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An Analysis on Indian Traditional Herbal Medicines Used For the Treatment of Diabetes

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Abstract – Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia, hypertriglyceridemia and hypercholesterolemia resulting from defects in insulin secretion or action or both. There are lots of chemical agents available to treat diabetic but total recovery from diabetes has not been reported till date. Alternative to these synthetic agents, plant provides a potential source of hypoglycemic drugs which are widely used in several traditional systems of medicines to prevent diabetes. This review mainly deals with diabetes, plants used as antidiuretics in various traditional systems of medicines and few examples of traditional herbal antidiuretic formulations available in the present market.

In the last few years there has been an exponential growth in the field of herbal medicine and these drugs are gaining popularity both in developing and developed countries because of their natural origin and less side effects. Many traditional medicines in use are derived from medicinal plants, minerals and organic matter .The World Health Organization (WHO) has listed 21,000 plants, which are used for medicinal purposes around the world. Among these 2500 species are in India, out of which 150 species are used commercially on a fairly large scale. India is the largest producer of medicinal herbs and is called as botanical garden of the world.

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INTRODUCTION:-

In recent years, there has been renewed interest in the treatment against different diseases using herbal drugs as they are generally non-toxic and World Health Organization has also recommended the evaluation of the effectiveness of plants in condition where we lack safe modern drugs. Plant derivatives with hypoglycemic properties have been used in folk medicine and traditional healing systems around the world (Yeh et al., 2003) from very ancient time. Despite the introduction of hypoglycemic agents from natural and synthetic sources, diabetes and its secondary complications continue to be a major medical problem to people (Ravi et al., 2005). Medicinal plants used to treat hypoglycemic and hyperglycemic conditions are of considerable interest to ethno botanical community as they are recognized to contain valuable medicinal properties in different parts of the plant.

In traditional medicine diabetes mellitus is treated with diet, physical exercise and medicinal plants, even though, more than 1200 plants are used around the world in the control of diabetes mellitus and approximately 30% of the traditionally used antidiuretic plants were pharmacologically and chemically investigated (Alarcon-Aguilar et al., 2002). On the other hand, potential hypoglycemic agents have also been detected for more than 100 plants used in antidiuretic therapy. Traditional treatments may provide the valuable clues for the development of new oral hypoglycemic agents and simple dietary adjuncts.

More than 100 medicinal plants are mentioned in the Indian system of medicines including folk medicines for the management of diabetes, which are effective either separately or in combinations (Kar et al, 2003).

As per the ethno botanical literature on traditional phytotherapy of Indian medicinal plants, the species like *Asparagus racemosus*, *Butea monosperma*, *Cathanranthus roseus*, *Coccinia indica*, *Gymnema sylvestre*, *Syzygium cumini* and *Momordica charantia* are consistently used by the tribal communities for the treatment of diabetes as well as in modern medicine.

There are many traditional systems of medicine in the world, each with different associated philosophies and cultural origins. Some of these, such as Tibetan traditional medicine, remain relatively localized in their country of origin; while others such as Ayurvedic

and Chinese traditional medicines are increasingly used in many different areas of the world. This paper will concentrate on the issue treatment of chronic diseases and heavy metal poisoning related to herbal traditional medicines. Ayurveda is the most widely practised of the Indian traditional medicine systems, but there are others such as Siddha and Unani which are also used in the Indian subcontinent.

Anti-diabetic - Diabetes mellitus is a clinical syndrome characterized by inappropriate hyperglycemia caused diseases in many countries. by a relative or absolute deficiency of insulin or by a resistance to the action of insulin at the cellular level. Plant materials which are being used as traditional medicine for the treatment of diabetes are considered one of the good sources for a new drug or a lead to make a new drug. Plant extract or different folk plant preparations are being prescribed by the traditional practioners and also accepted by the users for diabetes like for any other

Table 1 : List of plants have Anti-diabetic activity.

