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A REVIEW ON INDIAN MEDICINAL PLANTS AND MARKETED FORMULATIONS USED IN DIABETES MELLITUS

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ABSTRACT
Diabetes mellitus is a clinical syndrome characterized by a deficiency in insulin production or resistance to insulin action. Consequently, it leads to inappropriate hyperglycemia. The usage of herbal based medicine has been increasing tremendously in both developing and developed countries over the last three decades. The present study aims to provide a comprehensive review of antidiabetic activity of some medicinal plants. The efficiency of these medicinal plants may regulate the diabetic metabolic abnormalities. This work would help researchers to choose potential herbal for diabetic treatment. The study concludes that if explored and studies well these plants could act the unlimited source of bioactive compounds to be used in herbal medicine development. In the present review an attempt has been made to investigate the antidiabetic herbal plants and marketed formulations which may be useful to the health professionals and scholars for further scientific research in the field of pharmacology and therapeutics.

KEYWORDS: Diabetes mellitus, Antidiabetic activity, Medicinal plants, Formulations.

INTRODUCTION
Diabetes mellitus According to WHO, the term diabetes mellitus is defined as a metabolic disorder of multiple etiology characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and proteinmetabolism resulting from defects in insulin secretion, insulin action, or both. The effects of diabetes mellitus include long-term damage, dysfunction and failure of various organs. Diabetes mellitus may have the characteristic symptoms such as thirst, polyuria, blurred vision and loss of weight.[1]

Diabetes mellitus (DM) is a faction of metabolic disorder and commonly affects many people around the globe. Due to decrease in insulin, DM has been characterized by hyperglycemia, hyperlipedemia, hyperaminoacidemia and hypoinsulinaemia. DM generally known to be two types based on insulin dependent (i.e., type I and type II diabetes). Type I diabetes is also known as immature diabetes which depend on insulin and affects 5% of diabetic population. The Type II diabetes known to be non-insulin dependent and generally affects people who are above 40 age groups. It is well established that the hyperglycemia of diabetes which damages organs in the body.[2]

Types of diabetes mellitus[3]
1. Insulin Dependent Diabetes Mellitus (IDDM, Type 1)
2. Non-Insulin Dependent Diabetes Mellitus (NIDDM Type 2)
3. Gestational diabetes (Type 3)

Diabetes symptoms
- Loss of weight indicates that there is a problem in the blood sugar level and functioning of insulin
- Blurred vision
- Frequent urination is one of the major symptom of diabetes
- Severe hunger pain or emptiness stress and irritation also give sign of diabetes.
- Nausea and vomiting
- Extreme weakness and tiredness
- Unusual thirst
- Mood change, etc.

Diabetes causes
- Hereditary and genetics leads to diabetes
- It also cause due to increase production of glucose level in the blood vessels and less production of glucose in the body. Also caused due to infections caused by viruses.

- Stress, obesity, increased cholesterol level, excess intake of oil and sugar and no physical exercise are some other cause of diabetes.
- According to Ayurveda it is caused by vitiation of all the three dosha but vata is to most vitiate out of the three.

Dos & Don'ts for diabetes

- Controlling diet and eating right is very important for diabetic patients and their health.
- Low fat diet and vegetables like spinach, cucumber must be taken as they are good for controlling diabetes. Onion, sprouts, beans, garlic in the diet of diabetics low down the sugar level in the blood. Tomatoes, vegetable salad, fruits and milk products like cheese should be taken.
- Starchy food products like white bread, rice, potatoes should be avoided as they are not easily digestible.
- Diabetic patient should not be scared of eating sugar rich fruits. These are safe and do not increase insulin production.
- Less amount of oil should be taken and coffee, sugar refined flour, alcohol, heavy metals should be avoided.
- Meals should be small as the foods are easily digestible and are good for the health of diabetics.[4]

Treatment of diabetes mellitus

Insulin and oral hypoglycemic drugs Insulin therapy should aim to mimic nature, which is remarkably successful both in limiting postprandialhyperglycaemia and preventing hypoglycaemia between meals. Different preparations of insulin are available suchas human insulin, beef insulin, pork insulin. Insulin therapy is no free from complications and adverse effects. The most important adverse effect are weight gain and hypoglycaemia when inappropriate dose of insulin is taken and when there is mismatch between meals and insulin injection. They bind to sulfonylurea receptors on the ß-cell plasma membrane, causing closure to ATP sensitive potassium channels, leads to depolarized the cell membrane. Administration of sulfonylurea's to type 2 DM patient's increases insulin release from the pancreas and also may be further increase insulin levels by reduce hepatic clearance of the hormones. It has been shown to increase peripheral uptake of glucose, and to reduce hepatic glucose output by approximately 20-30% when given orally but not intravenously. Impaired absorption of glucose from the gut has also been suggested as amechanism of action.[5]

