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A REVIEW ON SOME MEDICINAL PLANT HAVING ANTIDIABETIC POTENTIAL

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ABSTRACT: Diabetes is a metabolic disorder of the endocrine system. The medicinal plant has used for the treatment of diabetes throughout the world. Several medicinal plants are known to treat diabetes, and they have no side effect. The medicinal plant performed a good clinical practice and is showing a bright future in the treatment of diabetes mellitus. Many studies have confirmed the benefits of the medicinal plant with a hypoglycemic effect in the management of diabetes mellitus. This present review evaluates the medicinal plant used for anti-diabetic activity. The present review profile gives information about the plant's scientific name, common name, family, and the part of the plant used to treat diabetes mellitus.

Keywords: Medicinal plant, Diabetic potential

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INTRODUCTION: Medicinal plant continues to be an important therapeutic aid for alleviating ailments of humankind. Over the last 2500 years, there has been a very strong traditional system of medicine such as Chinese, Ayurvedic, and the Unani, born and practiced more in the eastern continent. These traditions are still flourishing, since; approximately 80% of the people in the developing countries rely on these systems of medicine for their primary health care needs medicinal plants are good sources for new safe, biodegradable and renewable drugs [1].

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History of Use of Traditional Herbal Medicines: By definition, 'traditional' use of herbal medicines implies substantial historical use, and this is certainly true for many products that are available as 'traditional herb medicines.' In many developing countries, a large proportion of the population relies on traditional practitioners and their armamentarium of medicinal plants to meet healthcare needs. In Germany, for example, where herbal products are sold as 'phytomedicines,' they are subject to the same criteria for efficacy, safety, and quality as are other drug products [2].

The Role of Herbal Medicines in Traditional Healing: The pharmacological treatment of disease began long ago with the use of herbs [3]. Methods of folk healing throughout the world commonly used herbs as part of their tradition. Some of these traditions are briefly described below, providing some examples of the array of important healing

practices around the world that used herbs for this purpose.

Indian Traditional Medicine: Ayurveda is a medical system primarily practiced in India that has been known for nearly 5000 years. It includes diet and herbal remedies while emphasizing the body, mind, and spirit in disease prevention and treatment [4].

Japanese Traditional Medicine: Many herbal remedies found their way from China into the Japanese systems of traditional healing. Herbs native to Japan were classified in the first pharmacopeia of Japanese traditional medicine in the ninth century [5].

Traditional Chinese Medicine: Traditional Chinese medicine has been used by Chinese people from ancient times. Although animal and mineral materials have been used, the primary source of remedies is botanical. Of the more than 12 000 items used by traditional healers, about 500 are in common use. Traditional Chinese medicine is still in common use in China. More than half the population regularly uses traditional remedies, with the highest prevalence of use in rural areas. About 5000 traditional remedies are available in China; they account for approximately one-fifth of the entire Chinese pharmaceutical market [6].

History of Herbs in Medicine and Pharmacy: Herbs were our first source of medicine, and their use predates written history by several thousand years. No one knows when humans first used plants for medicine, but pollens of at least six medicinal plants were found in a Neanderthal burial site estimated to be at least 60,000 [7]. The early history of medicine parallels the history of herbal medicine: the first books written about medicine were also the first books written about herbs, including Chinese texts from 5000 yr ago, such as the famous herbal of the Yellow Emperor and the Egyptian text Ebers papyrus, written 3500 yr ago.

In Western medicine, the father of modern medicine, Theophrastus, is also the father of modern botany. Theophrastus published the first book describing plants in detail in 320 BC, which was also the first Western book about their medicinal uses. Herbal medicine has been at the heart of medicine in every culture in the world and at every time throughout history.

Today, according to the World Health Organization (WHO), more than 80% of the world's population relies on traditional medicines, mostly plant-based, as their main source of health care [8]. This figure includes not only the large populations of China and India and all of the less developed countries of the world but also many modern nations. Even in the United States, approx 25% of our prescription medicines are still extracted from plants or are synthetic copies of plant chemicals [8], and at least 57% of our top prescription medicines are derived in some way from plants, including semisynthetic, in which plant chemicals are used as building blocks for synthetic drugs [9].