S. No.	Common name	Botanical Name	Part Used	Family	Uses
1	Methi	*Trigonella foenum-gracecum*	Seeds	Fabaceae	Antidiabetic
2	fern	*Nephoelepsis tuberosa*	bulb	Oleandraceae	Antidiabetic
3	keukand	*Costus specious*	rhizome	Costaceae	Antidiabetic
4	Indian wheat	*Plantago ovata*	husk	Plantaginaceae	Antidiabetic
5	garlic	*Allium sativum*	bulb	Alliaceae	Antidiabetic
6	Indian Sarsaparilla	*Hemidesmus indicus*	root	Asclepiadaceae	Antidiabetic
7	onion	*Allium cepa*	bulb	Liliaceae	Antidiabetic
8	Pinyn	*Acontium carmichaeii*	Root	Ranunculaceae	Antidiabetic
9	Chilli pepper	*Capsicum annum*	Fruit	Solanaceae	Antidiabetic
10	goat's rue	*Galega officinalis*	Seed	Fabaceae	Antidiabetic
11	lingzhi mushroom	*Gandoderma lucidium*	Fruit	Ganodermataceae	Antidiabetic
12	Sea pea	*Lathyrus japonica*	Seed	Fabaceae	Antidiabetic
13	Rice	*Oriza sativum*	Root	Poaceae	Antidiabetic
14	Guduchi	*Tinospora cardifolia*	Plant	Menispermaceae	Antidiabetic
15	bitter gourd	*Momordica charantia*	fruit	Cucurbitaceae	Antidiabetic
16	Indian Kino Tree	*Pterocarpus marsupium*	bark	Fabaceae	Antidiabetic
17	ginger	*Zingiber officinale*	rhizome	Zingiberaceae	Antidiabetic
18	Gowar plant	*Cyamospsis tetragonolobus*	Fruit	Fabaceae	Antidiabetic
19	phalsa	*Grewia asiatica*	Fruit	Malvaceae	Antidiabetic
20	Indian Gum Arabic	*Acacia arabica*	seeds	Leguminosae	Antidiabetic
21	Holy Fruit Tree	*Aegle marmelos*	Root bark	Rutaceae	Antidiabetic
22	Aloe	*Aloe vera*	Leaf pulp extract	Aloaceae	Antidiabetic
23	Davana	*Artemisia pallens*	aerial parts	Compositae	Antidiabetic
24	Sugar apple	*Annona squamosa*	leaf extract	Annonaceae	Antidiabetic
25	King of Bitter	*Andrographis paniculata*	plant extract	Acanthaceae	Antidiabetic
26	Neem	*Azadirachta indica*	plant extract	Meliaceae	Antidiabetic
27	Life Plant	*Biophytum sensitivum*	plant leaf extract	Oxalidaceae	Antidiabetic
28	Tar vine	*Boerhavia diffusa*	aqueous leaf extract	Nyctaginaceae	Antidiabetic
29	Tanner's Cassia	*Cassia auriculata*	flower extract	Leguminosae	Antidiabetic
30	Ivy gourd	*Coccinia indica*	Leaf extract	Cucurbitaceae	Antidiabetic
31	Carilla Fruit	*Casearia esculenta*	Root extract	Flacourtiaceae	Antidiabetic
32	Madagascarperi winkle	*Catharanthus roseus*	leaf extract	Apocynaceae	Antidiabetic
33	Green tea	*Camellia sinensis*	leaf extract	Theaceae	Antidiabetic
34	Indian black berry	*Eugenia jambolana*	pulp extract of the fruits,	Myrtaceae	Antidiabetic
35	Mango	*Mangifera indica*	leaf extract	Anacardiacea	Antidiabetic
36	Holy Basil	*Ocimum sanctum*	leaf extract	Lamiaceae	Antidiabetic
37	Pomegranate	*Punica granatum*	Flower extract	Punicaceae	Antidiabetic
38	Indian Gentian	*Swertia chirayita*	Plant extract	Gentianaceae	Antidiabetic

To rescue humanity from the clutches of diseases is a duty revered and vital from the time immemorial. Plants are employed in treatment or as a remedial effect. As the man began to obtain closure acquaintance with his environment, he began to know more about plants. Plants are the oldest medicine known to mankind. These had been used by all cultures throughout history but India has one of the oldest, wealthiest and most diverse cultural living traditions associated with the use of herbal plants. Since the time of Charaka and Susruta numerous plants in diverse formulations have been used in various diseases. Plants have formed the basis of refined traditional medicine systems that have been in existence for thousands of year and continue to provide mankind with new remedies.

Natural products and their derivatives represent more than 50% of all drugs in clinical used in the world. It is also fact that one quarter of all medicinal prescriptions are formulations based on substances resulting from plants or plant derived synthetic analogs. According to WHO, 80% of the population rely on plants derived medicine for their health care. Natural remedies from plants are considered to be effective and risk-free.

