INTERNATIONAL JOURNAL OF APPLIED BIOLOGY AND PHARMACEUTICAL TECHNOLOGY

Volume: 2: Issue-4: Oct - Dec -2011 IJABPT *ISSN 0976-4550*

REVIEW OF FLORA OF ANTI-DIABETIC PLANTS OF PUDUCHERRY UT"

Aswini Kumar[1] Dixit and Sudurshan M[2]

Post Graduate and Research department of Plant Science, Kanchi Mamunivar Center for Post Graduate Studies, Lawspet, Puducherry-605 008
Emai: sudurm@gmail.com

ABSTRACT: Diabetes mellitus (DM) is the commonest endocrine disorder. The disease was well known to the ancient Indian medical experts. The modern pharmacopoeia contains many example of folk remedies which have led to the discovery of important therapies for a range of conditions. Traditional medicinal plants widely used and accounts for around 40 % of all health care delivered. In India indigenous medicines have been used in the treatment of DM since the time of Charaka and Sushruta (6th century BC). The main purpose of this research work is to document the anti-diabetic plants found in Puducherry. In this study the existing tradition of treating diabetes by 58 plants species, 52 genera comprise 36 families have been collected and summarized. The study reveals the persistence of folk medicine practices in Puducherry , especially in rural areas were people are still using indigenous traditional knowledge for health care, that are being influenced by cultural and socio-economical aspects, providing a cheaper and accessible alternative to the high cost pharmaceutical remedies. Present study does not prescribing any remedies for DM or any of the disease but the purpose is to document the use and draw the attention of pharmacologist, botanist, phytochemist and pharmocognosist for further scientific research in the field.
Key words: Flora, Antidiabetic plants, Puducherry

INTRODUCTION

Diabetes mellitus (DM) is the commonest endocrine disorder that affects more than 100 million people worldwide (6% of the population) and in the next 10 years it may affect about five times more people than it does now (WHO/Acadia, 1992; ADA, 1997). In India, the prevalence rate of diabetes is estimated to be 1-/5% (Patel *et al*., 1986; Verma *et al*., 1986; Rao *et al*., 1989). The disease was well known to the ancient Indian medical experts. All the renowned classic texts of Ayurveda like Charaka Samhita (1000 B.C.), Sushruta Samhita (600 B.C.) and subsequent works refer to this disease under the term *Madhumeha* or *Ikshumeha* (literally meaning sugar in the urine). In recent years, there is a revival of interest in the traditional system of medicine, where medicinal plants are a major source of biodynamic compound of therapeutic values. The traditional knowledge on medicinal plants is the main basis for biocultural and ecosystem conservation as well as further Pharmacological, Phytochemical, Toxicological and Ecological studies (Mohd Habibullah Khan *et al*., 2010). Traditional medicinal plants widely used and accounts for around 40 % of all health care delivered (Anonymous, 2002-2005).

Survey of Related Literature

Herbal medicines have good values in treatment in many countries, scientific investigation of medicinal plants have been initiated because of their potential (Patrick, 2002). Traditional medicine and ethnobotanical information play a vital role in scientific research (Awadh *et al*., 2004; Kala, 2005). In India indigenous medicines have been used in the treatment of DM since the time of Charaka and Sushruta (6th century BC) (Grover *et al*., 2001)

According to a WHO estimate, more than 80 % of the world population relies on traditional medicinal practise for primary health care needs (Malik et al., 1996). Over 75 % of the world population is depending on local health practioners and traditional medicines for their primary needs (Kattamani *et al*., 2000). Traditional ethonobotanical studies have in recent years received much attention due to their wide acceptability and clues for new or lesser – known medicinal plants (Tripathi, 2000). A number of reviews have been published in the last three decades on plants screened for hypoglycemic activity in India (Mukherjee *et al* ., 1966; Mehta 1982; Aiman, 1970; Chaudhury *et al* .,1970; Karnick,1972; Satyavati *et al*.,1976; Mukherjee,1981; Nagarajan *et al*., 1982; Satyavati,1984; Patnaik *et al* .,1986; Das *et al*., 1986; Satyavati *et al*., 1987; Sever, 1980; Handa *et al*.,1989; Atta ur-Rahman *et al* ., 1989; Singh *et al*., 1975 and Singhal *et al*., 1984) and els where(Sever, 1980; Handa *et a l*.,1989; Atta ur-Rahman *et al* ., 1989). Very recently, two exhaustive reviews have been published based on the global literature survey on 150 plants (Handa, 1989) and 343 plants (Atta ur-Rahman *et al*., 1989) in different part of the world. The main purpose of this research work is to document the anti-diabetic plants of Puducherry as the area is comprised of many medicinal floras.

