Antidiabetic Potential Of Some Rarely Used In Indian Medicinal Plants.

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Abstract

Diabetes mellitus is a group of metabolic disorders associated with the endocrine system that are in hyperglycemic conditions. Metabolic disorders can cause many complications such as neuropathy, retinopathy, nephropathy, ischemic heart disease, stroke, and micro angiopathy. Botanical therapies have been used around the world to treat diabetes. Among several medications and different medicines, various herbs are known to cure and control diabetes. History has shown that medicinal plants have long been used for healing around the world to treat diabetes. More than 800 plants around the world are shown by ethnobotanical information as remedies for the treatment of diabetes. Several parts of these plants have been evaluated and appreciated for hypoglycemic activity. Medicinal plants have been found to be more effective than conventional drug compounds with no/fewer side effects and relatively inexpensive. In this review paper, we have reviewed plants with anti-diabetic and related beneficial medicinal effects.

Keywords: *Antidiabetic plants, diabetes, hypoglycaemic activity, medicinal plants, oxidative stress.*

Introduction:

Diabetes mellitus is the common metabolic disorders. It acquiring around 2.8% of the world's population. It is anticipated to cross 5.4% by the year 2025. Since long back herbal medicines have been the highly esteemed source of medicine therefore, they have become a growing part of modern, high-tech medicine. In the above aspects the present review provides profiles of plants (65 species) with hypoglycaemic properties, available through literature source from various database with proper categorization according to the parts used, mode of reduction in blood glucose and active phytoconstituents having insulin mimetics activity. It was suggested that, plant showing hypoglycemic potential mainly belongs to the family Leguminoseae, Lamiaceae, Liliaceae, Cucurbitaceae, Asteraceae, Moraceae, Rosaceae and Araliaceae. The most active plants are Allium sativum, Gymnema sylvestre, Citrullus colocynthis, Trigonella foenum greacum, Momordica charantia and Ficus bengalensis. The some new bioactive drugs and isolated compounds from plants such as roseoside, epigallocatechin gallate, beta-pyrazol-1-ylalanine, cinchonain Ib, leucocyandin 3-O-beta-d-galactosyl cellobioside, leucopelargonidin-3- O-alpha-L rhamnoside, glycyrrhetinic acid, dehydrotrametenolic acid, strictinin, isostrictinin, pedunculagin, epicatechin and christinin-A showing significant insulinomimetic and antidiabetic activity with more efficacy than conventional hypoglycaemic agents. The antidiabetic activity of medicinal plants is the presence of polyphenols, flavonoids, terpenoids, coumarins and other constituents which show reduction in blood glucose levels. The management aspect of diabetes mellitus using these plants and their active principles.

Diabetes Mellitus is a chronic disease that occurs when the pancreas does not produce insulin, or when the body cannot effectively use insulin. It is a disorder of metabolism of carbohydrates, fats, and lipids, which is a high fasting blood sugar. It manifests as chronic hyperglycemia and leads to the development of diabetes-specific micro vascular pathology in the retina, glomerulus and peripheral nerve culminating into serious complications affecting

the eyes, kidneys and arteries .WHO statistics shows that worldwide 347 million people have diabetes and 80% of diabetic deaths occur in low and middle-income countries. According to the International Diabetes Federation, India is ranked second only to China in the list of top ten countries for a number of people with diabetes. Type 2 diabetes, is the major form of diabetes accounting for 90-95% of all diabetic cases and nearly half of all patients suffering from the disease are older than 65 years of age . It is a complicated and divergent disease which in addition to blood sugar control requires the management of lipid parameters, blood pressure and thrombotic factors.

The treatment for diabetes is both difficult and tedious; it is expensive, costly and not affordable . The current treatments for DM include the use of insulin and synthetic drugs such as sulfonylurea, metformin, alpha-glucosidase inhibitors and thiazolidinedione's in addition to lifestyle adjustments. The pharmacokinetic properties, secondary failure rates and accompanying side-effects like hypoglycemia, damage to liver, lactic acidosis, diarrhea, abdominal pain, weight loss and loss of appetite .Due to the problems associated with the current treatments, a large percentage of diabetics resort to alternative remedies that are purported to improve glycemic control . The WHO estimated that approximately 80% of the world's population rely mainly on traditional medicines for their primary health care. Importantly, the plant based drugs are biodegradable, safe, and cheap, having fewer side-effects, in India, China and other ancient traditional medicinal systems in the world, medicinal plants have been the major source of treatment for DM since time immemorial. The importance of research on medicinal plants is validated by the fact that a plethora of new drugs have been developed from plants; relevant examples include cromolyn used as bronchodilator, developed from Ammi visnaga (L) Lamk; galegine, from Galega officinalis L, which is a model for the synthesis of metformin and other bisguanidine-type antidiabetic drugs, papaverine from Papaver somniferum which forms the basis of cerapramil used in the treatment of hypertension, Artemisia annua (Quinhaosu) gave rise to artemininin, this compound and it analogs are now used as antimalarial therapy in many countries . Paclitaxel (Taxol), the most exciting plant-derived anticancer drug discovered in recent years .

