
78	<i>Aegle marmelos</i>	Bilra	Bael tree, Holy fruit tree	Vilvam
79	<i>Anamirta cocculus</i>	Garalaphala	Indian berry, Fish berry	Kakkollivirai
80	<i>Anoectochilus setaceus</i>	Vanasarpagandi	Bristy Anoectochilus	Oorchid
81	<i>Argemone Mexicana</i>	Brahmadandi	Mexican poppy	Bramadandu
82	<i>Biophytum reinwardtii</i>	Jalapushpa	Reinwardts tree plant	-
83	<i>Caryota urens</i>	Sritalah	Wine palm	Tippilipana
84	<i>Hibiscus abelmoschus</i>	Latakasturika	Musk mallow	Kasturivendai
85	<i>Horsfieldia irya</i>	-	Irya tree	Eeriya maram
86	<i>Maranta arundinacea</i>	Hulankiriya	Arrow root plant	Aruruttukkilangu
87	<i>Morinda citrifolia</i>	Tunnavu	Indian mulberry	Nuna
88	<i>Nelumbo nucifera</i>	Abja	Chinees water lily	Ambal
89	<i>Nymphaea lotus</i>	Alagandha	White Egyptian lotus	Allithamarai
90	<i>Ophiorrhiza mungos</i>	Bhiyangakshi	Indian snake root	Kirippundu
91	<i>Prunus cerasoides</i>	Charu	Himalaya cherry	-
92	<i>Tiliacora acuminata</i>	-	-	-
93	<i>Wissadula periplocifolia</i>	Wisadooliya	-	Wisadooliya
94	<i>Zeuxine regia</i>	-	-	Orchid

Giovannini and Howes mentioned in their article that, around 208 plant species are traditionally used to treat snakebites in Central America but there is a lack of clinical research to evaluate their efficacy and safety [58].

3.2. Family Distribution of the Medicinal Plants

A plant family is simply a collection of plants that share characteristics grouped together. Plants can be categorized by similar features, including overall appearance, seed groupings, flower shape, and more, to show their relationship to one another. Understanding how a particular species of plant relates to others within its family is important for all forms of growing and gardening because it can provide information about aspects of plant care [59].

Table 2. Details of Family distribution of the Medicinal Plants

No	Family Name	Frequency	Percentage (%)
01	Fabaceae	9	9.60
02	Alangiaceae	1	1.06
03	Cucurbitaceae	6	6.38
04	Aristolochiaceae	2	2.12
05	Lauraceae	1	1.06
06	Asclepiadoideae	2	2.12
07	Euphorbiaceae	3	3.19
08	Apocynaceae	6	6.38
09	Piperaceae	2	2.12
10	Polygalaceae	2	2.12
11	Acoraceae	1	1.06
12	Amaryllidaceae	2	2.12
13	Rubiaceae	5	5.31
14	Caparidaceae	1	1.06
15	Solanaceae	5	5.31
16	Amaranthaceae	3	3.19
17	Lamiaceae	3	3.19

18	Meliaceae	1	1.06
19	Acanthaceae	1	1.06
20	Moringaceae	1	1.06
21	Zingiberaceae	1	1.06
22	Rhamnaceae	1	1.06
23	Sapotaceae	2	2.12
24	Hypoxidaceae	1	1.06
25	Arecaceae	1	1.06
26	Menispermaceae	4	4.25
27	Vitaceae	1	1.06
28	Dioscoreaceae	1	1.06
29	Asteraceae	1	1.06
30	Apiaceae	1	1.06
31	Malvaceae	2	2.12
32	Lythraceae	1	1.06
33	Rutaceae	1	1.06
34	Pedaliaceae	1	1.06
35	Loganiaceae	2	2.12
36	Musaceae	1	1.06
37	Poaceae	1	1.06
38	Combretaceae	1	1.06
39	Calophyllaceae	1	1.06
40	Portulacaceae	1	1.06
41	Orchidaceae	2	2.12

Families of the selected medicinal plants are [showed shown](#) in Table 2. [According to that result, among theFrom these](#) 94 medicinal plants, 9 (9.6%) of the species were found in Fabaceae [and followed by 6 \(6.38%\) in Cucurbitaceae and Apocynaceae families.](#) [Furthermore, t](#)[his review also](#) encompasses some plants that are rarely or less often used.