Objectives of the Study

- To identify the flora of Anti-Diabetic potential plants in various part of Puducherry.
- To motivate the people to use the ethno medicinal plants of instead of allopathic medicine.
- To create the attention of pharmacologist, botanist, phytochemist and pharmocognosist for further scientific research in the field.

Methodology

Study Area

The geographic area of Puducherry is 49,300 ha. The Union Territory is scattered over four locations (Fig-1), each having the status of a district, Puducherry region and Karaikal region in Tamil Nadu,Yanam region in Andhra Pradesh and Mahe region in Kerala Fig-1. The present Study was conducted along the coastal habitats village of Puducherry is located on the Coromandal coast between 11° 52’ 56” and 11° 59’ 53” north and from 79° 45’ 00” to 79° 52’ 43” east. It is limited on the east by the Bay of Bengal and on the other three sides by the Cuddalore, and Villupuram districts, of Tamil Nadu state. The physiography map of the district present more or less a flat land elevated about 15 meters from the sea level and there are two main drainage basins, the Gingee river which crosses diagonally from northwest to the southeast and the other, Ponnaiyar which forms the southern border of the dis-trict. This two main d drainage basins, interspersed with lagoons, lakes and banks. The town limits of Puducherry are located on the east coast of peninsular at 162 km from the south of Chennai. The total area of Puducherry and its eleven enclaves is about 290 sq. km (Fig.2 & 3).

.

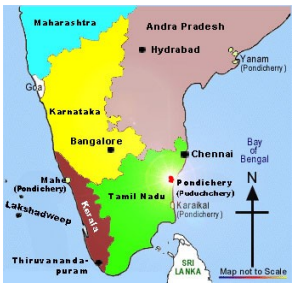

Fig-1 Map showing the Pondicherry region – South India

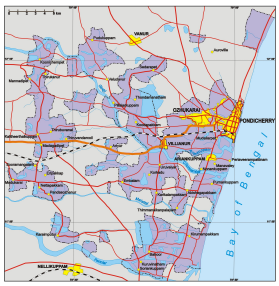

Fig-2 Map showing the Study area located in Pondicherry and its near area

Fig.3 Map showing the Satellite view of Puducherry Coromental Coast

Data collection

The survey of medicinal flora includes the investigation of species treating diabetes, their genera and families possessing medicinal properties. The ethonobotanical data were collected by the suggested methodology (Jain, 1964). Traditional botanical knowledge on plants and their therapeutic application to respective ailments were collected from ethnic group of local people. The data including local name, part used were collected interview, questionnaire, collecting sample and discussion were carried out in the field visit. For identification of the specimens collected from the study area, they were compared with specimens of herbarium, French Institute, Puducherry. Identification and Nomenclature of the specimen were made by the local flora such as " An Excursion flora of Central Tamil Nadu"(Methew, 1982), "Further Illustration on the flora of Tamil Nadu Carnatic" (Methew, 1988), "Flora of presidency of Madras"(Gamble & Fischer, 1915-1935, Vol 1-3) and " Flora of sacred groves of Puducherry Region- A Pictoral Guide (Ramanujam *et al*., 2007).

RESULT AND DISCUSSION

There are several plants which are used as traditional medicines for various disease but for treating diabetes there is a limited number of species, which have been identified and used either directly or with the combination of other species, for the treatment of diabetes mellitus in Puducherry and its nearby areas (Table- 1).