DIABETES MELLITUS AND INSULIN

The carbohydrates we take as food is simplified to glucose molecules by various metabolic functions. This molecule serves as the source for energy or ATP production in the body required for vital functions. Insulin is a natural hormone secreted from the β- cells of pancreas which helps the cells to uptake glucose molecules from the blood stream. Hence deficiency of insulin results in the failure of glucose utilization by the cells and leading to its increased concentration in blood stream. This condition is known as diabetes.

Insulin affects the metabolism of carbohydrate, fat, proteins and ion flux by attaching to the specific insulin receptor on the cell surface. This hormone interaction is irreversible and the insulin molecule remains chemically unaltered during this contact. The hormone receptor complex is then taken inside the cell by an endocytic mechanism and metabolised to free the insulin molecule to the membrane for re-use .The glucose molecules are then oxidised to produce ATP or energy molecules. Insulin resistance is caused by the cell membrane. The excess of sugar or glucose in blood is excreted by kidney in urine.

ROLE OF HERBAL PLANTS IN DIABETES

It is estimated that more than 200 species of plants exhibit anti-diabetic properties. Plants keep on playing a vital role in the treatment of diabetes. There is increase demand in industry to use substitute approaches to treat diabetes, such as plant-based medicines, is also due to the side effects related with the use of insulin and oral hypoglycaemic agents. On the other hand therapeutic properties of herbal plants in dissimilar diseases had been mentioned in Rigveda and later in Atharva Veda (1200 B.C.). The medicinal plants were regrouped and Nagarjuna while expurgation Susruta Samhita mentioned the existence of active pharmacological materials in bark, leaf, flower, fruit, rhizome etc. Spaced out from the above leads, the wealth of herbal plants in diseases was obtained from Ayurved, Unani, Sidha, Ethno medicine and Folklore. Many traditional medicines in use are obtained from medicinal plants, minerals and natural matter. The World Health Organization (WHO) has listed 21,000 plants, which are used for medicinal purposes around the globe. More than 400 herbal plants with glucose-lowering likely are known. Herbal plants have been used for several years by different cultures in the region of the world for the cure of diabetes. Herbal plants continue to play an important role in diabetes, particularly in developing countries where most people have inadequate resources. Synthetic hypoglycemic agents in existing use for the treatment of diabetes generate staid side effects. Traditional medicinal plants have the advantage of having little or no side effect.

Some medicinal plants traditionally used for treatment and management of diabetes -

1. *Acacia catechu* (Mimosaceae) - It commonly known as Khair in Hindi and Nalla Sandra in Telgu. It is mainly distributed in India, Pakistan, Nepal and China. The bark and heartwood of the plant mainly used for the treatment of diabetes.

2. *Alpinia galangal* (L). Sw. (Zingiberaceae) - It commonly known as Bara kalisan in Hindi and Dumparastramu in Telgu. The plant is mainly distributed in India in Assam, Meghalaya and Tamil Naidu. Rhizomes of the species mainly used in treatment of diabetes.

3. *Cassia auriculata Linn.*(Caesalpiniaceae) - It commonly known as Mature tea tree in English; Tarwar in Hindi and Awal in Gujrati. It is mainly distributed in Central Provinces, Western Coast, South India and Ceylon. The flower buds of the plant mainly used in the treatment of diabetes.

4. *Cassia glauca Lam* (Caesalpiniaceae) - The plant is commonly known as Kondatantemu in Telgu, Kovalai in Tamil and Vellatakara in Marathi. It is mainly distributed throughout the India and in Tropical Asia and Australia. The bark and leaves of the plant prescribed in diabetes.

5. *Eugenia jambolana Lam* (Myrtaceae) - The plant is known as Nilaprala in Sanskrit: Jambul in English; Jambuda in Gujrati. It is mainly distributed throughout the plains from the Himalayas to South India. Juice of the fruit is used as antidiabetic.

6. *Ficus bengalensis* (Moraceae) - The common names of plant is Vata in Sanskrit and Vada in Hindi. It is mainly found in lower Himalayas region. Infusion of the bark reducing the blood sugar level.