Herbal treatment of diabetes

There are several literature reviews by different authors about anti-diabetic herbal products, but the most informative is the review by Atta-Ar-Rahman who has documented more than 300 plant species accepted for their hypoglycaemic properties. This review has classified the plants according to their botanical name, country of origin;parts used and nature of active agents. One such plant isMomordicacharantia (Family: Cucurbitaceae). WHO are listed 21,000 plants, which are used for medicinal purposes throughout 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 the botanical garden of the world.[5]

Home remedies for diabetes

Bilberry (*Vacciniummytillus*) and Blueberryare effective herbs that cure diabetes bylowering blood sugar and cholesterol levels.

Bitter gourd (*Momordicacharantia*) fruitdecoction in the morning in empty stomach atleast for one month is helpful in bringing theblood sugar level to normal.

Curry leaves (*Murrayakoenigii*) controlsdiabetes so is one of the important homeremedies for diabetes. Hereditary diabeticpatients also get the best benefit from its intake.Chewing (8–10) curry leaves in empty stomachis very effective for bringing sugar level inurine and blood to normal.

Gooseberry, Amla (*Emblicaofficinalis*) is anatural herb that cures diabetes and brings the
blood sugar to normal.

Green Tea (*Camellia sinensis*) consumptionhas been used traditionally to control bloodsugar in the body. It is associated withprevention of Type 2 diabetes, lowering fasting blood levels of glucose, reducing triglyceridesand free fatty acids, and enhancing ability ofadipocytes to respond to insulin and absorbblood sugar. Its consumption also increases the body's ability to utilize blood sugar. Green tea polyphenols regulates the expression of genes involved in glucose uptake and insulinsignaling.

Gurmar (*Gymnemasylvestre*) cures diabetesby lowering high sugar level in the blood andlead to proper functioning of insulin and alsominimize the urge of taking sweets in thediabetes patients.

Ispaghula husk (*Plantagoovata*) is naturalsafe for treatment of diabetes.

Maidenhair tree (*Gingobiloba*) is veryeffective in controlling diabetes.

Mango leaves (*Mangiferaindica*) are helpfulin controlling diabetes. Take mango leaves, soak them in water and keep it overnight then inan empty stomach take this liquid. Dry the leaves of mango trees and make its powder in agrinder. Mix the dry powder (1 teaspoon) of mango leaves in a glass of water and drink itevery day. This is one of the useful homeremedies for diabetes and good natural cure fordiabetes.

Papaya (*Carica papaya*) are boiled and madeinto a paste and given with a pinch of common
salt and jeera powder for six months to cureddiabetes.

Sweet potato leaves (*Ipomoea batatas*) whentaken with ash gourd or when taken with anyherbaltea are effective in curing diabetes.[6,7]

Screening models for antidiabetic activity

Diabetes induced animal model

1. Alloxan

Diabetogenic action of alloxan is mediated byreactive oxygen species. Alloxan and the product of its reduction, dialuric acid, establish a redox cycle with the formation of superoxide radicals. These radicals under godismutation to hydrogen peroxide. Thereafter highly reactive hydroxyl radicals are formed by the fenton reaction .the action of reactive oxygen species with simultaneous massive increases in cytosolic calcium concentration causes rapid destruction of β cells. The actionofalloxaninthepancreas is preceded by its rapid uptake by the β cells.[8]

2. Streptozotocin

Streptozotocin2-deoxy-2-[3-[methyl-3-nitrosoureidp]-d-glucopyranose]] is synthesized by steptomycetesachromogenes and is used to induce both type-1 and type-2.Streptozotocininduces diabetes in almost all the species. diabetes dose varies with the species and the optimal dose required to produce diabetes in rat was found to be [50-60mg/kg i.p. or i.v],in mice 9175-200mg/kg i.p. or i.v] and in the dogs [`15 mg/kg for 3 days].Due to its low solubility the rapid i.v ;injection appears to be best route of administration.[8]