In this study the existing tradition of treating diabetes by 58 plants species, 52 genera comprise 36 families have been collected and summarized. The Plant includes *Abutilon indicum* (L.) Sweet, *Aegle marmelos* (Linn.) Corr. Serr, *Alternanthera sessilis* (L.) R.Br.ex DC, *Anacardium occidentale* L, *Andrographics paniculata* (Burm.f.), *Azadirachta indica* Adr. Juss, *Bacopa monnieri* (Linn.) Pennell, *Cassia fistula* L, *Catharanthus roseus* (Linn.) G. Don. (=Vinca rosea Linn.), *Cissampelos pareira* Linn, *Coccinia grandis* (Linn.) Voigt, *Cressa cretica* Linn, *Cucumis sativus* Linn, *Curcuma longa* Linn, *Ficus benghalensis* Linn, *Ficus racemosa* Linn, *Gmelina arborea* Roxb, *Gmelina asiatica* L, *Gymnema sylvestre* (Retz.) R. Br.ex Romer & Schultes, *Helicteres isora* Linn, *Hemidesmus indicus* (Linn/) R. Br, *Hybanthus enneaspermus* (Linn.), *Hydrophila auricilata* (Schum.) Heine, *Ichnocarpus frutescens* (Linn.) R. Br, *Jatropha indica* L, *Jatropha gossipiifolia* L, *Lawsonia inermis* Linn, *Luffa acutangula* Roxb, *Madhuca indica* Gmel, *Mangifera indica* L, *Momordica charantia* Linn, *Moringa oleifera* Lam, *Murraya koenigii* (Linn.) Sprengel., *Musa paradisiaca* L, *Nelumbo* nucifera Gaertner, *Ocimum sanctum* L, *Paspalum scrobiculatum* Linn, *Phyllanthus emblica* L, *Pistia stratiotes* Linn. var. cuneata, *Plumbago indica* Linn, *Pongamia pinnata* (L.) Pierre, *Portulaca quadrifida* Linn, *Pterocarpus marsupium* Roxb, *Psidium guagava* L, *Punica granatum* Linn, *Ricinus communis* L, *Sida acuta* Linn, *Sphaeranthus indicus* Linn, *Syzygium cumini* (Linn.) Skeels, *Terminalia bellirica* (Gaertner) Rorb, *Terminalia chebula* Retz, *Terminalia catappa* L, *Tinospora cordifolia* (Wild.) Hook.f.Thomson, *Tribulus terrestis* L, The similar investigation also carried out in the various parts of India and abroad (Grover *et al*., 2002; Satyavati *et al*., 1989; N'guessan et al., 2009; Jain *et al*., 2008; Mohd Habibullah Khan *et al*., 2010; Panta, 2010 and Sankitha *et al*., 2007).

Table: 1 List of anti-diabetic plants of Puducherry UT.

