

Investigations on Anti-Diabetic Medicinal Plants Used by Tribal Inhabitants of Nalamankadai, Chitteri Reserve Forest, Dharmapuri, India

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Abstract

An ethnobotanical survey was conducted to collect information about medicinal plants used for the treatment of diabetics and associated complications by tribals in Nalamankadai village of Chitteri Hills, Dharmapuri District. The indigenous knowledge of local traditional healers and native plants used for the treatment of diabetics related health disorders were collected through questionnaire and personal interviews. A total of 10 informants with in the age group of 50 to 68 were interviewed, among them two were tribal practitioners. The investigation revealed that, the traditional healers and the inhabitants use 29 species of plants distributed in 28 genera belonging to 22 families to treat diabetics and related complications. Results depict that fresh plant materials were invariably preferred for the treatment of long term complications associated with diabetics. Anti-diabetic medicinal plants used by Malayali's in Chitteri have been listed along with plant parts used.

Keywords: Malayali's; Chitteri Hills; Ethnomedicine; Traditional Knowledge; Anti diabetic.

Introduction

A mounting body of research is hoisting the credibility of traditional knowledge in meeting the challenges of primary healthcare and management of natural resource globally (Ragupathy and Newmaster, 2008). However, societal domination of western medicine and lack of recognition to the stakeholders of biological resources, place and value of traditional knowledge base has been impeding the entry of traditional medicine into healthcare services and related field such as nutrition,

environmental management (Usher, 2000). Even though, traditional practices are empirical in nature, over 200 million people in India with limited access to primary healthcare centers, depend on traditional system of medicine to cater to their healthcare needs (Farnsworth, 1998).

India holds a credibility of diverse social, cultural and medical heritage with an unbroken tradition coming down across millennia. Though, medical heritage is centuries old, millions people in rural area still depend on traditional medicine to congregate their healthcare needs (Ved and Goraya, 2008).

Collection of information and documentation of traditional knowledge plays an important role in scientific research on drug development (Ragupathy et al., 2008). A study of WHO depicts that over 80% of world's population depends on biological resources for their primary healthcare demands (WHO, 2000).

Aboriginal people of the study area called Malayali's are the inhabitants of Sherveroyan hill ranges of Salem, Dharmapuri, Villupuram and Vellore districts. Malayali's are the largest tribal group constituting 47.6% of ST population in the state of Tamilnadu. It is claimed that they are descents of Vellalas of Kancheepuram and following invasion they fled to Sherveroyan Hills (Thurston and Rangachari, 1909). Malayali's are illiterate and speak a local dialect of Tamil; they physically resemble the Semong of Malaya. Traditional medicines are the primary healthcare resources to maintain their health and cure illness. Tribal practitioners with in the community are curators of their society. They have good knowledge of medicinal plants, diseases and treatment modalities. Besides, they serve as custodians of biodiversity. However, there are only a few reports available on ethnomedicinal aspects of plants used by Malayali's (Dwarakan and Ansari, 1992). Therefore, present investigation on the use of ethnomedicinal plants for the treatment of diabetics has been taken up in Nalamankadai village of Chitteri, Dharmapuri district, Tamilnadu, India.

“Diabetes” is a metabolic syndrome of multiple etiologies characterized by chronic hyperglycemia with abnormalities in carbohydrate, fat and protein metabolism due to defect in insulin secretions. Diabetes is associated with long term damage such as malfunction of eyes, kidneys, nerves, heart and blood vessels. It is associated with health complications including renal failure with risk of foot ulcers, including sexual dysfunction, heart disease, stroke and blindness. Different types of diabetes have been identified and categorized as Type I Diabetes, Type II Diabetes and Gestational Diabetes.

Since antiquity, diabetes has been treated with plant medicines. Ethnobotanical studies of traditional herbal remedies used for diabetes around the world have identified more than 1,200 species of plants with hypoglycemic activity (Babu et al, 2006). Natural medicines used in the traditional Chinese medical system for therapy of diabetes mellitus (Li et al, 2004). In India, indigenous remedies have been used in the treatment of DM since the time of Charaka and Sushruta (6th century BC) (Grover and Vats, 2001). Ayurveda and other Indian traditional medicine use plants in treatment of diabetics

(Chopra et al, 1986). However, traditional knowledge, derived empirically, has to be supported by scientific testing.

