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Medicinal plants prospective with antidiabetic activity: A review

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Abstract
Medicinal plants have a vast potential in the treatment of various ailments due to the presence of therapeutically important Phytochemicals. The therapeutic value of Indian medicinal plants is known since the ancient ages. *Ayurveda*, the oldest system of medicine recommends use of remedies, mainly based on medicinal herbs, for the treatment of a variety of diseases in man and animals. The herbal remedies are economical and within the reach of common man. It has been pointed out that about three-fourths of world's population cannot afford the expensive products of western pharmaceuticals. Therefore, about 80 per cent of people living in developing countries are almost completely dependent on traditional means for their primary healthcare needs. The therapeutic value of Indian medicinal plants is well recognized and acknowledged all over the world. There has been an ever enhancing awareness globally to rely on natural remedies in place of the chemical drugs. More recently, the western multinational drug companies, taking leads from ayurveda and Indian folklore medicines, are diverting their R and D activities on Indian medicinal plants to find out the active principles, isolate and patent them. Diabetes is a serious metabolic disorder and several marketed medications are available to alleviate the symptoms of diabetes. However, these over the counter drugs are expensive and associated with several complications. Herbal medicines are gaining importance as they are cost-effective and also display improved therapeutic effects with lesser side effects. The present review includes the reports available on medicinal plants used for treating diabetes complications. The aim of the review is to categorize and summarize the available information on medicinal plants with anti-diabetic properties and suggesting outlooks for future research.

Keywords: Medicinal plants, phytochemical, antidiabetics, anti hyperglycemic

Introduction
Medicinal Plants are a source of large amount of drugs comprising to different groups such as antispasmodics, emetics, anti-cancer, antimicrobials, antidiabetic etc. A large number of the plants are claimed to possess the antibiotic properties in the traditional system and are also used extensively by the tribal people worldwide. It is now believed that nature has given the cure of every disease in one way or another. Plants have been known to relieve various diseases in Ayurveda. WHO has recently estimated that 80% of the populations of the developing countries rely on traditional medicine, mostly plant drugs, for their primary health care needs (Denoe and Bough, 1999) [4]. In India, the history of medicinal uses of plants dates back to 3500-1800 B.C. where in the Rig-Veda mentions a number of plants with different healing practices. A large part of the population depends even at the present time on the indigenous systems of medicine, ayurveda, Unani and Sidha.
Diabetes mellitus (DM) is a chronic endocrine disorder which is characterized by high blood glucose levels that can interfere with carbohydrate, protein, and fat metabolism **(**Bastaki 2005) [3]. It is caused due to the deficit production of insulin by the β-Langerhans islet cells of the pancreas or due to defective insulin uptake in the peripheral tissues (Al-Goblan *et al.* 2014). An increase in the blood glucose level immediately after a meal triggers the release of insulin hormone from the pancreas. Insulin stimulates the liver to metabolize glucose and also stimulates the fat and muscle cells to remove glucose from the blood which results in a drop of blood sugar level to normal levels. If a person is diabetic, the blood sugar level remains high due to nil or ineffective production of insulin by the pancreas (Dean and McEntyre 2004) [5]. India has more than 61 million people living with diabetes and hence is considered to be the "capital of diabetes". Effective treatment of diabetes and its associated complications still remains a major challenge for India due to several issues such as inadequate health care system, lack of proper facilities, etc. (Viswanathan and Rao 2013) [27]. Herbal formulations are favored over synthetic drugs to reduce the ill-effects of diabetes and its secondary complications due to lesser side effects and also being cost effective (Modak *et al.* 2007) [17].

The present review aims to summarize some of the important Indian medicinal plants with anti-diabetic activities.

Common phytochemicals found in plant containing potent anthelmintic activity.

a. Alkaloids
b. flavanoids
c. Triterpenoids
d. Phenols

Method of extraction of phytochemicals

The basic principle is to grind the plant material (dry or wet) finer, which increases the surface area for extraction thereby increasing the rate of extraction. Earlier studies reported that solvent to sample ratio of 10:1 (v/w) solvent to dry weight ratio has been used as ideal (Das *et al*,2010) [6].