Sl.No	Name of the species	Family	Local Name	Therapeutic Uses
1	Abutilon indicum (L.) Sweet	Malvaceae	Thutthi	Leaf extract used for treating diabetes.
2	Aegle marmelos (Linn.) Corr. Serr.	Rutaceae	Vilvamaram	Tender leaf (10 mL) mixed with 2-3 drops of honey given twice daily (evening and morning) on empty stomach to reduce blood sugar within 3-4 weeks.
3	Alternanthera sessilis (L.) R.Br.ex DC.	Amaranthaceae	Ponnagkanni keerai	The whole plant of Alternanthera sessilis is used to treat diabetes.
4	Anacardium occidentale L.	Anacardiaceae	Munthiri	Leaf extract used for treating diabetes.
5	Andrographics paniculata (Burm.f.)	Acanthaceae	Periyanangai	About 10 mL of leaf/root deoction given once aday for six months against both hyperglycaemia and gastric disorder.
6	Azadirachta indica Adr. Juss,	Meliaceae	Veppa maram	Seven tender leaves of the plant are prescribed daily to the person suffering from diabetes. six seeds of the plant made into a paste with 50 ml rice wash and 5 mL of ghee should be given after meal in case of long standing diabetes
7	Bacopa monnieri (Linn.) Pennell	Scrophulariaceae	Neerpirambi	Leaf juice is used for treating diabetes.
8	Boehaavia diffusa Linn.	Nyctaginaceae	Sattaranai	The raw leaf juice (10 mL) is used to reduce sugar in urine. The patient is also advised to take the leaves and tender branch tips as vegetabels.
9	Butea monsperma (Lam.) Taub.	Fabaceae	Kattuthee	The leaf extract (10 mL) is administered once a day fro 5-10 days on empty stomach. This reduces blood sugar and is also useful in glycosuria
10	Carica papaya Linn.	Caricaceae	Pappali	Green fruits are boiled and made into a paste and given with a pinch of common salt and jeera powder (Cuminum cyminum) for six months to cured diabetes
11	Cassia auriculata Linn.	Caesalpiniaceae	Aavaram	Leaf juice (10 mL) mixed with 5g old jaggery given once daily for one month at early stage of the diabetes.
12	Cassia fistula L.	Caesalpinioideae	Sarakkodrai	Pod extract of the plant is used for treating diabetes.
13	Catharanthus roseus (Linn.) G. Don. (=Vinca rosea Linn.)	Apocynaceae	Nithitakalyani Sutukattumalli	Fresh twig with two leaf buds is given daily for 7 days on empty stomach. During this administration, eating sugar containing food stuffs is strictly prohibited.
14	Cissampelos pareira Linn.	Menispermaceae	Ponmucuttai	About 60 g of the rood is boiled in half a littre of water for 20-30 minutes in a closed vesseal. About 30-60mL of this preparation is given two or three times daily to correct the kidney disorder caused by diabetes.
15	Coccinia grandis (Linn.) Voigt.	Cucurbitaceae	Kovai	Decoction of the plant twig along with flowers and young fruits given once daily for seven days for the treatment of sugar complaints.
16	Cressa cretica Linn.	Convolvulaceae	Uppumarikolunthu	The infusion of the whole plant, sweetened with jaggery of weight caused by diabetes.
17	Cucumis sativus Linn.	Cucurbitaceae	Vellari	Seeds (2g) made into paste with liquorice (Glycyrrhiza glabra) is given daily for 15 days to reduce the sugar level in blood. Those who suffer from diabetes and those who want to lose weight should be advised to consume unripen fruits.
18	Curcuma longa Linn.	Zingiberaceae	Mancal	15-20 mL of fresh juice of the rhizome with equal amount of fresh juice of nelli (Phyllanthus emblica) given three times in a day for 15 days against glycosuria
19	Ficus benghalensis Linn.	Moraceae	Aalamaram	An infusion of the bark (10 g) mixed 5 g jaggery is an effective and specific medicine for diabetes. This should be given once daily for 10 15 days to reduce blood sugar. The laticiferous sap of this tree is also effective in controlling the diabetes. An increasing capacity of pancreatic cells.
20	Ficus racemosa Linn.	Moraceae	Vellai atthi	A paste (50g) made out of the boiled unripe fruit and equal quantity of fine rice, given with normal meal for 23 months to reduce the sugar level in urine.
21	Gmelina arborea Roxb.	Verbenaceae	Kumalan	Juice of the young leaves with 2-3 drops of honey given three times a day afer food for 10 days to rectify eye-sight during diabetes (i.e. diabetic retinopathy
22	Gmelina asiatica L.	Verbenaceae	Ummi thekku	Decoction of the Leaf extract used for treating diabetis
23	Gymnema sylvestre (Retz.) R. Br.ex Romer & Schultes.	Asclepiadaceae	Nilakkumala	Dried leaf powder (2-3g) is given with water. Seven fresh leaves are prescribed daily in the morning for 15 days
24	Helicteres isora Linn.	Sterculiaceae	Sirukurinja	One teaspoonful root/bark powder given once daily for 15 days early in the morning before breakfast to relieve sugar complaints.