Experimentally, Shanmugasundaram *et al.*, (1990) confirmed the efficacy of traditional preparations claimed to be effective in the treatment of diabetics. Several herbs have shown anti-diabetic activity when assessed with the available experimental techniques (Mukherjee et al., 2006;). Wide array of plant derived compounds with consistent antidiabetic activity have proven their possible use in the treatment of DM (Farnsworth, 1998). Plants like *Allium cepa*, *Allium sativum*, *Aloe vera*, *Cajanus cajan*, *Coccinia indica*, *Caesalpinia bonducella*, *Ficus bengalensis*, *Gymnema sylvestre*, *Momordica charantia*, *Ocimum sanctum*, *Pterocarpus marsupium*, *Swertia chirayita*, *Syzigium cumini*, *Tinospora cordifolia* and *Trigonella foenumgraecum* have been studied in relation to diabetes and their complications. However, these plants have shown varying degree of hypoglycemic and anti-hyperglycemic activity (Grover and Vats, 2001).

The main objective of this study was to assess the diversity of ethnomedicinal plants used by Malayali's and document the traditional medical practices followed in healing complications associated with diabetics. Similar ethnobotanical studies have been elsewhere to document the traditional knowledge that has been vanishing (Ignacimuthu et al., 2006). Therefore, documenting indigenous knowledge is important from the view point of conservation of biological resources and their sustainable utilization in the management of Diabetics and its related complications.

Materials and Methods

Description of study area

Eastern Ghats, a broken chain of mountains in the Indian peninsular extends from Coromandal in West Bengal to Kanyakumari in Tamil Nadu, is about 1600 km long in North-South direction. The area of investigation approximately lies between 87°0' to 89°0' longitude and 28°0' to 37° 0' latitude. The study area Chitteri is located in Dharmapuri district Tamilnadu, India (Fig. 1). The mean annual temperature in the study area ranges from 12°C to 35°C during Mar – Jun and averages between 10°C to 25°C during Oct - Jan. Present investigation was conducted in Nalamankadai village located very close to Chitteri forest (Fig. 2). Field trips were conducted Oct 2008 to Mar 2009.

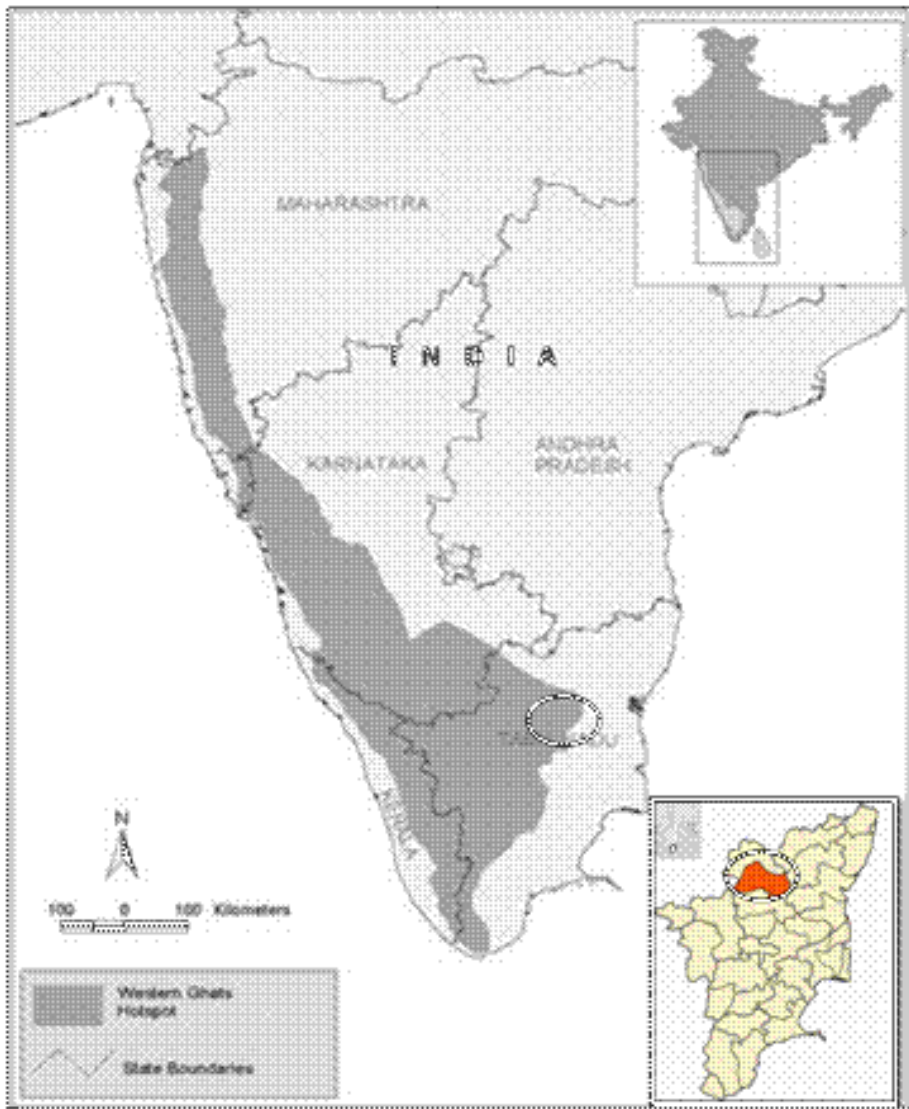


Fig. 1. Sketch map of the study area.