Diabetes mellitus is a group of metabolic disorder characterized by hyperglycemia resulting from defects in insulin secretion, action, or both. It is made up of two types: Type I and type II. Type I diabetes often referred to as juvenile diabetes, is insulin dependent and known to affect only 5% of the diabetic population. Type II, which is non-insulin dependent, usually develops in adults over the age of 40. It has already been established that chronic hyperglycemia of diabetes is associated with long term damage, dysfunction, and eventually the failure of organs, especially the eyes, kidneys, nerves, heart, and blood vessels [10]. It is estimated that 25% of the world population is affected by this disease. Currently, available therapy for diabetes includes insulin and various oral hypoglycemic agents such as sulfonylureas, metformin, glucosidase inhibitors, troglitazone, *etc*. But these are reported to produce serious adverse side effects such as liver problems, lactic acidosis and diarrhea [11]. It is currently affecting around 143 million people [12,] and the number of those affected is increasing day by day, by 2030 it is predicted to reach 366 million populations worldwide [13].

According to the World Health Organization (WHO), about 65-80% of the world's population in developing countries depends essentially on plants and plant-derived compounds for their primary healthcare needs. According to the National Medicinal Board, Govt. of India, 17,000 to 18,000 number of species of flowering plants are estimated of which 6,000 to 7,000, species are found to have medicinal usage in folk and documented System of medicine like Ayurveda, Siddha, Unani, and Homeopathy [14].

Type of Diabetes:

- ✓ Type 1 (Insulin dependent diabetes mellitus).
- ✓ Type 2 (Non insulin dependent diabetes mellitus).
- ✓ Type 3 (Gestational diabetes, mellitus).

Type 1 (Insulin Dependent Diabetes Mellitus): It is also called as Insulin Dependent Diabetes Mellitus (IDDM). It is due to failure of the body for insulin production (International diabetes federation) [15].

It is often childhood disease, so it is also called as Juvenile onset diabetes mellitus.

Insulin Dependent Diabetes Mellitus (or Juvenile Onset Diabetes)

- ✓ A most common type of diabetes in children
- ✓ An autoimmune disorder in which the immune system attacks and destroys the part of the pancreas that makes insulin.
- ✓ Symptoms include increased thirst, increased urination, increased hunger, weight loss, fatigue,
- ✓ Abdominal pain.
- ✓ Requires daily insulin injections to control blood sugar.
- ✓ Can't be prevented (autoimmune disorder.)