Medicinal Plants With Antidiabetic Potential:

India is one of the 12 mega diversity countries in the world with rich deposits of medicinal plant resources. The medicinal value of these plants lies in chemical substances that produce a positive physiological action on the human body. Since plants synthesize an extremely diverse range of chemical compounds, they represent a great potential for the discovery and development of new pharmaceuticals. Also, people are again returning back towards herbal medicines that are easily available, involve no or less side effects, and cost effective. About 80% of the world's population depends on medicinal plants for their health care need. Over a period of years, various plant based active compounds and its active principles have been analyzed for phytochemicals active against one of the deadly disorder Diabetes. More than 800 plant species with hypoglycemic activity have been examined and identified yet. Still, the search for more plant species with hypoglycemic activity is needed to know more about their particular bioactive molecules and the mechanism of action for the future development of drug.

Antidiabetic Plants Are In INDIA :

The climatic conditions in India support the growth and thriving of various plant species and hence the use of these plants by the poor population to disease conditions. There are about 800 plants that may possess antidiabetic properties according to botanical information . Most of the current drugs have been directly or indirectly derived from plants. An example is metformin that was derived from the plant G. officinalis L.

The plants with antioxidant and antidiabetic potential included in the general botanical data, taxonomic data, distribution in the world, experimental design, compounds isolated, mechanism of action, the antidiabetic and antioxidant capability of the plants are presented below:

Mangifera Indica L.[Mango]

Mango in an important species of the family anacardiaceae and the genus *Mangifera*, it is native to South East Asia from where it spread all over the world, it is the most popular fruit in the tropical and subtropical regions of the world. It is the national fruit of India, Pakistan, Philippines and the national tree of Bangladesh .

The plant is addition to the fruit consumption it is used for the treatment and management of diabetes . The peel and pulp of the plant contain carotenoids, and polyphenols such as quercetin, kaempferol, gallic acid, caffeic acid, catechins, tannins, mangiferin, leucocyanidin, epiatechin, quercetin and chromogenic acid . Phenolics have scavenging activity on free radicals mainly due to the presence of hydroxyl groups. Mangiferin (1, 3, 6, 7-tetrahydroxy-xanthone-C2-β-D-glucoside) a bioactive compound isolated from MI possesses a wide range of pharmacological actions including being anticancer , antibacterial , anti HIV , antioxidants , and antidiabetic .

The administration of mangiferin at a dose of 10 and 20 mg/Kg body weight (i.p.) in type 1 and 2 diabetic rats for 30 days showed significant antidiabetic, hypo-lipidemic, alpha amylase and alpha-glucosidase inhibitory effect . This glucoside has also been shown to improve renal function of diabetic nephropathy in rats and its inhibitory effect on overexpression of transforming growth factor-β1, advanced glycation end and extracellular matrix accumulation, Polyol pathway activation, reactive oxygen species (ROS) generation and mesangial cells proliferation demonstrated that the mangiferin exerts its antidiabetic activity by decreasing the insulin resistance. The ethanolic extracts of MI showed significant free radical scavenging activity and have cytoprotective (anti-apoptotic) effect; the leaves and fruits extract reduce the absorption of glucose in type 2 diabetes and stimulate glycogenesis in liver causing reduction in blood glucose level.

Azadirachta Indica A. Juss [Neem]

AI A. Juss is a member of the Meliacea family and the genus Azadirachta. It is a fast-growing tree that can reach up to 15-20 m and can sometimes reach 40 m. The plant is native to India and adapted to sub-arid and sub-humid tropical climates. It is widely grown in India, Pakistan, Indonesia, Sri Lanka, Caribbean, Nigeria, South and Central America. It is called "Dogonyaro" in Nigeria and grown all over the country, especially in the northern region. The plant has been used in the Indian Ayurveda traditional medicine for over 2000 years for the healing of various diseases and ailments .The composite leaf extract of AI and VA at 500 mg/Kg body weight ameliorates hypoglycemia and hepatic oxidative stress in STZ-induced diabetic rats . AI leaves glucosamine an active component of neem leaves is responsible for immunostimulatory activity in albino mice .