Fig. 2. Panoramic view of the study area in Chitteri Hills and the people.

Ethnobotanical Survey

Field investigations were conducted in Nalamankadai village, Chitteri, Dharmapuri. During the study, daily activities of the local inhabitants were closely observed and interpersonal contacts were established by participating in their functions. There were 10 informants within the age group of 30 to 68. Among them two were tribal practitioners. Ethnobotanical data were collected according to the methodology suggested by Jain and Goel (1995). The ethnobotanical data were collected using questionnaire, interviews and discussions in their local dialect.

Plant Collection

The medicinal plants used by the tribal people were collected following standard protocols and preserved using herbarium techniques. Specimen collected from the field were tagged and taken to lab. Flora of Presidency of Madras (Gamble, 1935) and Flora of Tamil Nadu Carnatic (Matthew, 1983;1991) were used for identification and authentication of the plants collected. Herbarium collections have been voucher numbered and deposited in the Herbarium at Government Arts College, Dharmapuri.

Results and Discussion

Table 1, enumerates the data obtained during the investigation. A total of 29 plant species belonging to 22 families have been recorded in the present study. However, plants like *G. sylvestre*, *M. indica*, *M. charantia*, *M. koeingii*, *S. cumini*, and *T. foenum-graecum* were more frequently used by the people in the area. Plant species belonging to families of Fabaceae (3), Alliaceae (2), Apocyanaceae (2), Cucurbitaceae (2), Euphorbiaceae (2) and Rutaceae (2). The usage of plant part Bulb – 2, Flower – 1, Fruit – 5, Leaf – 11, Seed – 8, Pseudo Stem – 1, Tuber – 2, Whole Plant – 1 (Fig. 3). From the data, it could be inferred that for more number of remedies fresh leaf materials (36%) is used followed by seeds (26%) and fruits (16%). However, plant parts like Bulb (3%) and tuber (3%) were less frequently used by the people in the area. Informations gathered during this study are in agreement with the previous reports (Jain and Patole, 2001; Ignacimuthu et al., 2006; Modak et al, 2007; Ramya et al, 2008).

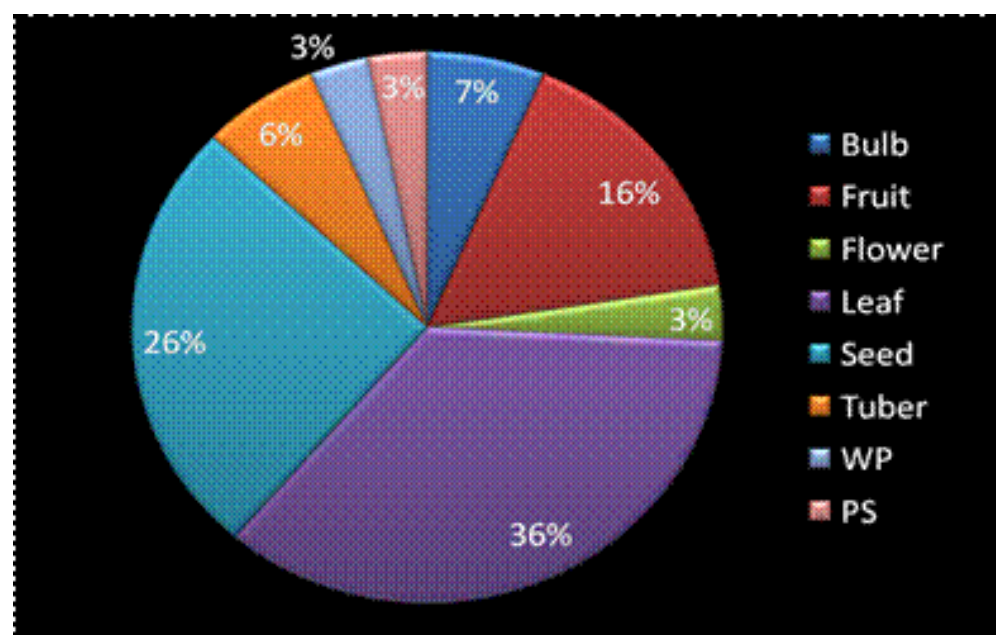


Fig. 3. Percentage distribution analysis of remedies obtained from different plant parts.