7. *Ficus glomerata* (Moraceae) - It is commonly known as Udumbara in Sanskrit and Gular in Hindi. The plant is mainly found in all parts of India. Fruit and sap extracted from the trunk of the tree efficacious in diabetes.

8. *Gymnema sylvestre* (Asclepiadaceae) - It is commonly known as Dhuleti in Gujrati and Maehasing in Hindi. It is mainly distributed in Tropical region of Africa and Asia. Leaves of the plant mainly used in diabetes.

9. *Musa sapientum* (Musaceae) - It is commonly known as Vana laxmi in Sanskrit and Kela in Hindi. The plant is mainly cultivated throughout the India. Unripe fruit used as vegetable for diabetes.

10. *Psidium guyava* (Myrtaceae) - It is commonly known as Perala in Sanskrit; Amrut in Hindi. It is mainly cultivated nearly all over India and common in Bengal. Water in which fruit is soaked is good for thirst in diabetes.

DIABETES CARE AND MEDICATIONS

As diabetes is not completely curable it needs a life time commitment to do what is necessary to control diabetes. With proper management it can be controlled to a greater extent. All of these factors are interconnected. And in the case of Type-2 diabetes, it can be totally controlled in some cases with diet and exercise**.** Daily monitoring of blood glucose level with a glucometer.

- Insulin injections and other medications to be taken as directed.
- Managing of diet and weight control.
- Managing a daily exercise plan.
- Daily monitoring and managing of skin and foot care.
- Daily oral hygiene.
- Regular visits to the eye doctor as well as the dentist.
- Regular checkup for blood pressure etc.

Diabetes can be managed with various types of medications

- Exogenous insulin.
- Oral hypoglycaemic agents.
- Alternative medicines like herbal treatments, Yoga, Unani medicines etc.

ANTIDIABETIC PLANTSIN TRADITIONAL MEDICINES

The NAPRALERT database lists over 1200 species of plants representing 725 genera in 183 families extending from the marine algae and fungi with antidiabetic activity. Over half of these have been used ethnopharmacologically in traditional medicine as antidiabetics, and some 50% of these traditional remedies have been studied experimentally.

In India, plants like *Abroma augusta*(L.) L.f., *Abutilum indicum* (L.) Sw., *Aconitum palmatum* D. Don., *Aloe barbadensis* Mill, *Asparagus racemosus* Wild., *Berberis aristata* DC., *Calamus rotang* (L.), *Cannabis sativa* (L.), *Catharanthus roseus* (L.) G. Don., *Cinnamomum tamala* (Buch.-Ham.) Nees, *Coccinea grandis*(L.)Voigt.,*Costus speciosus* (Koening) Sm., *Ficus racemosa* (L.), *Ipomoea batatus* (L.) Lamk.,*Momordica chrantia* (L.), *Nardostachys jatamansi* DC., *Picrorhiza kurrooa* Royle ex Benth., *Quercus lanata* Sm., *Swertia chirayita* (Roxb. ex Flem.) Karst.,*Syzygium cuminii* (L.) Skeels, *Trigonella foenumgraecum* (L.), *Urtica dioica* (L.), *Zingiber officinale* Rosc., *Allium cepa* L., *Allium sativum* L., *Aloe vera* (L.) Burm.f.,*Cajanus*

cajan (L.)Millsp.,*Coccinia indica* Wight & Arn., *Caesalpinia bonducella* (L.) Roxb., *Ficus bengalensis* L., *Gymnema sylvestre* R. Br., *Momordica charantia* L., *Ocimum sanctum* L., *Pterocarpus marsupium* Roxb., *Tinospora cordifolia* (Wild.) Hook.f. & Thomson, etc., are most commonly used species in traditional medicine as antidiabetic agents.

Enumeration of Antidiabetic plants

1. ***Abrus precatorius*** L. (Fabaceae). Local Name: Kundumani. The plant is a climber commonly known as Wild Liquorice and found through the plains of India. Leaf of this plant is mixed with the leaves of *Andrographis paniculata, Gymnema sylvestre* and seeds of *Syzygium cumini*. The mixture is shade dried and ground into powder and taken orally along with cow's milk. Dosage: About 50 ml of mixture is taken twice a day before food for 120 days.