3. Ferric nitrilotriacetate induction of diabetes mellitus

This rarely used procedure. Rats and rabbit`s parentrally treated with à large daily dose of ferric nitriloacetatemanifestated diabetic symotoms such as hyperglycemia glycosuria ketonemia and ketourea after approximately 60 days of treatment the blood insulin response to oral glucose loading poor.[8]

4. Non-insulin dependent diabetes mellitus [NIDD] resembling animal models

By altering the dose and the dose ofthe STZ injection, the n-stz models exhibit various stages of type-2 diabetes mellitus, such as impaired glucose tolerance, mild, moderate and severehyperglycemiasneonatalstz-inducedrat model of type 2 diabetes mellitus model is generated by injecting Wister rats on the day of their birth intravenously [8] [saphenous vein] or intraperitoneal with 100mg/kg of stz.

5. Harmone induced diabetes

Growth harmone induced diabetes; in intact adult dogs and cats repeated administration of growth harmone induces an intensively diabetic condition with all symptoms of diabetes including severe ketonemia and ketonuria ,corticosteroid induced diabetes: hyperglycemia, glycosuria, are observed in forced fed rats treated with cortisone, in guinea pig and rabbit experimental corticoid diabetes could be obtained without forced feeding.[8]

6. Insulin deficiency due to insulin antibodies

Bovine insulin [1mg] is injected subcutaneously to guinea pig at monthly intervals and is bleedby cardiac puncture two weeks after the second and subsequent doses of antigen. Intravenously injection [0.25-1.0ml] of guinea pig anti insulin serum to rats induces aldose of dependent increase ofblood glucose. This effect is due to neutralization by insulin antibodies secreted by the injected animal.

7. Virus induced diabetes

Type-1 diabetes may duetovirusinfection and β-cell specific autoimmunity. The d-variant of the encephalamycarditis virus [emc-d] selectively infects and destroys the β cells in the male ICR Swiss mice similar to the human insulin dependent diabetic.[8]

8. Genetically diabetic animals

Several animal species, mostly rodents have been described to exhibit spontaneous diabetes mellitus on a hereditary basis E.g.; spontaneously diabetic rats like BB rat WBN/KOB rat etc.[8]

9. Models of diabetes accelerated atherosclerosis

Accelerated cardiovascular disease is leading cause of both morbidly and mortality in diabetic patients. Aggressive therapy of dyslipidemia is necessary since the risk of myocardial infraction is the same as in non-diabetic patients with previous myocardial infraction. Currently rats and mice are the most widely used models to study diabetes and atherosclerosis.

Genetic models of diabetes

A) Spontaneously develop diabetic rats

These models permit the evaluation of the effect of the natural product on an animal without an interference of the side effects induced by the chemical drugs like alloxanand STZ reported above. Several recent publications summarized the major advances in this field (ex; spontaneously diabetic Gotokakizakhi rat which is a genetic model of type-2 diabetes originating from selective breeding over many generations of glucose-intolerant non diabetic wister rats.

B) Genetically engineered diabetic mice

In this case, rodents may be produced to over or under express proteins thought to play an keyrole in the glucose metabolisms although significant advances in this field have arisen in recent years ,especially with the advent of transgenic mice, there have been no studies carried out involving natural products on this models.[8]

Indian medicinal plants with anti diabetic properties
Acacia arabica: **(Babhul)**

Fig. 1: ***Acacia Arabica.***

The plant extract acts as an antidiabetic agent by acting as secretagouge to release insulin. It induces hypoglycemia in control rats but not in alloxanized animals. Powdered seeds of *Acacia arabica* when administered (2, 3 and 4 g/kg body weight) to normal rabbits induced hypoglycemic effect by initiating release of insulin from pancreatic beta cells.[9]

Aeglemarmelos: **(Bengal Quince, Bel or Bilva)**

Fig. 2: ***Aeglemarmelos.***

Administration of aqueous extract of leaves improves digestion and reduces blood sugar and urea, serum cholesterol in alloxanized rats as compared to control. Along with exhibiting hypoglycemic activity, this extract also prevented peak rise in blood sugar at 1h in oral glucose tolerance test.