The chloroform extract of AI administered on murine diabetic model for 21 days significantly reduced the fasting blood sugar and islet regeneration and protection properties . The administration of 500 mg/kg body weight of AI leaf extract and AI bark extract was effective in improving the antioxidant status in cardiac and skeletal muscles . Azadirachtin and nimbin are the active ingredients in AI and they have the ability to regenerate the pancreatic beta cell. Recently the administration of the composite extract of Aegle marmelos, AI, Murraya koengii, Occimum sanctum, and S. cumini at 100 mg/Kg body weight caused a significant reduction in the blood sugar level, total cholesterol, triglyceride, low-density lipoproteins and an increase in the level of high-density lipoproteins.

Xylopia Aethiopica [Dunal]

XA, also known as the African pepper or Ethiopian pepper, belongs to the family annonaceae and the genus Xylopia. It is a tropical, slim, tall and aromatic tree that grows up to 15-30 m. It is found in the west, central and southern Africa in humid forest zones, Ghana, Kenya, Ethiopia, Senegal and Uganda. XA is a common ethno medicine in West Africa where it is used in the treatment of rheumatism and arthritis, cough, stomachache, bronchitis, biliousness and dysentery . The fruit and vegetable have many medicinal properties and contains phytochemicals, vitamins and minerals. Phytochemicals like flavonoids are potentially anti-allergic, anti-carcinogenic, anti-viral and antioxidants, the ethanolic extract of XA was found to increase steroid hormone , the aqueous extract was also shown to have anti-amylase and anti-lipase activity with antioxidant potentials .A poly-herbal formulation sold in containing the following*:* Stachytarpheta angustifolia, Alstonia congensis, *and* XA in the ratio 3:2:1 was found to have hypoglycemic and hyper-lipidemic activities .

Syzygium Aromaticum [Linn.] Merrill And Perry [Myrtaceae][Cloves]

S. aromaticum (clove) belongs to the family myrtaceae and the genus Syzygium. Native to Indonesia, this plant can grow to a height of 8-12 m, it is an aromatic flower bud commonly used in Africa, Asia and other parts of the world for the preparation of different spicy dishes. In Nigeria most traditional medical practitioners use the fruits and

cloves by boiling in water and the decoction is administered to patients for the treatment of cough, chest congestion and catarrh and the compound eugenol present in this plant is responsible for the aroma and has antioxidative and antimycotic ability .A triterpenoid compound extracted from the clove plant named oleanolic acid has potent diuretic/saluretic, anti-hyperlipidemic, antioxidant and hypoglycemic effects showed that oleonolic acid exhibited anti-hyperglycemic effect induced diabetic rats by the attenuation of the activities of glycogenic enzymes and the compound eugenol present in this plant is responsible for the aroma and has antioxidative and hepato-nephrotoxicity and oxidative stress due to aflatoxins .antimycotic ability. Clove bud powder (CBP) possesses high phenolic content, free radical scavenging activity and metal chelating and reducing properties, the major phenolic compounds found are Kaempferol, isoquercitrin, gallic acid, ellagic acid, and caffeic acid . Dietary supplementation of CBP in type 2 diabetic rats showed anti-hyperglycemic, hepatoprotective, hypolipidemic and antioxidant activities, by suppressing oxidative stress and delaying carbohydrate digestion .Oleanolic acid (3 β-hydroxy-olea-12-en-28-oic acid) and maslinic acid have been reported to modulate the activity of the intestinal glucose transporters and carbohydrate hydrolyzing enzymes thus reducing postprandial hyper-glycaemia and that the ethanolic extract of this plant suppresses elevated blood glucose levels in type 2 diabetic .Free and bound phenolic extract of clove bud was found to inhibit carbohydrate hydrolyzing enzymes; alpha-amylase and alpha-glucosidase in a dose-dependent manner (200-800 µg/ml). Decreasing the postprandial hyperglycemia peak is very crucial in the treatment of diabetes; there is a strong correlation between the phenolic content of clove and the enzyme inhibitory activities and with a strong antioxidant property which is the mechanism and the basis for its anti-diabetic action .

