

**Wound Healing Ethnomedicinal Plants Popular among the Malayali Tribes in Vattal Hills,
Dharmapuri, TN, India**

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Abstract

Healing of chronic lower extremity wounds is a global problem, especially in developing countries where traditional medicine is often used by the people in remote places. India has a rich tradition of plant based knowledge pertinent to healthcare. A survey of ethnomedicinal plant species used by Malayali's to heal cut/ wounds in Vattal Hills of Dharmapuri was made. A large number of plants/ extracts/ decoctions/ pastes are used by tribals to heal wounds, cuts and burns. In the present study, an attempt has been made to document ethnobotanical knowledge base and methods employed by Malayali's for treatment of cut/ wounds. A large number of ethnomedicinal plants used by the Malayali's have not been validated for wound healing potential. The present investigation resulted in the identification of 82 medicinal plant species distributed across 39 families that are used by Malayali's to heal cut/ wounds. This study is an attempt to gather the information on the existing ethnobotanical knowledge base and document the traditional claims toward the development of safe of effective herbal drugs for cut/ wounds. Results of the study is organized in table form depicting the botanical name, family, vernacular name and habit with a brief note on plant parts used and method of administration.

Key words: Malayali's; Vattal Hills; Ethnomedicine; Traditional Knowledge; Wound Healing; Medicinal Plants.

Introduction

Traditional folk medical practices are empirical in nature, several million people in India with limited access to organized modern health care centers depend on traditional systems of medicine to cater their primary health care needs. Traditional systems of medicine (Ayurveda, Siddha and Unani) are well established in India and are

widely acknowledged to be effective and safe without any side effects (Farnsworth, 1998).

India is rich in ethnic diversity and traditional knowledge (TK) that has resulted in a considerable body of ethnobotanical research. There are over 537 different aboriginal groups in India with widespread knowledge of plants (Jain, 1991). Traditional system of medicines has been in use over thousands of years in India. Significant contributions have been made by its practitioners particularly the primary health care providers at the community level (Jain, 1967). Folk healers (*Nattu Vaidhiyars*) in remote places use local flora for treating and preventing ailments and are generally considered as healthcare resource in rural places inaccessible to modern health care services. It has been estimated by WHO that at least 80% of the population globally relies on traditional medicine to meet their primary health care needs (Bannerman, 1982; WHO, 2000). Traditional folk medicine uses the knowledge, skills and practices based on theories, beliefs and experiences indigenous to its people and culture for maintenance of health. It holds a heritage of communal acceptance and is solely based on the expertise gained by herbalists over a period of time (Ayensu, 1986; Ved and Goraya, 2008).

Use of traditional medicine has changed dramatically over the years, due to its affordability, availability, accessibility and acceptability (WHO, 2008). Nevertheless, scientific evidence from the viewpoint of safety and effectiveness of traditional medicine products and practices is limited. Therefore, ethnobotanists, all over the world, have been actively working to collect, document and conserve indigenous medicinal plant resources and the associated traditional knowledge base. Studies on the use of and hunt for plant based drugs have accelerated in recent times as they are safe and have fewer side effects. Ethno-pharmacologists, botanists, microbiologists, and pharma-chemists are to comb in the hunt for novel bioactive compounds "leads" which could be developed as an effective drug for treatment of various infectious diseases (Pushpangadan and Atal, 1984; Cowan, 1999; Ved and Goraya, 2008).

India is one among the 12-mega biodiversity centres having about 10% of the world's biodiversity wealth, which is distributed across 16 agro-climatic zones. Out of 17,000 species of higher plants reported to occur within India, 7500 are known to have medicinal uses. This proportion of medicinal plants is the highest known in any other country against the existing flora of that country (Shiva, 1996). The vibrant repository of medicinal plants is perhaps the base for the sophisticated indigenous medical heritages, with an unbroken tradition coming down across millennia. The wealth is not only in terms of the number of unique species documented so far for their medicinal use but also the depth of the traditional knowledge base about the uses for human, veterinary health care and crop protection (Ved and Goraya, 2008).