25	Hemidesmus indicus (Linn/) R. Br.	Asclepiadaceae	Nannari	Powedered roots (5g) given 2-3 times a day in a cup of hot milk for one month to reduce sugar content in blood as well as urine. Young fruit (or) leaf juice given to the patient at least for six months.
26	Hybanthus enneaspermus (Linn.)	Violaceae	Orilai thamarai	20g of whole plant (including roots) ground with 3 black F.V Muell (=lonidium suffruticosum pepers (Piper nigrum) and the paste is given in the (L.) Ging.) morning on empty stomach for one month to relieve sugar complaints.
27	Hydrophila auricilata (Schum.) Heine	Acanthaceae	Neermulli	Leaf and stem extract used for treating diabetis.
28	Ichnocarpus frutescens (Linn.) R. Br.	Apocynaceae	Udarkodi	Fresh juice of leaf and fruit along with 2 black pepeer (Piper nigrum) given early in the morning on empty stomach to control increased sugar level.
29	Jatropha indica L.	Euphorbiaceae	Kattamanakku	Leaf extract used for treating diabetis
30	Jatropha gossipiifolia L.	Euphorbiaceae	Aadalai	Root barks extract used for treating diabetis.
31	Lawsonia inermis Linn.	Lythraceace	Muruthani	Decoction of equal quantity of flowers and seeds(25g)given once a day for 10-15 days to reduce the sugar level in urine.
32	Luffa acutangula Roxb.	Cucurbitaceae	Maruluvikam	Extract of the fruit skin (percarp) (10g) and roots (5g) administered once daily on empty stomach to reduce blood sugar.
33	Madhuca indica Gmel	Sapotaceae	Madhulai	The dried bark made into powder and the decoction is prepared from it, can be given 15g internally for diabetes mellitus for beneficial results.
34	Mangifera indica L.	Anacardiaceae	Mamaram	Leaf juice is taken in empty stomach for used for treating diabetis.
35	Momordica charantia Linn.	Cucurbitaceae	Pakal	Decoction of the fruits is given to the patients in the morning in empty stomach at least for one month. The patient is also advised at least for one month. The patient is also advised to take the fruit as vegetable in his/her daily diet. A mixture of Naval (Syzgium cumini), Sirukurinjan (Gymnema sylvestre), Vembu (Azadirachta indica) and Karavellam leaves (Acacia nilotica) in the ratio 1:1 : 1:2 is an effective remedy for diabetes.
36	Moringa oleifera Lam.	Moringaceae	Murungai	Fruit juice (15-20 mL) along with little old jaggery given once daily for 15 days. Patients are advised to take fruits and flower and leaves as vegetables in daily diet at least 15 days per year
37	Murraya koenigii (Linn.) Sprengel.	Rutaceae	Karuveppilai	Eating 7 fresh fully grown curry leaves every morning for three months is said to prevent diabetes due to heredity factors. It also cures diabetes due to obesity, as the leaves have weight reducing properties as the weight drops, the diabetic patients stop passing sugar in urine.
38	Musa paradisiaca L.	Musaceae	Vaazhai	Psuedo stem used for treating diabetis.
39	Nelumbo *nucifera* Gaertner.	Nelumbonaceae	Thamarai	Leaf and root extract used for treating diabetis.
40	Ocimum sanctum L.	Lamiaceae	Thulasi	1:1 ratio of thulasi and neem leafe paste is very effective for treating diabetis.
41	Paspalum scrobiculatum Linn.	Poaceae	Vapitam	Mature grains (10g) of this plant made into paste with the latex (1 mL) of Banyan prop roots (Ficus benghalensis) and adminstered once daily for 7 days to lessen excessive apetite during diabetes.
42	Phyllanthus emblica L.	Euphorbiaceae	Nellikai	5 g paste of fresh leaves given daily for one moth in empty stomach. Paste prepared from equal quantity of boiled fruits of this plant and the fruits of Thani (Terminalia bellirica) given with 50mL cow's milk twice daily one hour before food to rectify the problems of sugar related disease.
43	Pistia stratiotes Linn. var. cuneata	Araceae	Akayat-tamarai	The juice (10mL) of young plant mixed with equal amount of green coconut milk is given to reduce sugar content in blood. Periodic check of the patient is required.
44	Plumbago indica Linn.	Plumbaginaceae	Senkoduveri	Root extract (5 mL) with 5g of old jaggery given two times in a day for 5 days during excessive appetite related to diabetes.
45	Pongamia pinnata (L.) Pierre	Fabaceae	Pungam	Stem bark used for treating diabetis.
46	Portulaca quadrifida Linn.	Portulacaceae	Sirupasalai Tharaipasalai	A teaspoonful of seeds given every day with hot water for 2-3 months can increase the body's own insulin, which help in curing diabetes.
47	Pterocarpus marsupium Roxb.	Fabaceae	Vengai	Heart wood soaked overnight with water and filtrate (10mL) is given daily for one month. Seeds of this plant are also used for the same but found less efficient than the wood. Both bark and heart wood is effectively used for diabetes.
48	Psidium guagava L.	Myrtaceae	Koiyya	Leaf decoction used for treating diabetis.
49	Punica granatum Linn.	Punicaceae	Madhulam	Root bark and fruit rind ground in equal proportions and the paste (10g) given twice a day to check excessive urination i.e, polyrea due to the symptoms of diabetes.