This finding was almost comparable with the previous study [which](#) stated that, the highest numbers of plants [was were](#) reported from the [two family families](#) Fabaceae (32 species) and Apocynaceae (14 species) in a total of 341 different species belongs to 99 families [60]. Another study mentioned that, the 8 species out of 50 were found in the [Ffabaceae family](#) [61]. Day and De reported in their review [study](#) that, 73 plant families having 198 species [were](#) used [against for treatment of snakebites.](#) [The](#) plant family Fabaceae represents the maximum species (25) followed by Apocynaceae (16), Asteraceae (11), [etcand others.](#) [62]. [A R](#)recent study also found that, 150 botanical families containing plants with reputation [for treatment of against](#) snakebites [\(, among which the most cited ones were the families](#) Fabaceae, Asteraceae, Apocynaceae, Lamiaceae, Rubiaceae, Euphorbiaceae, Araceae, Malvaceae, and Acanthaceae [63].

3.3. Morphology of the Medicinal Plants

Plant morphology is the study of the physical form and external structure of plants. This is usually considered distinct from plant anatomy, which is the study of the internal structure of plants, especially at the microscopic level. Plant morphology is useful in the visual identification of plants [64]. [Based on the morphology \(Figure 1\) of medicinal plants 24 \(25%\) plants were classified to be herbs and shrubs; and trees 20 \(20.83%\).](#)

Morphology of Medicinal Plants

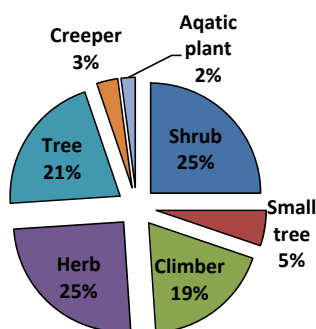


Fig. 1. Morphology Morphological classification of Medicinal medicinal Plants plants that are using used for the Mmanagement of snake bites

3.4. Habitat of the Medicinal Plants

Figure 2 showed that, the habitats of the the characterization of medicinal plants which are utilizing utilized in for the management of the snake bites, according to their habitats.

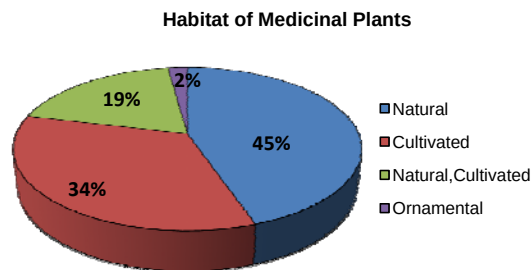


Fig. 2. Habitats of Medicinal medicinal Plants plants that are using used for the Management management of snake bites

In this review indicated indicates that, 42 (45%) of the medicinal plants were grown on in the natural habitat; 32 (34%) plants wereare cultivated plants, and 18 (19%) are plants werein both natural and cultivated habitats(Both).

3.5. Parts uses of the Medicinal Plants used for treatment of diseases

Medicinal properties derived from plants may come from many different parts of a plant including leaves, roots, barks, seeds, fruits, and flowers. The different parts of these plants are containing contain different active ingredients within a plant. Thus, one part of the plant could be toxic while another portion of the same plant could be curative (harmless) [65].

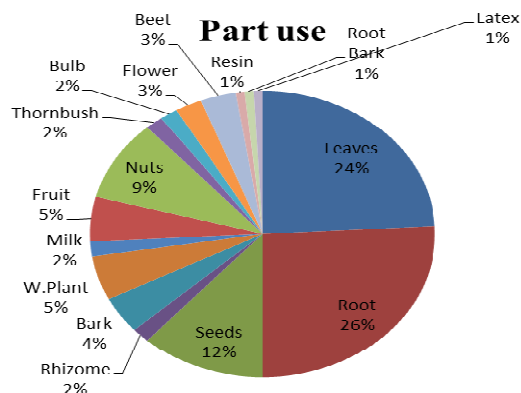


Fig. 3. Parts uses of Medicinal Plants that are using used for Management the management of snake bites

The Important parts of plants usesd for the management of the snake bites are showing shown in the Figure 3. The results review revealed that from these plants 31 species (26%) parts used for treatment were used as roots 31 species; (26%), leaves 29 (24%) as leaves and seeds 15 (12%) as seeds. However, in some cases there was latex and resin were also used but rarely. The findings of this This present study finding was fairly comparable with the previous study of 71 identified plant species which stated showed that, the leaves (24.82%), stems (11.68%) and flowers (10.95%) were found to be the most frequently employed structuresused parts for preparing the

extract. [66] in the preparation of the extracts in 71 identified plant species [66]. Another study reported that, leaves and roots are were the parts of plants most used in folk medicine [63].