It has been estimated that folk healers in India use approximately about 2500 species of medicinal plants which few more than 100 species serve as regular sources of medicine (Pei, 2001; Jain and Patole, 2001; Ved and Goraya, 2008). Ethnomedicine has attracted of scientists world over and received renewed attention in India in recent past because of its local acceptability. Plant extracts used in ethno medical treatments is enjoying great popularity, however, lacks scientific validation (Cowan, 1999; Ved and Goraya, 2008).

Traditional medicine still remains the main choice for a large majority of people for treating various diseases and ailments. Management in various forms of diseases like Diabetes, Cardiovascular disorders, hepatoprotective, antibacterial, antifungal and wound healing etc. are made. In India, traditional medicines find its use on par with Western medicine (Chopda and Mahajan, 2009). Moreover, those affected by cut/ wounds invariably use the expertise of both the systems. Classical management of wounds starts with an aseptic dressing and ends with the rehabilitation of normal structure and function in the affected part of the body. Ethno pharmacological or the plant based traditional

therapy not only accelerates the wound healing process but also to maintain the quality and aesthetics during the process of wound healing (Kumar et al., 2007).

A survey of literature depicts that raw material base for drugs used for different conditions of wound such as ulcers, syphilitic ulcers, maggots, septic-wounds, cellulitis, purulative ulcer, diabetic carbuncle and other related disorders are derived from natural resources. More than 70% of wound healing pharma products are of plant based, 20% are mineral based, and the remaining contain animal products as their base material. The plant based materials are used as first aid, antiseptic, coagulants, wound wash (extraction of pus), for infected wounds (Ignacimuthu et al, 2006). However, only few investigations have been made to assess the wound healing properties plants used by tribal people (et al., 2009). Biswas and Mukherjee, (2003) reviewed wound healing plants and described 164 plant species as novel source for obtaining bioactive substances with potential wound healing activity. Recently, Muthu et al., (2006) have documented 16 remedies with wound healing potential used by tribal community in Kancheepuram, Tamilnadu. Bhattacharya et al., (2007) made an elaborate study on the healing properties of some Indian medicinal plants against indomethacin-induced gastric ulceration of rats. They demonstrated that healing activity of the extracts of *P. betel* and *E. officinalis* is due to their antioxidant and mucin augmenting activities. However, pharmacological validation of Indian medicinal plants is very limited and a large number of plants used in tribal and folklore with enormous potential have not been validated for their wound healing properties (Kumar et al., 2007). Recent Schmidt et al., (2009) in an experiment with ethanolic extract of twelve plants pointed out that the hydrophilic extracts from *Galinsoga parviflora*, *Petiveria alliacea*, *Schinus molle*, *Waltheria douradinha* and *Xanthium cavanillesii* as well as the lipophilic extract of *Waltheria douradinha* were effective in promoting wound healing activity. Therefore, attempts to document wound healing activity of plants offers immense scope for researchers engaged in validation of the traditional claims and development of safe and effective drugs for cuts and wounds.

Malayali's are predominant hill tribes of Vattal Hills, Dharmapuri, Tamilnadu. Tribals of this community are familiar with local herbs and hold a vibrant knowledge base with regard to the use of the local plants to cure various ailments (Ramya et al., 2008). Their reliance on herbs for medicine has prompted the present investigation. In this study, an attempt is made to enumerate the medicinal plants used by the Malayali's as remedies for wound healing. This paper is an out come of an attempt to collect and document information about ethnomedicinal plant species used in wound healing used by the tribal community.

Methodology

Geographic location of Vattal Hills, Dharmapuri.

Tamil Nadu is the 11th largest state in India with a geographical area of 130058 km² and lies between 11° 00' to 12° 00' N latitudes and 77° 28' to 78° 50' E longitudes. The total forest cover Tamil Nadu is 21482 km² (16.52%) that includes 12,499 km² of dense forests (9.61%) and 8,963 km² of open forests (6.91%). Of the total forest area of Tamil Nadu, 3305 km² are under protected area (15%) which includes, 8 Wildlife sanctuaries, 12 Bird sanctuaries, 5 National parks, 3 Biosphere reserves and one Tiger reserve (Annamalai, 2004). The study area, Vattal Hills is located in the Dharmapuri district Tamilnadu, India (Fig. 1) there are many villages occurring and every Malayali village has several hamlets. Hamlets are found in different elevations (1100m). Temperature in the study area ranges from 12°C to 25°C during Mar – Apr and averages between 12°C during

Dec and 35°C during Apr – May (Ramya et al., 2008).