Table 1 Anti diabetic medicinal plant species used by the inhabitants of Nalamankadai, Chitteri.

Botanical Name	Family	Vernacular	Part(s)	Ethnobotanical Usage
<i>Acacia arabica</i> (Lam.) Willd.	Mimosaceae	Karuvaelai	S	Seeds hypoglycemic
<i>Aegle marmelos</i> (L.) Corr.	Rutaceae	Vilvam	L	Leaf powder with cow's milk is taken orally.
<i>Allium cepa</i> Linn.	Alliaceae	Vengayam	B	Leaf juice with honey or milk and taken orally.
<i>Allium sativum</i> Linn.	Alliaceae	Pundu	B	Leaf, bulb antidiabetic taken orally.
<i>Andrographis lineata</i> Wall. ex Nees.	Acanthaceae	Siriyangai	L	Leaf powder mixed with cow's milk is taken
<i>Azadirachta indica</i> A. Juss.	Meliaceae	Vembu	L	Leaves anti diabetic.
<i>Bombax ceiba</i> L	Bombacaceae	Elavampanchu	S	Seed powder with goat's milk is taken orally.
<i>Brassica juncea</i> (Linn.) Czern. & Coss.	Braceaceae	Kadugu	S	Seed powder with milk is taken orally
<i>Cajanus cajan</i> (Linn.) Millsp.	Fabaceae	Thuvarai	S	Seeds cooked and taken along with food.
<i>Catharanthus roseus</i> L. (G) Don.	Apocyanaceae	Nityakalyani	WP	Flower decoction taken orally.
<i>Coccinia indica</i> W & A	Cucurbitaceae	Kovai	F	Leaf / Fruit decoction is taken topically.
<i>Cuminum cyminum</i> Linn.	Apiaceae	Cheerakam	S	Fruit soaked in water and taken orally.
<i>Erythrina indica</i> Lam.	Fabaceae	Mulmurungai	L	Leaves consumed to treat diabetics.
<i>Euphorbia antiquorum</i> Linn.	Euphorbiaceae	Chzathura kalli	L	Leaves /fruits consumed to treat diabetics.
<i>Ficus benghalensis</i> Linn.	Moraceae	Alamaram	F	Fruits taken to treat diabetics.
<i>Gymnema sylvestre</i> R.Br.	Apocyanaceae	Sakkaraikolli	L	Leaf made to juice and taken orally.
<i>Hibiscus rosa-sinesis</i> Linn.	Malvaceae	Sembaruthi	L	Tender fresh leaves used to cure diabetes.
<i>Ipomoea batatas</i> (Linn.)	Convolvulaceae	Sakkaraivalli	T	Leaf juice is taken to treat diabetics
<i>Jatropha glandulifera</i> Rox.	Euphorbiaceae	Adalai chedi	T	Tubers boiled and taken to treat diabetics.
<i>Lantana camara</i> Linn.	Verbenaceae	Unni chedi	L/F	Leaf and fruits consumed raw - treat diabetics.
<i>Mangifera indica</i> L.	Anacardiaceae	Ma	S	Dry kernel powder in cow's milk.
<i>Momordica charantia</i> L.	Cucurbitaceae	Pavai	F	Fruit juice is taken to treat diabetics.
<i>Murraya koeingii</i> (L.) Spreng.	Rutaceae	Karuvepalai	L	Leaf juice is taken to treat diabetics.
<i>Musa paradisiaca</i> L.	Musaceae	Valai	PS	Stem extract reduces diabetics.
<i>Nelumbo nucifera</i> Gaertn.	Nymphiaceae	Alli	F	Flowers made to juice and taken orally.
<i>Ocimum santum</i> L.	Lamiaceae	Thulasi	L	Leaf powder with honey is taken orally.
<i>Punica granatum</i> L.	Punicaceae	Madulai	F	Fruit used to treat diabetics.
<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	Naval	S	Seeds powder reduce blood sugar/ diabetics
<i>Trigonella foenum-graecum</i> L.	Fabaceae	Vendhyem	S	Seed soaked in water used to treat diabetics

It has been previously shown that *M. charantia* and *E. jambolana* are very effective in controlling glucose levels in chemically induced mild to severe model of diabetics in rodents and seem to work by stimulating kinases involved in peripheral utilization of glucose (Grover and Vat, 2001). In addition, to the plants documented in the present study many other plants have shown excellent positive outcomes in respect to diabetic complications such as diabetic nephropathy, fructose induced insulin resistance,

and cataract. Recently, efficacies of *T. foenum graecum*, *O. sanctum*, *P. marsupium*, *M. koeingii* and *B. juncea* have been proven effective in the management of Diabetics and its related complications (Babu et al., 2006; Jung et al., 2006 Modak et al, 2007;).