Terminalia Arjuna [Roxb] Wight And Arn

This is a plant belonging to the family Combretaceae and genus Terminalia commonly called Arjuna. It is a large tree found throughout the South Asia region, and it is an exotic tree in India, it can grow up to a height of 25-30 m. The bark and fruits of this plant is used in traditional Indian medicine as an anti-dysentric, anti-pyretic, astringent, cardiotonic, lithotriptic, anticoagulant, hypolipidemic and anti-microbial, the large amount of flavonoids is responsible for the antioxidant and anti-microbial properties . The bark contains arjunine a lactone, arjunetin, essential oils and reducing sugars. The methanolic extract exhibited analgesic activity and acute anti-inflammatory activity . The extracts of this plant have the presence of alkaloids, triterpenoids, tannins and flavonoids. Gallic acid, apigenin, luteolin, quercetin, epicatechin, ellagic acid and 1-O-galloyl glucose are some of the compounds that have been isolated from this plant .

A dose of 250 and 500 mg/kg body weight of *T.* arjuna extract was found to have reno-protective and antioxidant ability in isolated perfused kidneys. The leaf extracts when administered at a dose of 100 and 200 mg/kg body weight orally to STZ-induced diabetic rats was found to significantly normalize blood glucose level and this is due to its antioxidant role . Due to the presence of tannins, saponin, and flavonoids, the bark extract exhibited antidiabetic activity by enhancing the peripheral utilization of glucose by correcting the impaired liver and kidney glycolysis and by limiting gluconeogenic formation, an action similar to that of insulin.The antioxidant activity of *T. arjuna* bark extract is due to the rich concentration of tannins, triterpenoid and saponins like arjunic acid, arjunolic acid, arjungenin, arjunglycosides, gallic acid, ellagic acid, oligomeric proanthocyanidins, and that the antidiabetic activity is due to the stimulation of β-cells of the pancreatic islets. The administration of *T. arjuna* ethanolic extracts at a dose of 250 mg/kg body weight per oral was found to reverse diabetic condition by inhibiting oxidation and degradation of lipids and due to the fact that *T arjuna* extract has the ability to reduce postprandial hyperglycemia an important cardiovascular risk factor in type 2 diabetic patients, it has got a promising anti-hyperglycaemic and hypo-lipidemic effects in type 2 diabetic.

Annona Squamosa Linn. (Annonaceae),

Its called custard apple in English and sharifa in Hindi. It is cultivated throughout India .The pharmacological active ingredients are present in seeds , leaves and aerial parts of the plants . The research reveals that the plant possesses both hypoglycemic and antidiabetic activity .It acts by enhancing insulin level from the pancreatic islets ,increases utilization of glucose in muscles and inhibits the glucose output from liver .Its margin of safety in high . The extract obtained from leaves of this plants is useful in maintaining healthy blood sugar and cholesterol leaves.

Common Plants Useful In Diabetes Mellitus

Several plants which are commonly used ingredients of daily food like onion, cinnamon, garlic, fenugreek, turmeric etc. are also documented to possess potential hypoglycemic property.

Allium cepa- It is also known as Onion. It exhibits hypoglycemic activity by stimulating insulin production. The major phytoconstituent in onion allyl propyl disulfide[91] have antidiabetic properties. It is also expected that onions extracts like glibenclamide may induce hypoglycaemia by stimulating insulin release and action, thereby enhancing cellular uptake and utilization of glucose in rats. It remains unclear whether the cellular glucose uptake may be due to increased insulin secretion or decreased insulin degradation rate.

Allium sativum- It is also called as Garlic and "Lahsun" in hindi. It is essential dietary spice component cultivated throughout India and is known for various uses. It has the capacity to stimulate insulin production by pancreatic beta cells to control diabetes. The studies showed that garlic can reduce blood glucose levels and increase plasma insulin in diabetic rats, mice, rats and rabbits. Garlic contains allicin compound which has antioxidant effects and increases the amount of catalase and glutathione peroxidase and a precursor of allicin-S-allyl cystein sulphoxide stimulate the insulin secretion in isolated beta-cells in normal rats.

Brassica nigra- It is also known as Mustard or rhai. Oral administration of mustard exerts considerable hypoglycemic activity. The hypoglycemic effect is due to the stimulation of glycogen synthetase and the repression of various glycogenic enzymes. Further, in one study the hypoglycemic effect of the seed extract of B. juncea was attributed to stimulation of glycogen phosphorylase and other gluconeogenic enzymes.