Extraction procedures

A. Plant tissue homogenization

Plant tissue homogenization in solvent has been widely used by researchers. Dried or wet, fresh plant parts are grinded in a blender to fine particles, put in a certain quantity of solvent and shaken vigorously for 5 - 10 min or left for 24 h after which the extract is filtered. The filtrate then may be dried under reduced pressure and redissolved in the solvent to determine the concentration. Some researchers however centrifuged the filtrate for clarification of the extract (Das *et al*, 2010) [6].

B. Serial exhaustive extraction

It is another common method of extraction which involves involves successive extraction with solvents of increasing polarity from a non polar (hexane) to a more polar solvent (methanol) to ensure that a wide polarity range of compound could be extracted. Some researchers employ soxhlet extraction of dried plant material using organic solvent. This method cannot be used for thermo labile compounds as prolonged heating may lead to degradation of compounds (Das *et al*, 2010) [6].

C. Soxhlet extraction

Soxhlet extraction is only required where the desired compound has a limited solubility in a solvent, and the impurity is insoluble in that solvent. If the desired compound has a high solubility in a solvent then a simple filtration can be used to separate the compound from the insoluble substance. The advantage of this system is that instead of many portions of warm solvent being passed through the sample, just one batch of solvent is recycled. This method cannot be used for thermo labile compounds as prolonged heating may lead to degradation of compounds (Nikhal *et al*, 2010) [20].

D. Maceration

In maceration (for fluid extract), whole or coarsely powdered plant-drug is kept in contact with the solvent in a stoppered container for a defined period with frequent agitation until soluble matter is dissolved. This method is best suitable for use in case of the thermo labile drugs (Ncube *et al*, 2008) [19].

E. Decoction

This method is used for the extraction of the water soluble and heat stable constituents from crude drug by boiling it in water for 15 minutes, cooling, straining and passing sufficient cold water through the drug to produce the required volume (Remington, 2008) [23]

F. Infusion

It is a dilute solution of the readily soluble components of the crude drugs. Fresh infusions are prepared by macerating the solids for a short period of time with either cold or boiling water (Remington, 2008) [23].

G. Digestion

This is a kind of maceration in which gentle heat is applied during the maceration extraction process. It is used when moderately elevated temperature is not objectionable and the solvent efficiency of the menstrum is increased (Remington, 2008) [23].

I. Percolation

This is the procedure used most frequently to extract active ingredients in the preparation of tinctures and fluid extracts. A percolator (a narrow, cone-shaped vessel open at both ends) is generally used. The solid ingredients are moistened with an appropriate amount of the specified menstrum and allowed to stand for approximately 4 h in a well closed container, after which the mass is packed and the top of the percolator is closed. Additional menstrum is added to form a shallow layer above the mass, and the mixture is allowed to macerate in the closed percolator for 24 hr. The outlet of the percolator then is opened and the liquid contained therein is allowed to drip slowly. Additional menstrum is added as required, until the percolate measures about three-quarters of the required volume of the finished product. The marc is then pressed and the expressed liquid is added to the percolate. Sufficient menstrum is added to produce the required volume, and the mixed liquid is clarified by filtration or by standing followed by decanting (Handa, *et al*, 2008) [10]

J. Sonication

The procedure involves the use of ultrasound with frequencies ranging from 20 kHz to 2000 kHz; this increases the permeability of cell walls and produces cavitation. Although the process is useful in some cases, like extraction of rauwolfi a root, its large-scale application is limited due to the higher costs. One disadvantage of the procedure is the occasional but known deleterious effect of ultrasound energy (more than 20 kHz) on the active constituents of medicinal plants through formation of free radicals and consequently undesirable changes in the drug molecules (Handa,*et al*,2008) [10].

Table 1: Some of the common Medicinal plants having antidiabetic activity.