Ethnobotanical survey

With the primary objective of gathering information about the traditional medicines used for wound healing used by Malayali people dwelling in the Hills were surveyed. Local traditional healers having practical knowledge of plants in medicine were interviewed during Oct 2008 – Apr 2009. Ethnobotanical data were collected according to the methodology suggested by Jain and Goel (1995). Ethnobotanical data were collected using questionnaire, interviews and discussions in their local dialect. Traditional medicines used for promoting wound healing were gathered from the folk healers, elderly man and experienced individuals practicing indigenous medicines. Information was considered only after confirmation through two or more informants. Based on the information provided by tribals, plant specimens were collected, and their identity was established using the local flora (Gamble, 1935; Mathew, 1983; 1991).

Result and Discussion

Medicinal plants used in the treatment of cut/ wound are listed in Table 1. The plants are arranged in alphabetical order of their botanical names, followed by the family and a brief note on plant parts used. In this study, 82 plant species belonging to 38 families have been recorded, that contributes to more than hundred remedies for cut/ wounds. Traditional healers use these plants to promote healing of cut/ wound besides other ailments such as cold, fever, cough, headache, diarrhea, fertility problems, toothache, stomach ache, diabetes, rheumatism, asthma, dysentery, small pox, bone fractures, earache, hair loss and poison (snake, scorpion and insect) bite etc., (Data not shown). The information collected from this study is in agreement with the previous reports (Biswas and Mukherjee, 2003; Chopda and Mahajan, 2009).

Habit based classification of plants used revealed that maximum remedies were obtained from Herb (33) followed by Tree (25) > Shrub (15) > Climber (8) and Straggler (1) respectively, indicating that more than 40% of the remedies were obtained from the Herbs followed by Tree 31% > Shrub 18% > Climber 10% and Straggler 1% (Fig. 2). Different parts of medicinal plants viz., root, stem, leaf, flower, fruit, seed, rhizome, tuber, bark, pulp, latex and gums/resin were used as source of medicine by the local traditional healers. Distribution analysis of plant parts used as source of wound healing bioactive principle revealed that plant parts viz., Flower (4), Fruit (11), Leaf (34), Root (17), Seed (12), Stem (16), Whole plant (18). Percentage analysis of the plant part used were in following order Leaf (30%) > Whole plant (16%) > Root (15%) > Seed (11%) > Fruit (10%) > Stem (14%) > Flower (4%) (Fig.3). Further, most of the remedies for wound healing were obtained from the leaves followed by whole plant. However, plant products viz., latex (40%), oil (30%), gums (5%) and others (25%) were in variably used as source of herbal drug to promote healing of wounds. Maximum numbers of remedies used for promoting wound healing were invariably used as external applicants, only few were taken orally.

Family wise distribution analysis of the plants used by the tribal healers revealed that medicinal plant species

were distributed across 39 families viz., Acanthaceae (2), Amaranthaceae (1), Anacardiaceae (1), Annonaceae (1), Apiaceae (2), Apocynaceae (3), Araceae (1), Asclepiadaceae (4), Asparagaceae (1), Asteraceae (5), Caesalpeniaceae (2), Cannabinaceae (1), Combretaceae (2), Convolvulaceae (1), Crassulaceae (1), Cucurbitaceae (1), Euphorbiaceae (3), Fabaceae (8), Lamiaceae (2), Liliaceae (2), Malvaceae (1), Meliaceae (2), Mimosaceae (5), Moraceae (2), Moringaceae (1), Musaceae (1), Myrtaceae (2), Nyctaginaceae (1), Oleaceae (1), Papaveraceae (2), Poaceae (3), Portulacaceae (1), Rosaceae (1), Rubiaceae (1), Rutaceae (4), Sapotaceae (1), Solanaceae (3), Verbenaceae (3), Zingiberaceae (3). Most of the remedies were obtained from plants belonging to families Fabaceae (8) followed by Asteraceae (5), Mimosaceae (5), Asclepiadaceae (4), Rutaceae (4), Apocynaceae (3), Euphorbiaceae (3), Poaceae (3), Solanaceae (3), Verbenaceae (3), Zingiberaceae (3), Acanthaceae (2), Apiaceae (2), Caesalpeniaceae (2), Combretaceae (2), Lamiaceae (2), Liliaceae (2), Meliaceae (2), Moraceae (2), Myrtaceae (2), Papaveraceae (2). In the study 18 families were represented by single species (Fig. 4).