TABLE 1: ANALYSIS OF REMEDIES OBTAINED FROM DIFFERENT PLANT PARTS FOR DIABETES MELLITUS

S. no.	Botanical name	Common name	Family	Active chemical constituents	Part used
1	*Acacia Arabica*	Indian gum	Fabaceae	Polyphenol, Tannin [7-12]	Seed, bark
2	*Aegle mamelos*	Golden Apple	Rutaceae	Aegeline 2, Coumarin, Flavonoid, Alkaloid [13-15]	Leaf, seed, Fruit
3	*Allium cepa*	Onion	Liliaceae	Allyl propyl disulfide, S- methyl cysteine sulphoxide [12,16, 17]	Bulb
4	*Aloe barbadensis*	Barbados Aloe	Asphodelaceae	Lophenol, 24-methyl-lophenol, 24-Ethyllophenol1 [8, 19]	Leaf
5	*Allium sativum* L.	Garlic	Alliaceae	Diallyl disulfide oxide, Ajoene, Allyl propyl disulfide, S-allyl cysteine, S-allyl mercaptocysteine [20-22]	Root
6	*Azadirachta indica*	Neem	Meliaceae	Nimbidine [11, 12, 23]	Leaf, seed
7	*A. heterophyllus*	Jackfruit	Moraceae	Sapogenin [11, 12, 24, 25]	Sapogenin
8	*Aloe vera*	Barbados aloe	Liliaceae	Pseudoprototinosaponin, Prototinosaponin [18, 25, 26]	Leaf
9	*Annona Sqamosa*		Annonaceae [26-29]		fruit peel
10	*A. sphaerocephala*	Wormwood	Asteraceae	Polysaccharide [11, 12, 30, 31]	Fruit
11	*Abelmoschus esculentus*	Gumbo	Malvaceae	Carbohydrate, Gum, Mucilage, Protein, Phytosterol, Flavonoid, Tannin, Phenolics, Volatile oil [11]	Fruit
12	*Abrus precatorius* L.	Jequirity	Fabaceae [32, 33]		Seed
13	*Abutilon crispum* (L.)	Nela benda	Malvaceae [34]		Leaf
14	*Butea monosperma*	Bastard teak	Fabaceae	Butein, Palasonin, Stigmasterol-3 *β*-D-glucopyranoside [11]	Fruit
15	*Beta vulgaris*	Beetroot	Chenopodiaceae	Sugar beet pectin, Polydextrose [12, 35]	Whole plant
16	*Biophytu. Sensitivum*	Sikerpud	Oxalidaceae [12, 26, 36]	-	Whole plant
17	*Brassica juncea*	Mustard	Brassicaceae	Isorhamnetin diglucoside [37]	Seed, Leaf
18	Brassica nigra L	Black mustard	Cruciferae [38]		Whole plant
19	*Bauhinia acuminata*	White kachnar	Caesalpiniaceae [39]		Leaf
20	*Boerhaavia diffusa* L.	Tar vine	Nyctaginaceae [38]		Leaf
21	*Bridelia ferruginea*	Balli chettu	Phyllanthaceae [40]		Leaf, fruit, stem bark, roots
22	*Carica papaya*	Papaya	Caricaceae	Saponin, Tannin, Alkaloid, Flavonoid [11]	Fruit
23	*Coccinia*	Ivy-gourd	Cucurbitaceae	B-amyrin, Lupeol, Cucurbitacin B [11, 12,	Fruit