Medicinal Plants name	Parts used	Type of extract	Activity	References
Alangium lamarckii	Leaves	Alcoholic	Antidiabetic	Kumar R *et al.* 2012 [13]
Albizia odoratissima	Bark	Methanol	Antidiabetic	Kumar D *et al.* 2011 [14]
Berberis vulgaris	Root	Aqueous	Hypoglycaemic	Meliani *et al.* 2011 [15]
Brassssica juncea	seed	Aqueous	Hypoglycemic	Thirumalai *et al.* 2011 [26]
Catharanthus roseus	Leaf/flower	Methanol	Hypoglycemic	Ohadoma *et al.* 2011 [21]
Chaenomeles sinensis	Friuts	ethyl acetate	Antidiabetic	Sancheti *et al.* 2011 [24]

Costus speciosus	rhizome	hexane	Antidiabetic	Eliza *et al.* 2009 [7]
Marrubium vulgare	Aerial part	Methanol	hyperglycemic	Elberry *et al.* 2011 [8]
Ocimum sanctum	Aerial part	Hydroalcholic	Antidiabetic	Patil R *et al.* 2011 [22]
Piper betle	Leaf	Aqueous	Hypoglycemia	Khatun *et al.* 2016 [16]
Psidium guajava	Fruit	Ethanol	Antihyperglycemic	Huang *et al.* 2011 [11]
Syzygium cumuni	fruit	Methanolic	Antidiabetic	A Kumar *et al.* 2008 [2]
Semecarpus anacardium	Nut	Milk	Antidiabetic	H. Khan *et al.* 2012 [12]
Setaria italica	Seed	Aqueous	Antihyperglycemic	Sireesh Khan *et al.* 2011 [25]
Solanum torvum	Fruit	Methanol	Antihyperglycemic	Gandhi *et al.* 2011 [9]

Future prospects

- There is need to screening of medicinal plants with reference to the phytoconstituents on the basis of research problem in mankind and animals.
- The 80% population of developing countries depends upon herbal medicine so marketing is too good
- To explore indigenous Traditional knowledge through medicine plants needs government support and establishment of biotechnology industry for proper implementation of herbal medicine
- Need of establishment and implementation of policy frame work for the regulation and standardization of herbal medicines.

Conclusion

- Plant medicine are used as alternative methods to control diabetics condition
- Plant based antidiabetics are safe, economical, easily available in surrounding and it will be helpful us.
- It is eco-friendly and promotes biodiversity.