3.6. Siddha Properties of the Medicinal Plants

The drugs used in Siddha medicine were are classified on the basis of five properties: taste, character, potency, class/ efficacy and action [67]. Taste has got a significant place in Siddha Medicine. Tongue experiences these tastes when a drug is administered orally. The dynamics of Siddha preparations are based on taste parameters. Six tastes are known as sweet, sour, salty, pungent (spicy), bitter and astringent. Potency is described as an active constituent of the drug. This constituent is responsible for the pharmacological activity of the medicinal herb and other drugs. The drugs have cold and hot potency. Class (Bio transformation) is said to be the post absorptive taste or taste of the drug after absorption which also is considered to be an important aspect [68, 69]. Table 3 is showing shows the siddha properties such as taste, potency and efficacy of the medicinal plants which are using used for the management of the snake bites.

Table 3. Siddha Properties of the Medicinal Plants

No	Taste	Fr.	%	Potency	Fr.	%	Efficacy	Fr.	%
01	Bitter	52	48.14	Hot	64	70.32	Pungent	68	72.34
02	Sweet	24	22.22	Cold	27	29.67	Sweet	26	27.65
03	Pungent	15	13.88						
04	Astringent	14	12.96						
05	Sour	03	02.77						

Fr. - Frequency; % - Percentage

Comment [SA3]: What about salty – not included in the table?

According to Table 3, shows these plants that contain: Siddha properties such as bitter taste 52 (48.14%); hot potency [64 (70.32%)] and pungent efficacy [68 (72.34%)].

3.7. Pharmacological Actions of the Medicinal Plants

Action is the function of the drug which mentions the outcome effect of the drug like expectorant, tonic, diuretic etc. A drug can have more than one action [68, 69].

Table 4. Pharmacological action of Medicinal Plants

No	Pharmacological Action	Frequency	Percentage (%)
01	Stimulant	32	34.04
02	Antiperiodic	11	11.70
03	Germicide	02	02.13
04	Alterative	24	25.53
05	Anthelmintic	17	18.08
06	Diuretic	36	38.30
07	Emetic	20	21.27
08	Febrifuge	07	07.45
09	Laxative	30	31.91
10	Nauseant	03	03.19
11	Nutritive	17	18.08
12	Tonic	35	37.23
13	Purgative	20	21.28
14	Emmenagogue	12	12.77
15	Abortifacient	02	02.13
16	Carminative	16	17.02
17	Aphrodisiac	11	11.70
18	Expectorant	25	26.60
19	Antipyretic	02	02.13
20	Analgesic	01	01.06
21	Anti-inflammatory	09	09.57
22	Anodyne	08	08.51

23	Cathartic	03	03.19
24	Stomachic	19	20.21
25	Digestive	01	01.06
26	Rubefacient	11	11.70
27	Deodorant	01	01.06
28	Diaphoretic	08	08.51
29	Antidote	13	13.83
30	Acrid	01	01.06
31	Anti-bilious	05	05.34
32	Demulcent	19	20.21
33	Disinfection	10	10.64
34	Blood purificator	01	01.06
35	Astringent	33	35.11
36	Cooling	17	18.08
37	Anti-spasmodic	11	11.70
38	Antiseptic	16	17.02
39	Sialagogue	01	01.06
40	Galactagogue	03	03.19
41	Styptic	10	10.64
42	Emollient	05	05.34

The specific pharmacological actions of the medicinal plants which are utilizing utilized for the management of snake bites were are listed in the tTable 4. According to this table, pharmacological actions such as diuretic [36 (38.3%)]; tonic [35 (37.23)]; astringent [33 (35.1%)] and stimulant [32 (34.04%)] were present in these medicinal plants.

3.8. Dietary and Poisonous plants

The figure Figure 4 revealed that, from these 94 medicinal plant species 39 (41.49%) plants were commonly used as for dietary purposes and 9 (9.57%) plants were shown to be poisonous.