Allium cepa: **(Onion)**

Fig. 3: ***Allium cepa.***

Various ether soluble fractions as well as insoluble fractions of dried onion powder show anti-hyperglycemic activity in diabetic rabbits. Administration of a sulfur containing amino acid from *Allium cepa*, S-methyl cysteine sulphoxide (SMCS) (200 mg/kg for 45 days) to alloxan induced diabetic rats significantly controlled blood glucose as well as lipids in serum and tissues and normalized the activities of liver hexokinase, glucose 6-phosphatase and HMG Co A reductase. When diabetic patients were given single oral dose of 50 g of onion juice, it significantly controlled post-prandial glucose levels.[9]

Mangiferaindica: (Mango)

Fig. 4: ***Mangiferaindica.***

The leaves of this plant are used as an antidiabetic agent in Nigerian folk medicine, although when aqueous extract given orally did not alter blood glucose level in either normoglycemic or streptozotocin induced diabetic rats. However, antidiabetic activity was seen when the extract and glucose were administered simultaneously and also when the extract was given to the rats 60 min before the glucose. The results indicate that aqueous extract of *Mangiferaindica*possesshypoglycemic activity. This may be due to an intestinal reduction of the absorption of glucose. [9]

Allium sativum: **(Garlic)**

Fig. 5: ***Allium sativum.***

Allicin, a sulfur-containing compound is responsible for its pungent odour and it has been shown to have significant hypoglycemic activity. This effect is thought to be due to increased hepatic metabolism, increased

insulin release from pancreatic beta cells and/or insulin sparing effect. Aqueous homogenate of garlic (10 ml/kg/day) administered orally to sucrose fed rabbits (10 g/kg/day in water for two months) significantly increased hepatic glycogen and free amino acid content, decreased fasting blood glucose, and triglyceride levels in serum in comparison to sucrose controls.

S-allylcysteinsulfoxide (SACS), the precursor of allicin and garlic oil, is a sulfur containing amino acid, which controlled lipid peroxidation better than glibenclamide and insulin. It also improved diabetic conditions. SACS also stimulated *in vitro* insulin secretion from beta cells isolated from normal rats.[9]

Aloe vera and Aloe barbadensis: **(Ghritakumari)**

Fig. 6: ***Aloe vera.***

Aloe has a long history as a multipurpose folk remedy. The plant can be separated into two basic products: gel and latex. *Aloe vera* gel is the leaf pulp or mucilage, aloe latex, commonly referred to as "aloe juice," is a bitter yellow exudate from the pericyclic tubules just beneath the outer skin of the leaves. Extracts of aloe gum effectively increases glucose tolerance in both normal and diabetic rats. Treatment of chronic but not single dose of exudates of *Aloe barbadensis* leaves showed hypoglycemic effect in alloxanized diabetic rats. Single as well as chronic doses of bitter principle of the same plant also showed hypoglycemic effect in diabetic rats. This action of *Aloe vera* and its bitter principle is through stimulation of synthesis and/or release of insulin from pancreatic beta cells. Oral administration of *Aloe vera* might be a useful adjunct for lowering blood glucose in diabetic patients.[9,10]

Trigonellafoenumgraecum: **(Fenugreek, Methi)**

Fig. 7: ***Trigonellafoenumgraecum.***

4-hydroxyleucine, a novel amino acid from fenugreek seeds increased glucose stimulated insulin release by isolated islet cells in both rats and humans. Oral administration of 2 and 8 g/kg of plant extract produced dose dependent decrease in the blood glucose levels in both normal as well as diabetic rats. Administration of fenugreek seeds also improved glucose metabolism and normalized creatinine kinase activity in heart, skeletal muscle and liver of diabetic rats.[10]

Tinosporacordifolia: **(Guduchi)**

Fig. 8: ***Tinosporacordifolia.***

Oral administration of the extract of *Tinosporacordifolia* roots for 6 weeks resulted in a significant reduction in blood and urine glucose and in lipids in serum and tissues in alloxan diabetic rats. The extract also prevented a decrease in body weight. *T. cordifolia* is widely used in Indian ayurvedic medicine for treating diabetes mellitus. Oral administration of an aqueous *T. cordifolia* root extract to alloxan diabetic rats caused a significant reduction in blood glucose. Though the aqueous extract at a dose of 400 mg/kg could elicit significant anti-hyperglycemic effect in different animal models, its effect was equivalent to only one unit/kg of insulin. It is reported that the daily administration of either alcoholic or aqueous extract of *T. cordifolia* decreases the blood glucose level and increases glucose tolerance in rodents.[10]

Azadirachtaindica: **(Neem)**

Fig. 9: ***Azadirachtaindica.***

Hydroalcoholic extracts of this plant showed anti-hyperglycemic activity in streptozotocin treated rats and this effect is because of increase in glucose uptake and glycogen deposition in isolated rat hemidiaphragm. [11]