50	Ricinus communis L.	Euphorbiaceae	Amanakku	Flower decoction used for treating diabetis.
51	Sida acuta Linn	Malvaceae	Karuncaranai	Root powder (2-3g) with one glass of milk given daily is effective within a short period. A periodic check may be undertaken for the level of sugar in blood for the patient.
52	Sphaeranthus indicus Linn	Asteraceae	Kottai karanthai	The whole plant is made into paste. About 15g of paste given with old jaggery twice a day for 3 days to check the excessive urination and to control the blood sugar.
53	Syzygium cumini (Linn.) Skeels.	Myrtaceae	Naval	About 10g of the leaves and (Sirukurinjan) Gymnema sylvestre in (1:1) ratio are boiled in 500mL of water till it reduces to about 50mL. The filtered extract is then given along with 5g of jaggery daily for two months. The fruit pulp (5g) or dried powder (1-2g) is given twice a day for 15 days. However, the seed powder (1-2g) given twice daily is more effective than the fruit. Periodic sugar level in blood to be checked.
54	Terminalia bellirica (Gaertner) Rorb.	Combretaceae	Thandi Thanai Semmaram	Fruit used for treating diabetis.
55	Terminalia chebula Retz.	Combretaceae	Katukkai	Fruit used for treating diabetis.
56	Terminalia catappa L.	Combretaceae	Nattuvatham	Leaf and Fruit used for treating diabetis.
57	Tinospora cordifolia (Wild.) Hook.f.Thomson	Menispermaceae	Seenthil	Delicate stem juice of 15-20mL with 2 drops of honey is given twice a day for 15 days. Stem powder (5g) of this plant and 2-3g of long pepper powder (Piper longum) are prescribed for 7 days for oral stomatites of diabetic patients and also expected to reduce sugar level in blood.
58.	Tribulus terrestris Linn.	Zygophyllaceae	Nerinji	Common on fallow lands of Lawspet near halipads andalso along the coastal regions of Pondicherry.

Conclusion

In conclusion, the results of my study demonstrated the persistence of folk medicine practices in Puducherry, especially in rural people are still dependent on indigenous knowledge for health care that are being influenced by culture and socioeconomic aspects, providing a cheaper and accessible alternative to the high cost pharmaceutical remedies. In spite of the overwhelming influence and our dependence on modern medicine and tremendous advances in synthetic drugs, many people still rely on herbal drugs the reason is that, if the herbal medicines are used properly they don't have any side effects. Hence, the survey need to be subjected to pharmacological studies in order to discover their true potential, as it is very difficult to judge the effectiveness of the herbal medicine. The main purpose is not to be prescribing any remedies for any of the disease but to be document the use and draw the attention of pharmacologist, botanist, phytochemist and pharmocognosist for further scientific research in the field.

Acknowledgement

The authors are sincerely thankful to Dr. O.P.Shyma, Director, Kanchi Mamunivar Centre for Post Graduate Studies, Lawspet, Puducherry, Dr.A.Pragasam, Head of Department of Plants Science and all the faculty of the department for exchanging their valuable intellectual guidance during the course of this research work.