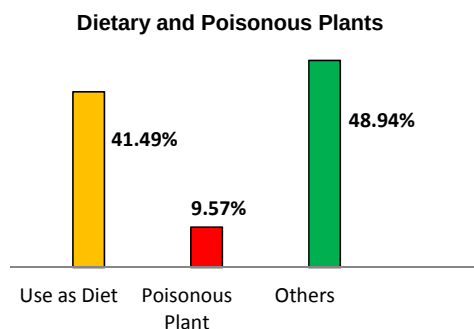


Fig. 4. Dietary and Poisonous plants

3.9. Phytochemical contents

Phytochemicals are non-nutritive plant chemicals that have protective or disease preventive properties. They are non-essential nutrients, meaning that they are not required by the human body for sustaining life. It is well-known that plants produce these chemicals to protect themselves but recent researches demonstrate that they can also protect humans against diseases. There are more than a thousand known phytochemicals [70]. Therefore, the phytochemical contents were analyzed seen in these selected plants and are reported in the Table 5.

Table 5. Phytochemical contents of Medicinal Plants

No	Phytochemicals	Frequency	Percentage (%)
01	Flavonoids	88	93.61

02	Saponin	81	86.17
03	Anthraquinones	13	13.82
04	Glycosides	40	42.55
05	Cardiac glycosides	16	17.02
06	Alkaloids	44	46.80
07	Tannin	60	63.82
08	Gumarine	12	12.76
09	Formic acid	04	04.25
10	Reducing sugar	28	29.78
11	Amino acids	32	34.04
12	Carbohydrates	20	21.27
13	Phenolic compound	12	12.76
14	Terphenoids	18	19.14
15	Lignin	09	09.57
16	Catechols	16	17.02
17	Steroids & Sterols	19	20.21
18	Gum & mucilage	12	12.76
19	Protein	12	12.76

Phytochemicals such as flavonoids 88 (93.61%) and saponin 81 (86.17%) were highly found to be high in these medicinal plants. This was followed by Tannin 60 (63.82%) was found. In vitro studies showed that the flavonoid contents inhibited the hyaluronidase activity based on different venoms venom - dose-dependently dependency [71]. Another study mentioned that the phytochemicals such as plant phenols, alkaloid, triterpenoid, steroid showed effective anti-snake venom activity [72]. In vitro and in vivo studies demonstrated that several alkaloids, flavonoids, polyphenols, terpenoids, saponins, sterols, glycosides, etc., from herbal medicines effectively neutralized local tissue damage induced by venom toxins/enzymes [73].

3.10. Mode of Transmission

Modes of transmission of the selected medicinal plants are showing shown in the Figure 5.

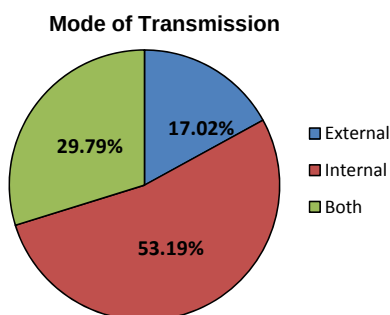


Fig. 5. Mode Transmission of the Selected Medicinal Plants

Commonly, Siddha system of Medicine classifies all medicinal preparations into 64 categories, of which 32 are internal medications and 32 are external medications and methods [67, 68]. A review of some of the more commonly used dietary supplements and their chemistry and topical use confirms that there is merit in using these plants both internally and externally [8].

This review confirmed that, fifty (53.19%) of these species were used as external and internal (Both) medication in the management of snake bites. A Pprevious related study mentioned that, regarding the mode of use, the most frequent one is the topical application of the vegetal products directly on the place of the bite. On the other hand, the use of some plant species is made by through internal and external routes simultaneously, while for some other species the route of administration could be chosen among to be internal or external use [63].

CONCLUSION

This literature review provides useful documented evidence on the management of snake bites in Traditional **Medicine** medicine. However there is a need for further reviews related to the chemical composition, chemical elements, phytochemicals, physicochemical properties, toxic substances, **and** **e**Extensive scientific studies **should** also to be carried out to justify its clinical potential in **the** management of snake bites in future.

ETHICS APPROVAL

It is not applicable.

CONSENT

It is not applicable.