Cocciniaindica: **(Ivy gourd)**

Fig. 10: ***Cocciniaindica.***

Dried extracts of *Cocciniaindica* (500 mg/kg body weight) were administered to diabetic patients for 6 weeks. These extracts restored the activities of enzyme lipoprotein lipase (LPL) that was reduced and glucose-6-phosphatase and lactate dehydrogenase, which were raised in untreated diabetics. Oral administration of 500 mg/kg of *C. indica* leaves showed significant hypoglycemia in alloxanized diabetic dogs and increased glucose tolerance in normal and diabetic dogs. [11]

Phyllanthusamarus: **(Bhuiamala)**

Fig. 11: ***Phyllanthusamarus.***

Traditionally it is used in diabetes therapeutics. The whole plant extract also reduced the blood sugar in alloxanized diabetic rats. [11]

Juglansregia: **(Walnut)**

Fig. 12: ***Juglansregia.***

It is one of the medicinal plants used in tradition Indian medicine as a treatment for diabetes, but little scientific documentation supports its anti-diabetic action. The scientists at Isfahan University, Isfahan, Iran evaluated the anti-diabetic effect of ethanolic walnut leaf extract. During experiment twenty four male Wister rats were divided into four groups: non diabetic rats, alloxan-induced diabetic rats treated with ethanolic extracts of walnut (200mg/kg) and alloxan –induced diabetic rats treated with glibenclamide (0.6mg/kg). Fasting blood sugar decreased meaningfully in diabetic rats treated with walnut leaves and diabetic rats treated with glibenclamide. Insulin level increased and glycosylated hemoglobin decreased significantly in diabetic groups receiving either glibenclamide or *J. regia* compared with the diabetic group with no treatment. The histological study revealed that the size of islets of Langerhans enlarged consequentially as compared to diabetic rats with no treatment. Effects of administering glibenclamide or extract of walnut on all parameters discussed above showed no difference and both tended to bring the values to near normal. Thus, the ethanolic extract from this plant leaves has a dramatic antidiabetic effect on diabetes –induced rats.[12]

Leucaslavandulifolia:

Fig. 13: ***Leucaslavandulifolia.***

The plant *Leucaslavandulifolia Sm*. of family Labiatae was evaluated for its Antidiabetic activity in alloxan induced diabetic rats as well as for its in vitro antioxidant property. It was observed that Methanolic extract of *L. lavandulifolia* exhibited significant antidiabetic activity in dose dependent manner, but not better than glibenclamide.[13]

Momordicacharantia: **(Bitter gourd)**

Fig. 14: ***Momordicacharantia.***

It is commonly used as an antidiabetic and antihyperglycemic agent in India as well as other Asian countries. Extracts of fruit pulp, seed, leaves and whole plant was shown to have hypoglycemic effect in various animal models. Polypeptide p, isolated from fruit, seeds and tissues of *M. charantia* showed significant hypoglycemic effect when administered subcutaneously to langurs and humans. Ethanolic extracts of *M. charantia* (200 mg/kg) showed an antihyperglycemic and also hypoglycemic effect in normal and STZ diabetic rats.[14]

***Ocimum sanctum:* (Holy basil, Tulsi)**

Fig. 15: *Ocimum sanctum.*

Since ancient times, this plant is known for its medicinal properties. The aqueous extract of leaves of *Ocimum sanctum* showed the significant reduction in blood sugar level in both normal and alloxan induced diabetic rats. Significant reduction in fasting blood glucose, uronic acid, total amino acid, total cholesterol, triglyceride and total lipid indicated the hypoglycemic effects of tulsi in diabetic rats. Oral administration of plant extract (200 mg/kg) for 30 days led to decrease in the plasma glucose level by approximately 9.06 and 26.4% on 15 and 30 days of the experiment respectively. Renal glycogen content increased 10 fold while skeletal muscle and hepatic glycogen levels decreased by 68 and 75% respectively in diabetic rats as compared to control. [15]

***Eugenia jambolana:* (Jamun)**

Fig. 16: *Eugenia jambolana.*

In India decoction of kernels of *Eugenia jambolana* is used as household remedy for diabetes. This also forms a major constituent of many herbal formulations for diabetes. Antihyperglycemic effect of aqueous and alcoholic extract as well as lyophilized powder shows reduction in blood glucose level. This varies with different level of diabetes. In mild diabetes (plasma sugar >180 mg/dl) it shows 73.51% reduction, whereas in moderate (plasma sugar >280 mg/dl) and severe diabetes (plasma sugar >400 mg/dl) it is reduced to 55.62% and 17.72% respectively. The extract of jamun pulp showed the hypoglycemic activity in streptozotocin induced diabetic mice within 30 min of administration while the seed of the same fruit required 24 h. The oral administration of the extract resulted in increase in serum insulin levels in diabetic rats.[16]