	indica			[41]	
24	*Curcuma longa*	Turmeric	Zingiberaceae	Curcuminoid [12]	Root
25	*Cuminum cyminum*	Cumin seed	Apiaceae	Aldehyde [12, 42]	Seed
26	*C. sativum*	Coriander	Apiaceae	Alanine [12, 42]	Leaf
27	*C. zeylanicum*	Cinnamon	Lauraceae	Cinnamaldehyde [11, 12]	Leaf, Bark
28	*Catharanthus Roseus*	Red periwinkle	Apocynaceae	Vinculin, Alkaloid [12]	Whole plant
29	*Capsicum frutescens*	Chilli	Solanaceae	Capsaicin [43]	Fruit
30	*Diospyros lotus*	Date plum	Ebenaceae	Phenolics [11]	Fruit
31	Datura stramonium	Thorn apple	Solanaceae [33]		Seed
32	*Emblica officinalis*	Amla	Euphorbiaceae	Tannoid [11, 12]	Fruit
33	*Eucalyptus globules*	Blue gum	Myrtaceae	Calytoside [11, 12, 44]	Leaf
34	*Erythrina variegate*	Sunshine tree	Fabaceae		Root
35	*Ficus bengalensis*	Banyan tree	Moraceae	Leucopelargonidin [11, 12, 46]	Bark
36	*Ficus carica*	Anjir	Moraceae	Invert sugar [11, 12, 46]	Leaf, fruit
37	*Gymnema sylvestre*	Sugar Destroyer	Asclepiadaceae	Gymnemic acid, Gymnema, Saponin [47, 12]	Leaf
38	*Grifola frondosa*	Maitake	Meripilaceae	Disaccharide [11]	Fruit
39	*Glycine max*	Soya beans	Fabaceae	3-O-methyl-D-chiro-inositol [9-12]	Seed
40	*H. auriculata*	Talmakhana	Acanthaceae [12]	-	Whole plant
41	*Helicteres isora*	East Indian screw tree	Sterculiaceae	Steroid, Terpenoid, Alkaloid, Carbohydrate, Phenolics [11]	Fruit
42	*Ibervillea sonorae*	Huereque	Cucurbitaceae	Monoglyceride (MG), Fatty acid [41, 11, 12]	Root
43	*Ipomoea batatas*	Sweet potato	Convolvulaceae [48]		Leaf
44	*Justicia glacua*	Water-willow	Acanthaceae [49]		Plant
45	*Jatropha curcas*	Barbados nut	Euphorbiaceae	Tannin [11, 12, 49]	Whole plant
46	*Lyophyllum decastes*	*Lyophyllum Decastes*	Lyophyllaceae	Polysaccharide [11]	Fruit
47	*L. sechellarum*	Sea coconut	Palmae	Carbohydrate [11]	Fruit
48	*Lycium barbarum*	Chirchita	Solanaceae	Polysaccharide [50, 51]	Fruit
49	*Limonia acidissima*	Wood apple	Rutaceae	Polysaccharide [11, 12]	Fruit
50	*Momordica charantia*	Bitter melon	Cucurbitaceae	Charantin, Momordicin, Galactose binding, Lectin, Non-bitter, Diosgenin, Cholesterol, lanosterol, *β*-sitosterol, Cucurbitacin glycoside [52, 53, 11, 12]	Whole plant
51	*Mentha piperita*	Peppermint	Lamiaceae	Essential oil, Terpen, Flavonoid. Vanadium, Zinc, Chromium, Copper, Iron, Potassium, Sodium, Nickel [54, 12]	Leaf
52	*Mangifera indica*	Mango tree	Anacardiaceae	Mangiferin, Phenolics, Flavonoid [55, 11, 12]	Leaf, stem Bark, fruit
53	*Musa paradisiaca*	Banana	Musaceae	Dietary fibre, Pectin [11, 12]	Fruit
54	*Musa sapientum*	Sweet banana	Musaceae	Flavonoid, Steroid, Glycoside [56]	Flower
55	*Nigella sativa*	Roman Coriander	Ranunculaceae	Thymoquinone [57, 12]	Whole plant
56	*Opuntia dillenii*	Prickly pear	Cactaceae	Polysaccharide [12]	Fruit
57	*Ocimum sanctum*	Holy basil	Lamiaceae	Eugenol (1-hydroxy-2-methoxy-4- 26] Allylbenzene [58, 12]	Leaf
58	*Physalis alkekengi*	Strawberry Tomato	Solanaceae	Polysaccharide [11, 12]	
59	*Persea americana*	Avocado	Lauraceae	Fat, Protein, Vitamin, Mineral [11, 12]	Fruit
60	*Psidium guajava*	Guava	Myrtaceae	Terpen, Flavonoid, Strictinin,	Leaf,