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APPENDIX

No	Morphology	Common part use	Part use on Snake bite	Mode of administration	Used as Diet	Poisonous plant
01	Shrub	Leaves ,Root	Leaves, Root	External & Internal		
02	Small tree	Leaves ,Seeds, Bark	Leaves, Seed	External		
03	Climber	Root, Rhizome, Whole plant	Rhizome	External & Internal		
04	Climber	Leaves ,seeds, Root, Whole plant	Root	External & Internal		
05	Small tree	Leaves ,Bark	Bark	Internal	✓	
06	Climber	Leaves ,Root, Rhizome	Leaves	Internal		
07	Climber	Leaves, Whole plant	Leaves , Whole plant	External & Internal		
08	Herb	Leaves, Root, Whole plant	Leaves, Root	Internal		
09	Shrub	Leaves, Root, bark, Flowers, Milk	Leaves, Milk	External & Internal		✓
10	Climber	Fruits	Fruits	External & Internal	✓	
11	Climber	Rhizome, Whole Plant, Seed	Seeds	Internal		
12	Shrub	Leaves, Whole plant	Leaves	Internal		
13	Shrub	Leaves, Whole plant	Leaves	Internal		
14	Climber	Leaves, Root, Seeds, Nuts , Fruit, Matured Fruit	Leaves, Seed, Nuts, Thorn bush	External & Internal	✓	
15	Herb	Root, Rhizome	Root	External & Internal		

16	Herb	Leaves, Flowers, Seeds, Bulb	Bulb	Internal	✓	
17	Shrub	Leaves, Root, Fruit	Leaves	Internal		
	Tree	Leaves, Root, Seeds, flowers	Root ,Seeds	Internal		
19	Climber	Leaves, Seeds, Fruit	Leaves	Internal	✓	
20	Tree	Seeds, Nuts	Nuts	Internal		✓
21	Creeper	Leaves, Seeds, Fruit, stem	Fruit	External	✓	
22	Creeper	Root ,Seeds, Fruit, Matured Fruit	Root	External		
23	Herb	Whole Plant, Root	Root	External		
24	Herb	Leaves , Whole Plant	Whole plant	Internal	✓	
25	Shrub	Leaves ,seeds, Fruit, Flowers	Leaves	External		✓
26	Herb	Leaves	Leaves	Internal	✓	
27	Shrub	Leaves ,Flowers	Leaves	External & Internal		
28	Shrub	Leaves	Leaves	Internal		✓
29	Herb	Bulb	Bulb	Internal	✓	
30	Climber	Leaves	Leaves	Internal		
31	Climber	Matured leaves ,Milk	Milk	External		✓
32	Tree	Leaves , Root, Bark, Root bark, Seeds, Resin, Flowers	Flowers	Internal		
33	Tree	Leaves ,Tender, Flowers, Fruit, Seeds, Bark, Root bark, Wood, Resin	Seeds	Internal	✓	
34	Shrub	Root	Root	Internal	✓	
35	Shrub	Leaves ,Root	Leaves	Internal		
36	Herb	Whole plant	Whole plant	Internal		
37	Tree	Leaves ,Seeds, Flowers, Bark, Tender, Resin, Pods, Root, Whole plant	Leaves	External & Internal	✓	
38	Shrub	Leaves ,Seeds	Leaves	Internal		
39	Herb	Dry beet/Rhizome	Dry beet	External & Internal	✓	
40	Tree	Root ,Beet, Fruit	Root	External & Internal		
41	Tree	Leaves , Flowers, Fruit, Seeds, Root bark, Bark	Root, Palanggothu	External & Internal	✓	
42	Herb	Root ,Beet	Beet	Internal		
43	Tree	Leaves, Sprouting, Flowers, Spathe Fruit , Thorne bush, Root, Coconut shell, Bat, Whole plant	Root ,Thorne bush	Internal	✓	
44	Climber	Leaves ,Root	Root	Internal	✓	
45	Tree	Leaves ,Fruit, Bark	Leaves, Bark	External & Internal		
46	Creeper	Stem ,Root	Root	Internal	✓	
47	Herb	Beet	Beet	Internal	✓	
48	Herb	Leaves, Flowers, Seed, Root, Root bark, Whole plant		External		
49	Herb	Leaves ,Seeds, Root, Whole plant	W .Plant	External & Internal		
50	Tree	Seeds , Flowers, Bark	Seeds	Internal		
51	Shrub	Resin	Resin	Internal	✓	
52	Shrub	Leaves , Flowers, Root, Bark	Root	Internal	✓	
53	Small Tree	Flowers ,Pods, Fruit, Seeds, Root, Bark	Root	External & Internal	✓	
54	Shrub	Leaves ,Bark, Root	Root	External		
55	Climbing shrub	Leaves ,Stem, Root, Beet	Root	External & Internal	✓	