***Pterocarpusmarsupium:* (Indian kino tree)**

Fig. 17: *Pterocarpus marsupium.*

Pterostilbene, a constituent derived from wood of this plant caused hypoglycemia in dogs showed that the hypoglycemic activity of this extract is because of presence of tannates in the extract. Flavonoid fraction from *Pterocarpusmarsupium* has been shown to cause pancreatic beta cell regranulation. Marsupin, pterosupin and liquiritigenin obtained from this plant showed antihyperlipidemic activity. Like insulin, (−) epicatechin stimulates oxygen uptake in fat cells and tissue slices of various organs, increases glycogen content of rat diaphragm in a dose-dependent manner.[17]

Antidiabetic herbal products marketed in india

Many formulations are in the market and are used regularly by diabetic patients on the advice of the physicians.

Sr. no.	Brand name	Manufacturer	Ingredient
1	Diabecon	Himalaya	Balsamodendronmukul, Pterocarpusmarsupium, Casearіaesculenta, Gymnemasylvestre, Glycyrrhizaglabra, Tinosporacordifolia, Swertiachirata, Tribulusterrestris, Phyllanthusamarus, Gmelinaarborea, Berberisaristata, Aloe vera, Eugenia jambolana, Asparagus racemosus, Boerhaaviadiffusa, Sphaeranthusindicus, Gossypiumherbaceum, Shilajeet and 180 cppowders of Momordicacharantia, Piper nigrum, Ocimum sanctum, Abutilon indicum,Curcuma longa, Rumexmaritimus and Trikatu
2	HypoNIDD	CharakPharma	YashadBhasma (Zinc Calx), Shilajit (Purified Asphaltum), Karela (*Momordicacharantia*,bitter gourd), Haridra (*Curcuma longa*, turmeric), Tarwar (*Cassia uriculata*,Avarakkai, Indian broad-beans), Amalaki (Amla, Indian Gooseberry, *Emblicaofficinalis*), Raja Jambu (*Eugeniajambolana*), Mamejavo (*Enicostemmalittorale*), Meshashringi (*Gymnemasylvestre*), Vijaysaar (*Pterocarpusmarsupium*), Guduchi (*Tinosporacordifolia*), Neem (*Meliaazadirachta*), KiratTikta (*Swertiachirata*
3	Diabetes-Daily Care	Nature'Health Supply	Alpha Lipoic Acid, Chromax, Vanadium, Cinnamon Extract, Fenugreek extract, *Gymnemasylvestre* extract, *Momordica* extract, Licorice Root extract
4	Ayurveda alternative herbal formula to Diabetes:	Chakrapani Ayurveda	Gurmar (*Gymnemasylvestre*), JamunGutli (*Syzygiumcumini*), Neem (*Azadirachtaindica*), Methika (*Trigonellafoenumgracecum*), Guduchi (T*inosporacordifolia*), Pushkarmool (*Inularacemosa*) , Karela (*Momordicacharantia*).
5	Pancreatic tonic 180 cp	Ayurvedic herbal supplement	*Pterocarpusmarsupium, Cinnamomumtamala, Gymnemasylvestre, Azadirachtaindica, Ficusracemosa, Aeglemarmelos, Trigonellafoenumgraceum, Momordicacharantia, Syzygiumcumini*
6	Madhumeha KusumakaraRas	Shree Dhoothapapeshwar Limited	VasantKusumakar Rasa (Suvarnayukta), Mamajjakaghana (Dried Aq. extract of *Enicostemmalittorale*), Haridra (*Curcuma longa*), Amalaki*(Emblicaofficinalis*), ShuddhaShilajatu (Processed asphaltum), Guduchi (*Tinosporacordifolia*), Yashadabhasma (*Zinc bhasma*), Bilvapatraswaras (*Aeglemarmelos),* Asana kwath (*Pterocarpusmarsupium*).

CONCLUSION

The present review has presented comprehensive details of antidiabetic plants and marketed formulations which may be useful to the health professionals and scholars for further scientific research in the field of pharmacology and therapeutics. Some of these plant derived medicines, however, offer 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 antidiabetic 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 antidiabetic effect.

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