REFERENCES

1. ADA, 1997. Clinical practice recommendation 1997, Screening for diabetes. Diabetes care 20(1), pp. 22-24.
2. Aiman, R. Recent research on indigenous antidiabetic medicinal plants — an overall; assessment. Indian J Physiol & Pharmacol 1970, 14 (2): 65.
3. Anonymous, traditional medicine strategy, WHO, 2002-2005, WHO/EDM/TRM/2002.1.
4. Atta-ur-Rahman and Khurshid Zaman.Medicinal plants with hypoglycemic activity. J Ethnopharmacol 1989, 26(2):1.
5. Atal, C.K. and Kapur, B.M. (Eds). Regional Research Laboratory, Jammu (India) 1982, p. 584.
6. Awadh A, Ali N, Al-rahwi IK and Lindequist U, Some medicinal plants used in Yemeni herbal to treat malaria, Afr J Traditional complement Alt Med, 1 (2004). pp. 72-76.
7. Chaudhury, R.R. and Vohora, S. B. Plants with possible hypoglycaemic activity in advances in Research in Indian Medicine, Udupa, K.N., Chaturvedi, G.N. and Tripathi, S.N. (Eds) Banaras Hindu University, Varanasi (India), 1970, pp. 57.
8. Das, P.K., Dasgupta, G. and Mishra, A.K. Clinical studies on Medicinal Plants of India in Current Research of Medicinal Plants in India. Dhawan, B.N. (Ed), INSA, New Delhi, 1986, pp. 72.

9. Gamble JS. 1915-1935. Flora of Presidancy of Madras. (Vol 1-3 by Fischer CFC) Bishen Singh Mahendra Pal Singh, Dehradune.
10. Grover JK, Yadav S, Vats V. Medicinal plants of India with anti-diabetic potential. Journal of Ethnopharmacology 81 (2002), pp. 81-100.
11. Handa, S.S., Chawla, A.S. and Maninder. Hypoglycemic plants—A review. Fitoterapia 1989, 60 (3): 195.
12. Jain DL., Baheti AM., Jain SR and Khandelwal. Use of medical plants among tribes in satputa region of Dhule and Jalgoon district of Maharastra- An Ethnobotanical servey. Indian journal of traditional knowledge, Vol.9 (1) 2010, pp.152-157.
13. Jain SK, The role of botanist in folklore research, Folklore, 5 (4) 1996, pp. 145-150.
14. Kala CP, Ethnomedicinal botany of the Apatani in the Eastern Himalayan region of India, *J Ethnobiol Ethnomed,* 1(11) 2005.
15. Grover, J.K., Vats, V. 2001. Shifting Paradigm ‘‘from conventional to alternate medicine.’’ An introduction on traditional Indian medicine, Asia Pacific Biotechnology News 5 (1), pp. 28-32.
16. Karnick, C. R. Some aspects of crude Indian drugs plants used in Ayurvedic system of medicine *(Madhumeha)* (Dia betes). Acta Phytother Amst 1972, 19: 141.
17. Kattamani KN., Munikrishnappa MP., Hussain SA and Reddy PN. Use of plants as medicine under semi arid tropical climate of Raichur district of North Karnataka, J Med Aromat Pl Sci, 22-23(2000) pp.406-410.
18. Malik JK, Thacker AM and Ahmed A, Ethnoveterinary medicine in western India, Ethnoveterinary Research and Devolopment, Edited by Mc Corkle C, (Intermediate Technology Publication, UK), 1996, pp.148.
19. Matthew KM. 1982. Illustration on the Flora of the Tamil Nadu Carnatic, The Rapinat Herbarium, St Joseph College, Tirutchirapalli, India, pp. 1027.
20. Matthew KM. 1982. Further Illustration on the Flora of the Tamil Nadu Carnatic, The Rapinat Herbarium, St Joseph College, Tirutchirapalli, India, pp. 915.
21. Mehta K.C. Indian herbal drugs in the treatment of diabetes. Current Med Pract 1982, 26 (10) : 305.
22. Mohd Habibullah Khan and Yadava PS, antidiabetic plants used in Thobal district of Manipur, Northeast India, indian journal of traditional knowledge, Vol.9(3), July 2002, pp.510-514.
23. Mukherjee, S.K. Indigenous drugs in Diabetes mellitus. J Diabetic Asso India 1981 21 (Suppl) : 97.
24. Mukherjee, S. K. and Mukherjee, S. Therapeutic advances in Diabetes mellitus through ages. J Res Indian Med 1966, 1 -0: 9.
25. Nagarajan, S., Jain, H.C. and Aulakh, G.S. Indigenous plants used in the control of Diabetes in 'Cultivation and Utilization of Medicinal Plants'.
26. N'guessan Koffi, Kouassi Konan Édouard and Kouadio Kouassi, Ethnobotanical Study of Plants Used to Treat Diabetes, in Traditional Medicine, by Abbey and Krobou People of Agboville. American Journal of Scientific Research, ISSN 1450-223X Issue 4 (2009), pp.45-58.
27. Panda T, Preliminary Study of Ethno-Medicinal Plants Used to Cure Different Diseases in Coastal District of Orissa, India. British Journal of Pharmacology and Toxicology 1(2): 67-71, 2010.
28. Patnaik, G.K. and Dhawan, B.N. Pharmacological studies on Indian Medicinal plants in Current Research on Medicinal Plants in India. Dhawan, B.N. (Ed), Indian National Science Academy, New Delhi, 1986, pp. 45.
29. Patrick OE, 2005. Herbal medicines: challenges, tropical J Pharmaceut Res, 1 (2), pp 53-54.
30. Patel, M., Jamrozik, K., Allen, O., Martin, F.I., Eng, J., Dean, B. 1986. A high prevalence of diabetes in a rural village in Papua New Guinea. Diabetes Research and Clinical Practice 2 (2), pp.97-103.