References

1. Al-Goblan AS, Al-Alfi MA, Khan MZ. Mechanism linking diabetes mellitus and obesity. Diabetes Metab Syndr Obes. 2014; 7:587-591.
2. Kumar A, Ilavarasan R, Jayachandran T, Deecaraman M, Aravindan P, Padmanabhan N *et al*. Anti-diabetic activity of Syzygium cumini and its isolated compound against streptozotocin-induced diabetic rats, Journal of Medicinal Plants Research. 2008; 2(9):246-249.
3. Bastaki S. Diabetes mellitus and its treatment. Int J Diabetes Metab. 2005; 13:111-134.
4. Danoe AR, Bogh HB. Use of herbal medicine against helminthes in livestock-renaissance of an old tradition. World Anim. Rev. 1999; 93:60- 67.
5. Dean L, McEntyre J. The genetic landscape of diabetes [Internet]. National Center for Biotechnology Information (US), Bethesda, 2004
6. Das K, Tiwari RKS, Shrivastava DK. Techniques for evaluation of medicinal plant products as antimicrobial agent: Current methods and future trends. Journal of Medicinal Plants Research. 2010; 4(2):104-111.
7. Eliza J, Diasy P, Ignacimuthu S, Duraipandiyan V. Antidiabetic and antilipidemic effect of eremanthin from *Costus speciosus* (Koen.) Sm., in STZ-induced diabetic rats. Chem Biol Interact. 2009; 182:67-72
8. Elberry AA, Harraz FM, Ghareib SA, Gabr SA, Nagy AA, Sattar EA. Methanolic extract of Marrubium vulgare ameliorates hyperglycemia and dyslipidemia in streptozotocin-induced diabetic rats. Int J Diabetes Mellitus, 2011
9. Gandhi GR, Ignacimuthu S, Paulraj MG, Sasikumar P. Antihyperglycemic activity and antidiabetic effect of methyl caffeate isolated from *Solanum torvum* Swartz. fruit in streptozotocin induced diabetic rats. Eur J Pharmacol. 2011; 670:623-631
10. Handa SS, Khanuja SPS, Longo G, Rakesh DD. Extraction Technologies for Medicinal and Aromatic Plants. International centre for science and high technology, Trieste, 2008, 21-25.
11. Huang CS, Yin MC, Chiu LC. Antihyperglycemic and antioxidative potential of Psidium guajava fruit in streptozotocin-induced diabetic rats. Food Chem Toxicol. 2011; 41:2189-2195
12. Hedayathullah Khan HB, Vinayagam KS, Palanivelu S, Panchanatham S. Anti-diabetic effect of *Semecarpus anacardium* Linn nut milk extract in a high fat diet STZinduced type 2 diabetic rat model. Comp Clin Pathol. 2012; 21(6):1395-1400.
13. Kumar R, Patel DK, Prasad SK, Laloo D, Krishnamurthy S, Hemalatha S. Type 2 antidiabetic activity of bergenin from the roots of *Caesalpinia digyna* Rottler. Fitoterpia. 2012; 83(2):395-401.
14. Kumar D, Kumar S, kohli S, Arya R, Gupta J. Antidaibetic activity of methanolic bark extract of *Albizia odoratissima* Benth in alloxan induced diabetic albino mice. Asian Pac J Trop Med. 2011; 4:900-903.
15. Meliani N, Amine Dib ME, Allali H, Tabti B. Hypoglycaemic effect of *Berberis vulgaris* L. in normal and streptozotocin induced diabetic rats. Asian Pac J Trop Biomed. 2011; 6:468-471.
16. Mst. Monira khatun, Md. Ashrafuzzaman Sapon, Md. Shamim Hossain, Md. Rezuanul Islam, Antidiabetic Activity of Piper Betle In Alloxan Induced Type 1 Diabetic Model Rats, International Journal of Pharmaceutical Sciences and Research. 2016; 7(2):675-680.
17. Modak M, Dixit P, Londhe J, Ghaskadbi S, Paul A, Devasagayam T. Indian herbs and herbal drugs used for the treatment of diabetes. J Clin Biochem Nutr. 2007; 40(3):163-173.
18. Nadkarni KM. Indian Materia Medica, Popular Prakashan Private Limited, Bombay, India, 1976; I:II.
19. Ncube NS, Afolayan AJ, Okoh AI. Assessment techniques of antimicrobial properties of natural compounds of plant origin: current methods and future trends. African Journal of Biotechnology. 2008; 7(12):1797-1806.
20. Nikhal SB, Dambe PA, Ghongade DB, Goupale DC. Hydroalcoholic extraction of *Mangifera indica* (leaves) by Soxhletion. International Journal of Pharmaceutical Sciences. 2010; 2(1):30-32.
21. Ohadoma SC, Michael HU. Effects of co-administration of methanol leaf extract of Catharanthus roseus on the hypoglycemic activity of metformin and glibenclamide in rats. Asian Pac J Trop Med, 2011, 475-477.
22. Patil R, Patil R, Ahirwar B, Ahirwar D. Isolation and characterization of anti-diabetic component (bioactivity guided fractionation) from *Ocimum sanctum* L. (Lamiaceae) aerial part. Asian Pac J Trop Med. 2011, 278-282.

23. Remington JP. Remington The science and practice of pharmacy, 21st edition, Lippincott Williams & Wilkins, 2008, 773-774.
24. Sancheti S, Sancheti S, Seo SY. Antidiabetic and antiacetylcholinesterase effects of ethyl acetate fraction of *Chaenomeles sinensis* (Thouin) Koehne fruits in streptozotocin-induced diabetic rats. Exp Toxicol Pathol, 2011; 65(1, 2):55-60.
25. Sireesh Y, Kasetti RB, Nabi SA, Swapna S, Apparao C. Antihyperglycemic and hypolipidemic activities of Setaria italica seeds in STZ diabetic rats. Pathophysiology. 2011; 18:159-164.
26. Thirumalai T, Therasa VS, Elumalai EK, David E. Hypoglycemic effect of *Brassica juncea* (seeds) on streptozotocin induced diabetic male albino rat. Asian Pac J Trop Biomed. 2011; 4:323-325
27. Viswanathan V, Rao VN. Problems associated with diabetes care in India. Diabetes Manag. 2013; 3(1):31-40.