				Isostrictinin, Pedunculagin, Polysaccharide [59]	Fruit
61	*Phyllanthus emblica; P. Acidus*	Indian gooseberry	Euphorbiaceae	Tannin [11, 12]	Fruit
62	*Piper betle*	Pan	Piperaceae [60]		Leaf
63	*Piper longum*		Piperaceae [11, 60, 12]		Root
64	*Punica granatum*	Pomegranate	Punicaceae	Tannin [12]	Fruit
65	*Panax ginseng*	Ginseng	Araliaceae	Saponin [12]	Fruit
66	*Rhus coriaria*	Sicilian Sumac	Anacardiaceae	Limonene, Nonanal, Dec-2 (Z)-enal [11, 12]	Fruit
67	*Thespesia populnea*	Portia tree	Malvaceae	Populnetin, Herbacetin, Populneol, Quercetin [12]	Fruit
68	*Terminalia chebula*	Chebulic myrobalan	Combretaceae	Shikimic, Gallic, Triacontanoic, Palmitic acid, *β*-sitosterol, Daucosterol[61, 12]	Stem bark
69	*Terminalia Catappa*	Indian almond	Combretaceae	Petroleum ether, Methanolic, Aqueous [11, 12, 61]	Fruit
70	*Turnera diffusa*	Damiana	Turneraceae	Flavonoid, Terpen [12]	Leaf
71	*Tamarindus indica*	Tatul tree	Fabaceae	Flavonoid, Polysaccharide [10, 11, 12]	Seed, Fruit
72	*Triticum vulgare*	Wheat	Poaceae	Albumin [11,12]	Whole plant
73	*V. angustifolium*	Wild blueberry	Ericaceae	Phenolic [10, 11, 12]	Fruit
74	*Viburnum opulus*	Cranberry bush	Caprifoliaceae	Tannin [11, 12]	Fruit
75	*V. myrtillus*	Bilberry	Ericaceae	Anthocyanoside [10, 11, 12]	Leaf, Fruit
76	*W. somnifera*	Winter cherry	Solanaceae	Withanolide, Alkaloid [62, 10, 11]	Leaf
77	*Withania coagulans*	Vegetable Rennet	Solanaceae	Milk-coagulating enzyme, Esterase, Fatty oil, Essential oil, Alkaloid [62, 10, 11]	Fruit
78	*Xanthocercis zambesiaca*	Nyala tree	Fabaceae	Fagomine, 4-O-beta-Dglucopyranosylfagomine, Castanospermine [7, 9, 10]	Leaf
79	*Zingiber officinale*	Ginger	Zingiberaceae	Gingerol, Ethanol [63, 12]	Bulb
80	*Ziziphus spinachristi*	Christ thorn	Rhamnaceae	Christinin-A, Fatty acid [64, 65]	Leaf

DISCUSSION: Diabetes mellitus is spreading alarmingly throughout the world and three fourths of the world populations and considered as a major cause of high economic loss which can, in turn, impede the development of nations. Moreover, uncontrolled diabetes leads to many chronic complications such as blindness, heart disease, and renal failure, *etc*. Diabetes is increasing day – by – day, presently, insulin is the only drug before ailing patients. However, some crude drug of herbal origin is in use of the market. The promising crude drug must be analyzed in clinically manifested hyperglycemia in the wake of a thorough investigation of ethnomedicinal anti-diabetic herbs.

The study revealed that 80 plant species belonging to 49 families were generally used for the treatment of diabetes. The majority of the experiments confirmed the benefits of medicinal plants with hypoglycemic effects in the management of diabetes mellitus. Among the plants used for diabetes, *Annona squamosa*, *Momordica charantia*, *Egyptian Morus alba*, *Lycium barbarum*, *Allium sativum*, and *Aegle marmelose* seems to be most common plants used to treat diabetes and are available everywhere. The most commonly involved active constituents are flavonoid, tannin, phenolics, and alkaloid. Numerous mechanisms of actions have been proposed for these plant extracts. Some hypotheses relate to their effects on the activity of pancreatic *β*-cells (synthesis, release) or the increase of the insulin sensitivity or the insulin-like activity of the plant extracts. All of these actions may be responsible for the reduction or abolition of diabetic complications.

CONCLUSION: Long before the use of insulin became common; indigenous remedies were used for the treatment of diabetes mellitus. There has been an increasing demand from patients for the use of natural products with antidiabetic activity. This is largely because insulin cannot be used orally and insulin injections are associated with the risk of hypoglycemia and impairment of hepatic

and other body functions. The undesirable side effects and contraindications of synthetic drugs and the fact that they are not suitable for the use during pregnancy have made scientists look towards hypoglycaemic agents of plant origin.

The present review has presented comprehensive details of anti-diabetic plants used in the treatment of diabetes mellitus. Some of these plant-derived medicines, however, offer the potential for cost-effective management of diabetes through dietary interventions, nutrient supplementation, and combination therapies with synthetic drugs in the short term, and as the sole medication from natural sources over the long term. The presences of bioactive chemicals are mainly responsible for this anti-diabetic action.

However, many other active agents obtained from plants have not been well characterized. More investigations must be carried out to evaluate the mechanism of action of medicinal plants with an anti-diabetic effect.

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