Interestingly, most of the remedies used to promote wound healing were derived from single plant. However, sometimes combination of two parts of the same plant/ two or more plants has been documented. Besides, method of preparation and administration of medicine varied significantly depending on the plant species and plant part used. Most of the formulations used were in the form of paste (prepared by grinding the plant material). Very rarely, animal products were used in the formulations prepared for external application. Animal products (such as milk or urine) also served as an ingredient in the preparation. The paste is applied over the affected part of the body. Alternatively, juice extracted from fresh plant material or powder form of dry plant material was also used.

The method of preparation used by the practitioners can broadly be classified into four categories, viz.: plant parts applied as a paste, juice extracted from the fresh plant materials, powder made from dried plant materials, decoction obtained from fresh plant materials. External applications (cut/ wounds) and internal consumption of the preparations were used to enhance the process of wound healing. The most frequently used preparations were decoctions (taken internally) and powdered plant material (external application). Traditional healers more frequently use the plants that are available at the time to treat cut/ wounds, thus more number of plants were invariably used for same property as an alternative source.

Table 1. Wound healing plants used by Malayali tribals of Vattal Hills.

Name of the plant	Family	Vernacular (Tamil)	Habit	Plant Part (s)
<i>Abrus precatorius</i> Linn.	Fabaceae	Kunri	C	Se
<i>Acacia arabica</i> Willd.	Mimosaceae	Karuvelamaram	T	St, L, Fr, Se
<i>Acacia caesia</i> (L.) Willd.	Mimosaceae	Nanjupattai	T	B

<i>Acacia leucophloea</i> (Roxb.) Willd.	Mimosaceae	Sarayapattai maram	T	B
<i>Achyranthus aspera</i> Linn	Amaranthaceae	Naayuruvi	H	WP
<i>Acorus calamus</i> Linn	Araceae	Vasambu	H	Rh
<i>Adathoda vasica</i> Nees	Acanthaceae	Aadaathodai	S	L
<i>Aegle marmelos</i> Correa ex Roxb	Rutaceae	Vilvam	T	L, St, Fr
<i>Albizzia lebbek</i> (Linn.) Willd.	Mimosaceae	Vaaghaimaram	T	St, B
<i>Aloe vera</i> Linn.	Liliaceae	Katralai	H	L
<i>Alstonia scholaris</i> R. Br.	Apocynaceae	Ezhilamippalai	T	L, St
<i>Anacardium occidentale</i> Linn.	Anacardiaceae	Mundri	H	R, St, F
<i>Anisomeles malabarica</i> (L.) R. Br. Ex. Sims.	Lamiaceae	Paei miratti	T	St
<i>Annona squamosa</i> Linn.	Annonaceae	Sitapzhalam	T	R, L, Fr, Se
<i>Anthocephalus cadamba</i> Linn	Rubiaceae	Kadambamaram	T	St, Fr
<i>Argemone maxicana</i> Linn.	Papaveraceae	Bharmanthandu	H	R, L
<i>Asparagus racemosus</i> Willd.	Asparagaceae	Thanneervittankizhagu	C	R
<i>Azadirachta indica</i> A. Juss.	Meliaceae	Vemmpu	T	L,
<i>Bambusa bambos</i> (L.) Voss.	Poaceae	Moongil	H	St, R
<i>Bauhinia purpurea</i> Linn.	Caesalpeniaceae	Mandarai	T	B, Fl, Fr
<i>Blepharis maderaspatensis</i> (L.) Roth.	Acanthaceae	Vettukaaya pachilai	S	L
<i>Boerhavia diffusa</i> Linn.	Nyctaginaceae	Mookkiratthai	H	WP
<i>Bryophyllum pinnatum</i> (Lam.) Kurz.	Crassulaceae	Kattipotalkutti	H	L
<i>Caesalpinia bonduc</i> (L.) Roxb.	Caesalpineaceae	Kazhar chiaykkai	T	Se
<i>Calendula officinalis</i> Linn.	Asteraceae	Thulvkkasaamanthi	H	Fl
<i>Calotropis gigantea</i> (Linn.)R. Br. ex Ait.	Asclepiadaceae	Erukku	S	La