2. ***Andrographis lineata*** Wallich ex Nees (Acanthaceae). Local Name: Siriya nangai. The plant is annual herb found in the hedgerows throughout the plains in India and commonly cultivated in gardens. Leaf is shade dried, powdered and taken orally along with cow's or goat's milk. Dosage: 2 teaspoon of powder is taken twice a day after food for 2-3 months.

3. ***Andrographis paniculata*** (Burm.f.) Wall. ex Nees (Acanthaceae). Local Name: Periya nangai. The plant is annual herb (Commonly known as King of Bitters) found in the hedgerows throughout the plains in India and cultivated in gardens. Leaf is shade dried, powdered and mixed with boiled rice and cow's milk and taken orally. Dosage: 50 ml of mixture is taken thrice a day after food for 120 days.

4. ***Canthium parviflorum*** Lam. (Rubiaceae). Local Name: Sakkarai kovaimaram. A shrubby and woody plant found throughout the Western Ghats. Shade dried leaf powder is mixed with cup of water or goat's or cow's milk or boiled rice and taken orally. Dosage: One or two teaspoon is taken early in the morning regularly until cure

5. ***Costus speciosus*** (Koenig.) J. E. Smith (Costaceae). Local Name: Kostak-kilangu. A tuberous fleshy herb, plentifully found in north India and in the Western Ghats the plant is seen in hilly areas. Fresh rhizome is ground into a paste and taken orally. Dosage: 20-25 gm is taken thrice a day after food for 2 months.

6. ***Gymnema sylvestre*** (Retz.) R. Br. ex Schultes (Asclepiadaceae). Local Name: Siru kurinjan. A climbing shrub commonly found in the plains of central and southern India. Dried leaves are pounded and the fine powder thus obtained is taken orally along with milk. Dosage: About 50 ml is taken twice a day after food for 120 days to treat diabetes.

7. ***Memecylon umbellatum*** Burm. f. (Melastomataceae). Local Name: Sakkarai vaembu. A bushy small tree found in the hilly areas of Western Ghats. Shade dried leaf powder is mixed with cup of water and boiled rice and kept overnight and taken orally. Dosage: One teaspoon is taken early in the morning for forty days or until cure.

8. ***Momordica charantia*** L. (Cucurbitaceae). Local Name: Kaattu pagar-kai. The plant is commonly known as Bitter guard and has many varieties. The plant is climbing shrub and generally cultivated everywhere in India. Unripe fruits are taken orally along with food. Dosage: 2-3 fresh unripe fruits are taken at any time per day for 3 months.

9. ***Syzygium cumini*** (L.) Skeels. (Myrtaceae). Local Name: Naaval maram. The plant is large tree and commonly known as Jambolan or Black Plum found throughout the plains. Juice extracted from the leaf is mixed with honey or cow's milk and fresh fruits are taken orally. Dosage: 2 teaspoon of juice is taken twice a day after food for 3 months. It is one of the significant antidiabetic plant and it has long been reported for its use in many pharmacological activities mainly diabetes. During the last four decades, numerous folk medicine and scientific reports on the antidiabetic effects of this plant have been cited in the literature. Clinical and experimental studies suggest that, different parts of the plant especially fruits, seeds and stem bark possess promising activity against diabetes mellitus. *S. cumini* exerts a dual effect namely a combination of mechanism of action of sulfonylurea and biguanids and may bring about its hypoglycaemic action through stimulation of surviving ß cells of islets of langerhans to release more insulin.

CONCLUSION

The study of ethnomedical systems and plants as therapeutic agents is of importance in addressing health problems of traditional communities. Among the plants used by traditional healers (Kanis and Paliyars), most of the plants have been used in folk medicine and traditional healing systems around the world from very ancient time. The wealth of tribal's knowledge on medicinal plants points to a great potential for research and the discovery of new drugs to fight diseases including diabetes, obtaining new foods and other new uses. Instead of trying to identify the active components of herbs through massive collection of plants from natural sources, it is better to start investigating the efficacy of the medicinal plant based on the traditional healthcare practices by indigenous people.

Traditional plants or herbal formulations might offer a natural key to unlock diabetic complications. Now a time traditional plants or herbal products had been recommended for treatment of diabetes. The potency of herbal drugs is significant and they have negligible side effects than the synthetic anti-diabetic drugs. There is an increasing demand by patients to use the natural products with anti-diabetic activity. In recent time there has been renewed interest in the plant

remedies. Plants hold definite promises in the management of diabetes.

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