31. Phani Ratna Prasanth, G and Ashok Kumar D, Ethno-Medico Botany of medical plants for the treatment of Diabetic activity in Krishna district of Andhra Pradesh. International Journal of Pharmaceutical Research and Development, 2009, PUB/ART/ Vol.8.
32. Rao, P.V., Ushabala, P., Seshiah, V., Ahuja, M.M., Mather, H.M. 1989. The Eluru survey: prevalence of known diabetes in a rural Indian population. Diabetes Research and Clinical Practice 7 (1), pp.29-31.
33. Ramanujam MP., Ganesan T., Kadamban D., Kumaravelu G and Devaraj P. Flora of sacred groves of Puducherry Region-A Pictoral Guide, Forest Department , Puducherry, 2007. pp. 77-95.
34. Sankitha M and Kadavul K, Ethno botanical values and conservation of a few anti-diabetic plants of Puducherry. Nature environment and pollution technilogy, 2007, Vol. 6 (1), pp.91-96.
35. Singh, K.N., Chandra, V. and Barthwal, K.C. Hypoglycemic activity of *Acacia arabica, Acacia ben.hani* and *Acacia modesta* leguminous seed diets in normal young albino rats. Indian J Physiol Pharmacol 1975, 19 (3): 167.
36. Satyavati, G.V. Pharmacology of medicinal plants and other natural products in Current Research in Pharmacology in India (1975-1982), Das, P. K. and Dhawan, B.N. (Eds), Indian National Science Academy, New Delhi, 1984, p. 119.
37. Satyavati, G.V., Gupta, A.K., Tandon, N. Medicinal Plants of India Vol. 2, Indian Council of Medical Research, New Delhi, 1987.
38. Satyavati, G. V., Raina, M K. and Sharma, M. Medicinal Plants of India Vol. 1, Indian Council of Medical Research, 1976.
39. Satyavati GV., Tandon Neeraj and Sharma Madhu. Indigenous plants drugs for Diabetes Mellitus, Indian Council of Medical Research, New Delhi, Diabetes Bulleta October, 1989, 181 Q.
40. Singhal, P.C. and Joshi, L.D. Role of gum arabica and gum catechu in glycaemia and cholesterolemia. Curr Sci 1984, 53: 91.
41. Sever, B.O. Oral hypoglycemic plants in West Africa. J Ethnopharmacol 1980, 2: 109.
42. Tripathi YC, Ethnomedical treasure of tribal Rajasthan, J Non Timbet Forest Product, 7(1 / 2) (2000) pp.77-84.
43. Verma, N.P., Mehta, S.P., Madhu, S., Mather, H.M., Keen, H. 1986. Prevalence of known diabetes in an urban Indian environment: the Darya Ganj diabetes survey. British Medical Journal 293 (6544), pp.423-424.
44. WHO/Acadia, 1992. Rapport de la Journal International de, diabetes 14 October.