<i>Cannabis sativa</i> Linn.	Cannabinaceae	Ganja	H	L
<i>Carthamus tinctorius</i> Linn.	Asteraceae	Chendurakam cheddi	S	Fl, Se
<i>Centella asiatica</i> (Linn.) Urban.	Apiaceae	Vallaarai	H	WP
<i>Citrus medica</i> Linn.	Rutaceae	Narthankai	S	Fr
<i>Clausena dentata</i> (Willd.) Roem.	Rutaceae	Anai thazhai	S	L
<i>Clitoria ternatea</i> Linn.	Fabaceae	Kakkanam	H	R, L, Se
<i>Coccinia indica</i> W&A.	Cucurbitaceae	Kovvai	C	WP
<i>Coriandar sativum</i> Linn.	Apiaceae	Kottamalli	H	Fr
<i>Cryptolepis buchananii</i> Roem & Schul.	Asclepiadaceae	Paalkodi	H	La
<i>Curcuma aromatica</i> Salisb.	Zingiberaceae	Kasturi manjal	H	Rh
<i>Curcuma longa</i> Linn.	Zingiberaceae	Manjal	H	Rh
<i>Cynodon dactylon</i> Pers.	Poaceae	Arugampullu	H	WP
<i>Datura metel</i> Linn.	Solanaceae	Oomatthai	H	WP, L
<i>Dolichos biflorus</i> Linn.	Fabaceae	Kollu	H	WP, Se
<i>Eclipta alba</i> (Linn.) Hassk.	Asteraceae	Karisalaankanni	H	WP
<i>Emlica officinalis</i> Gaertn.	Euphorbiaceae	Nellikkaai	T	Fr
<i>Erythrina indica</i> Lam.	Fabaceae	Kaliyanamurunkkai	T	St, Se, L
<i>Euphorbia hirta</i> Linn.	Euphorbiaceae	Ammanphachharisi	H	R, L
<i>Evolvulus alsinoides</i> Linn.	Convolvulaceae	Vishnukranthi	St	Fr
<i>Ficus benghalensis</i> Linn.	Moraceae	Alamaram	T	B, L, Se
<i>Ficus religiosa</i> Linn.	Moraceae	Araasamaram	T	WP
<i>Gloriosa superba</i> Linn.	Liliaceae	Kalappankizhangu	C	R
<i>Gmellina arborea</i> Roxb.	Verbenaceae	Kumil	T	R, L
<i>Gymnema sylvestre</i> R.Br.	Asclepiadaceae	Shirukurinjan	C	L

<i>Hemidesmus indicus</i> (L.) R.Br.	Asclepiadaceae	Nannaari	C	R
<i>Hordeum vulgare</i> Linn.	Poaceae	Sambalpulu	H	L
<i>Jasminum grandiflorum</i> Linn.	Oleaceae	Mullai	C	WP
<i>Jatropha curcus</i> Linn.	Euphorbiaceae	Kattuammanaku	S	L
<i>Lantana camara</i> Linn.	Verbenaceae	Unnicheddi	S	WP
<i>Madhuka indica</i> J F Gmel.	Sapotaceae	Ielupai	T	WP
<i>Melia azedarach</i> Linn.	Meliaceae	Malai vemmpu	T	L
<i>Mimosa pudica</i> Linn.	Mimosaceae	Thottasurungi	H	WP
<i>Moringa oliefera</i> Lam.	Moringaceae	Murungai	T	WP
<i>Murryaya koenginii</i> (Linn.) Spreng.	Rutaceae	Karuveppilai	S	WP, L
<i>Musa paradisiaca</i> Linn.	Musaceae	Vaazhai	S	WP
<i>Nerium indicum</i> Mill.	Apocynaceae	Arali	S	R
<i>Papaver somiferum</i> Linn.	Papaveraceae	Kasakasa	H	Se
<i>Phaseolus trilobus</i> Ait.	Fabaceae	Kaatupayaru	H	WP
<i>Plectranthus coleoides</i> Benth.	Lamiaceae	Omavalli chedi	H	L
<i>Pongamia glabra</i> Vent.	Fabaceae	Pungam	T	L, Se
<i>Portulaca quadrifida</i> Linn.	Portulacaceae	Serupasalaikeerai	H	L
<i>Psidium guajava</i> Linn.	Myrtaceae	Koyya	H	L, Fr
<i>Pterocarpus marsupium</i> Roxb.	Fabaceae	Vengai	T	L
<i>Rauvolfia serpentina</i> Benth. ex Kurz.	Apocynaceae	Vesammurukee	S	R, L
<i>Rosa chinensis</i> Jacq.	Rosaceae	Rosa	S	L, Fl
<i>Sida cordifolia</i> (Linn)	Malvaceae	Nillathuthi	H	R
<i>Solanum nigrum</i> L.	Solanaceae	Mana thakkali	C	L