Conclusion

Present investigation indicates that Chitteri is blessed with splendid diversity of ethnomedicinal plants. The study depicts that resource persons are invariably elderly people and the younger generation is reluctant to take up nattuvaithiyam. Therefore, documentation of traditional knowledge is the only way out to preserve the knowledge base conserve the plant resources endemic to this area. Further, ethnomedical approach for the treatment of diabetes is a practical, cost-effective and biological safe.

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References

- Babu, P.A., Suneetha, G., Boddepalli, R., Lakshmi, V.V., Rani, T.S., Rambabu, Y., Srinivas, K. 2006 A database of 389 medicinal plants for diabetes. *Bioinformation* 1(4):130-171.
- Chopra, R.N., Nayar, S.L., Chopra, I.C. 1986 Glossary of Indian Medicinal Plants, Council of Scientific and Industrial Research, ND. India.
- Dwarakan, P., Ansari, A.A. 1992 Ethnobotanical notes of Valikadupatti and surroundings of Kollimalais of Salem district, Tamil Nadu. *J Econ Taxon Bot Addit Ser.* 10:495-499.
- 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.
- Grover, J.K., Vats, V. 2001 Shifting Paradigm from conventional to alternate medicine. An introduction on traditional Indian medicine. *Asia Pacific Biotechno News* 5(1):28-32.
- Ignacimuthu, S., Ayyanar, M., Sankara Sivaraman, K. 2006 Ethnobotanical investigations among tribes in Madurai District of Tamil Nadu, *J. Ethnobiol Ethnomedicine* 2:25-30.

- Jain, A.K., 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., Goel, A.K. 1995. *A manual of Ethnobotany*, Scientific Publishers, India, 142-153.
- Jung, M., Park, M., Lee, H.C., Kang, Y.H., Kang, E.S., Kim, S.K. 2006 Antidiabetic agents from medicinal plants. *Curr Med Chem.* 13(10):1203-1218.
- Li, W.L., Zheng, H.C., Bukuru, J., De Kimpe, N. 2004 Natural medicines used in the traditional Chinese medical system for therapy of diabetes mellitus. *J Ethnopharmacol.* 92(1):1-21.
- Mathew, K.W. 1983. *The Flora of Tamil Nadu Carnatic*, RHT, Tiruchirapalli, India.
- Mathew, K.W. 1991. *An Excursion flora of Central TamilNadu*, IBH Publishing, ND, India.
- Modak, M., Dixit, P., Londhe, J., Ghaskadbi, S., Paul, A., Devasagayam, T. 2007 Indian herbs and herbal drugs used for the treatment of diabetes. *J Clin Biochem Nutr.* 40(3):163-173.
- Mukherjee, P.K., Maiti, K., Mukherjee, K., Houghton, P.J. 2006 Leads from Indian medicinal plants with hypoglycemic potentials. *J Ethnopharmacol.* 106(1):1-28.
- Ragupathy, S., Newmaster, S.G., Maruthakkutti, M., Velusamy, B., Ul-Huda, M.M. 2008 Consensus of the 'Malasars' traditional aboriginal knowledge of medicinal plants in the Velliangiri holy hills, India. *J Ethnobiol Ethnomed.* 27(4):8-15.
- Ramya, S., Rajasekaran, C., Sivaperumal, R., Krishnan, A., Jayakumararaj, R. 2008 Ethnomedicinal Perspectives of Botanicals used by Malayali Tribes in Vattal Hills of Dharmapuri (TN), India. *Ethnobotanical Leaflets* 12:1054-1060.
- Shanmugasundaram, E.R., Gopinath, K.L., Shanmugasundaram, K.R. 1990 Possible regeneration of the islets of Langerhans in streptozotocin-diabetic rats given *Gymnema sylvestre* leaf extracts. *J Ethnopharmacol* 30:265-279.
- Thurston, E., Rangachari, K. 1909 "Vellala." In: *Castes and Tribes of Southern India*, 7:361-389. Madras State, India.
- Usher, P.J. 2000. Traditional ecological knowledge in environmental assessment and

management. *Arctic*, 53(2):183-193.

Ved, D.K., 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.