56	Shrub	Leaves ,Seeds, Root, Beet	Root, Beet	Internal	✓	
57	Shrub	Leaves ,Flowers, Seeds, Fruit	Seeds	External & Internal	✓	
58	Tree	Fruit ,Seeds	Fruit	Internal		
59	Tree	Leaves ,Fruit, seeds, Bark, Root Bark.	Seeds	External		✓
60	Herb	Leaves ,Root, Whole plant	Leaves ,Root	External & Internal		
61	Shrub	Fruit , Whole plant, Root	Root	Internal	✓	
62	Tree /shrub	Leaves ,Flowers, Pods, Fruit, Bark ,Wood, Stem	Bark	External & Internal	✓	
63	Herb /Grass	Root , Whole plant	W .Plant	Internal	✓	
64	Small tree	Fruit ,Bark, Root	Root	External		
65	Climber	Leaves ,Root	Root	External & Internal	✓	
66	Tree	Bark ,Root	Root	Internal		
67	Tree	Leaves ,Fruit, Seeds	Seeds	External & Internal		
68	Tree	Leaves , Flowers, Seeds, Bark, Resin	Seeds	External & Internal		
69	Climbing Shrub	Leaves ,Seeds, Bark, Root, Root Bark	Seeds	External & Internal		
70	Herb	Seeds	Seeds	External & Internal		
71	Herb	Leaves ,Stem	Leaves	Internal	✓	
72	Herb	Leaves ,Root, Root Bark, Whole plant	Leaves ,Root	Internal	✓	
73	Herb	Leaves ,Seeds	Leaves	Internal	✓	
74	Climber	Leaves , Seeds, Root	Root	Internal		✓
75	Climber	Leaves , Flowers, Fruit, Whole plant	Fruit ,Flowers	Internal	✓	
76	Shrub	Leaves	Leaves	Internal		
77	Shrub/ Climber	Leaves ,Fruit, Root	Root	Internal	✓	
78	Tree	Leaves , Flowers, Pods, Fruit	Root	Internal	✓	
79	Climber	Fruit , Bark, Seeds	Fresh bark	External		✓
80	Herb	W .Plant	W .Plant	External		
81	Herb	Seeds , Whole plant Milk	Seeds	External		✓
82	Small Tree	Leaves	Leaves	Internal		
83	Tree	Leaves ,Root Bark, <i>Spathe</i>	Root Bark	Internal	✓	
84	Shrub	Leaves ,Root, Seeds	Seeds	External & Internal		
85	Tree	Leaves ,Root, Latex	Latex ,Root	External & Internal		
86	Herb	Tuber ,Rhizome	Rhizome	Internal	✓	
87	Tree	Leaves ,Root, Tender leaves, Unripe berries, Charred, Stem bark, Fruit	Tender leaves	External	✓	
88	Aquatic plant	Flowers, Fresh root stock, Seeds, Rhizome.	Fresh root stock	Internal	✓	
89	Aquatic plant	Root stock ,Flowers, seeds, Fruit, Rhizome ,Leaves	Fruits	Internal		
90	Herb	Leaves ,Root	Root	Internal	✓	
91	Shrub	Bark, Fruit	Bark	External		
92	Herb	Bark, Root	Root	Internal		
93	Tree	Leaves, Whole plant	Leaves	External		
94	Herb	Leaves, Flowers	Leaves	External		

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APPENDIX 1. Review Records of the Medicinal Plants which are utilizing in the Management of the Snake Bite



KING COBRA



COMMON COBRA

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[King Cobra](#)

COMMON KRAIT

COMMON KRAIT



RUSSELL'S VIPER

[COMMON](#)

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RUSSELL'S VIPER

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APPENDIX 2: Venomous Species of Snakes in Sri Lanka