<i>Sonchus oleraceus</i> L.	Asteraceae	Kaalaadi pachilai	H	L
<i>Syzygium cuminii</i> (Linn.) Skeels	Myrtaceae	Naval	T	St, Se
<i>Tephrosia</i> <i>purpurea</i> (L.) Pers.	Fabaceae	Kattukolingi	H	WP
<i>Terminalia arjuna</i> (Roxb.) W&A	Combretaceae	Marudam	T	St
<i>Terminalia</i> <i>chebula</i> Retz.	Combretaceae	Kadukai	T	F
<i>Tridax</i> <i>procumbens</i> Linn.	Asteraceae	Vettukkaayathalai	H	L
<i>Vitex negundo</i> Linn.	Verbeneceae	Nochi	S	L
<i>Witahnia</i> <i>somnifera</i> (Linn.) Dunal.	Solanaceae	Amukkuramkizhangu	S	Tu
<i>Zingiber</i> <i>officinale</i> Rosc.	Zingiberaceae	Inji	H	R

Fig. 1. Location of the study area Vattal Hills, Dharmapuri, Tamil Nadu, India.

Fig. 2. Habit wise percentage distribution of the source of wound healing plants.

Fig. 3. Percentage distribution of wound healing remedies obtained from different parts of the plant.

Fig. 4. Family wise Distribution of Medicinal Plants used by the Malayali Tribal in Vattal Hills of Dharmapuri Dist, Tamilnadu.

Conclusion

The survey indicates that, the study area has plenty of medicinal plants to alleviate a wide spectrum of human ailments. Further, the information gathered depicts that people of this area prefer folk medicine due to their socio economical status, lack of modern health care facilities, transportation and believe that plants are intricate aspect of their culture and tradition. It is clearly evident from the study that the knowledge of plants and its usage is limited to elderly *Vaidhiyars*. Since the younger generation is not interested in learning the state of art and secrets of traditional technology, there is a high risk of losing this vibrant knowledge base in the near future. This rapidly vanishing cultural diversity needs to be studied and documented before it disappears definitively. Therefore, documenting and protecting Traditional Ecological Knowledge (TEK) has become key aspect in planning and management of natural resources. Likewise, scientific validation though isolation and characterization of the bioactive principle from plant is expected to pave way for novel drugs from herbal source for the treatment of cut/ wounds.

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References

- Annamalai, R. 2004. Tamil Nadu biodiversity strategy and action plan – Forest Biodiversity. Tamil Nadu Forest Department, Government of Tamilnadu, Chennai.
- Ayensu, E. S. 1986. World Medicinal Plant Resources, In Chopra, V. L. and Khoshoo, T. N., (Eds.), Conservation for Productive Agriculture, pp 15 -27, Indian Council of Agricultural Research, New Delhi, India.
- Bannerman, R. H. 1982. Traditional medicine in modern health care, World Health Forum 3(1): 8 - 13.
- Bhattacharya, S., Chaudhuri, S. R., Chattopadhyay, S., Bandyopadhyay, S. K. 2007. Healing Properties of Some Indian Medicinal Plants against Indomethacin-Induced Gastric Ulceration of Rats. *J Clin Biochem Nutr.* 41(2): 106 - 114.

- Biswas T. K. and Mukherjee, B. 2003. Plant Medicines of Indian Origin for Wound Healing Activity: A Review *International Journal of Lower Extremity Wounds* 2: 25.
- Chopda M.Z. and Mahajan R.T. 2009. Wound Healing Plants of Jalgaon District of Maharashtra State, India *Ethnobotanical Leaflets* 13: 1-32.
- Cowan, M. M. 1999. Plant Products as Antimicrobial Agents, *Clinical Microbiology Reviews* 12(4): 564 - 582.
- Farnsworth, N. R. 1998. Screening plants for new medicines. In Wilson, E.O. (Ed.), *Biodiversity National Academy Press, Washington DC*, pp 83 - 97.
- Gamble, J.S. 1935. *Flora of the Presidency of Madras, Vol I-III*, Bishen Singh Mahendra Pal Singh, Dehra Dun, India.
- Ignacimuthu, S., Ayyanar, M. and Sankara Sivaraman, K. 2006. Ethnobotanical investigations among tribes in Madurai District of Tamil Nadu (India), *Journal of Ethnobiology and Ethnomedicine*, 2: 25 - 30.
- Jain, A. K. and Patole, S. N. 2001. Less-known medicinal uses of plants among some tribal and rural communities of Pachmarchi forest (M.P.), *Ethnobotany*, 13: 96 - 100.
- Jain, S. K. 1967. *Ethnobotany: Its scope and study*, *Indian Museum Bull* 2: 39 - 43.
- Jain, S. K. 1991. *Dictionary of Indian Folk Medicine and Ethnobotany*. New Delhi: Deep publications.
- Jain, S. K. and Goel, A. K. 1995. *A manual of Ethnobotany*, Scientific Publishers, Jodhpur, India, pp 142 - 153.
- Kumar, B., Vijayakumar, M., Govindarajan, R. and Pushpangadan P. 2007. Ethnopharmacological approaches to wound healing - Exploring medicinal plants of India, *Journal of Ethnopharmacology* 114(2): 103 - 113.
- Mathew, K.W. 1983. *The Flora of Tamil Nadu Carnatic*, The Rapinant Herbarium, St. Josephs College, Tiruchirapalli, India.
- Mathew, K.W. 1991. *An Excursion flora of Central TamilNadu, India*, Oxford and IBH Publishing Co., New Delhi, India.
- Muthu, C., Ayyanar, M., Raja, N., and Ignacimuthu, S. 2006. Medicinal plants used by traditional healers in Kancheepuram District of Tamil Nadu, India, *International Journal of Lower Extremity Wounds* 2: 25 - 31.
- Pei, S. J. 2001. *Ethnobotanical approaches of traditional medicine studies: Some experiences from Asia*.

Pharmaceutical Biology 39: 74 - 79.

Pushpangadan, P. and Atal, C.K. 1984. Ethno-medico-botanical investigations in Kerala - Some primitive tribal of Western Ghats and their herbal medicine. *Journal of Ethnopharmacology* 11(1): 59 - 77.

Ramya, S., Rajasekaran, C., Sivaperumal, R., Krishnan, A. and Jayakumararaj, R. 2008. Ethnomedicinal Perspectives of Botanicals used by Malayali Tribes in Vattal Hills of Dharmapuri (TN), India. *Ethnobotanical Leaflets* 12: 1054 - 1060.

Schmidt, C., Fronza, M., Goettert, M., Geller, F., Luik, S., Flores, E. M., Bittencourt, C. F., Zanetti, G. D., Heinzmann, B. M., Laufer, S., Merfort, I. 2009. Biological studies on Brazilian plants used in wound healing. *J Ethnopharmacol.* 122(3): 523 - 532.

Ved, D.K. and Goraya, G. S. 2008. Demand and Supply of Medicinal Plants in India, Bishen Singh, Mahendra Pal Singh, Dehra Dun and FRLHT, Bangalore, India.

WHO. 2000. General Guidelines for Methodologies on Research and Evaluation of Traditional Medicine Geneva, Switzerland WHO/EDM/TRM/2000.1 pp 1 – 80.