Cinnamomum zeylanicum and **C. verum**- Cinnamon is usually called as "Dalchini" in Hindi. Phenolic extract of cinnamon shows the insulin potentiating activity and in-vivo glucose control effects in humans. Also, oral administration of its ethanolic extract produced a dose dependent decrease in blood glucose levels in alloxan induced rats. While another species (*C. verum*) exhibits hypoglycemic activity by increasing the activity of insulin. It also shows an increase in lipid metabolism. According to another study, Cinnamon hypoglycaemic activity may be recognized to numerous mechanisms of action, comprising the stimulation of insulin release and insulin receptor signaling, the activation and regulation of enzymes involved in carbohydrate metabolism, glycolysis, gluconeogenesis, stimulation of cellular glucose uptake and increased glucose transporter-4 receptor synthesis. Another study shown that cinnamtannin B1, a proanthocyanidin isolated from the stem bark of ceylon cinnamon, stimulates the phosphorylation of the insulin receptor β-subunit on adipocytes as well as other insulin receptors.

Coccinia grandis- It is also known as kundru. Oral administration of *C.* grandis leaves extract exerted both acute and long term antihyperglycemic effects in healthy, alloxan induced and streptozotocin induced diabetic rats.

Cuminum cyminum- It is usually called as "Jeera". Oral administration of cumin seeds has been reported to possess hypoglycemic activity. Also the ethanolic extract of cumin reduces the glycemic levels. Plasma levels and elevates insulin levels in diabetic rats. Moreover, in another study analysis of its essential oils showed major presence of α-pinene which exhibited mild antidiabetic activity.

Curcuma longa- It is also called as turmeric. It is responsible for the decrease in blood glucose levels by reducing the effect of enzymes responsible for converting dietary carbohydrates into glucose. Ferulic acid or 4-hydroxy-3-methoxy-cinnamic acid found in turmeric have hypoglycemic properties. Some ferulic acid-derived amide compound has evidence for insulin secretion from pancreatic beta cells. Curcumin and its analogues have a mechanism of action similar to that of thiazolidinedione, an anti-diabetic drug, through peroxisome proliferator-activated receptor-γ (PPAR-γ) activation. Thus, curcumin may be effective in the regulation of glycaemia and lipidaemia.

Murraya koenigii- This plant is commonly called as Curry plant. It is used as a spice in food for taste and odor. Its aqueous extract has been reported to possess effective hypoglycemic property. It has also been reported to reduce blood cholesterol levels. In another study its ethanolic extract showed a significant reduction in blood glucose level in Nicotinamide-Streptozotocin induced diabetic rats.

Phyllanthus niruri- The methanolic extract of aerial parts lowered blood glucose, suppressed postprandial rise in blood glucose following a glucose meal, reduced hemoglobin glycation and increased absolute and relative weights as well as glycogen content of liver in diabetic rats.

Phyllanthus amarus- It is also known as bhui amla. It has been reported that ethanolic extract of its leaves results in drastic reduction of the blood glucose levels and significant recovery in body weight of diabetic mice.

Piper nigrum and P. longum- It is also known as black pepper. It is used in various antidiabetic polyherbal formulations. Piperine, the active alkaloid of Pepper has been tested for its glucose regulatory efficacy and daily oral administration for 2 weeks lowered blood glucose concentrations and hepatic glucose-6-phosphatase enzyme activity. It has also reported to possess alpha-glucosidase, alpha-amylase and aldose reductase inhibitory activity[59]. In another study it is also reported to reduce hyperlipidemia, increase serum insulin levels and improve liver functions in diabetic rats.

Punica granatum- It is commonly known as pomegranate. It has been reported that when alloxan-diabetic male wistar rats were administered with pomegranate fruits aqueous extract in different doses showed significant reduction in fasting blood[107]. In another study ethanolic extract of leaves of *P. granatum* were reported to show antidiabetic and antihyperlipidemic effects in alloxan-induced type 2 diabetes mellitus albino rats.

Syzigium cumini- It is also known as jamun. It has been reported that ethyl acetate and methanol extract produced significant reduction in blood glucose level. In another study, jamun fruit and seed's ethanolic extracts resulted in the reduction of the blood glucose level, improvement in insulin levels in hyperglycemic rats. While the improvement was much more significant in seed extract in comparison to the fruit extract.

Trigonella foneum graecum- It is also called as Fenugreek or Methi. It is used in food and medicine. It is a good source of iron, phosphorus, sulfur etc. It is a hypoglycemic agent used in traditional Indian medicinal practice. Methi extract prepared with different parts of the plant shows hypoglycemic activity. An amino acid '4-hydroxyleucine' is a component of fenugreek which increases glucose-induced-insulin resistance and reduces the blood glucose level. Also the administration of methi seed powder solution had pronounced effects in improving lipid metabolism in type II diabetic patients with no adverse effects.

Zingiber officinale- It is also known as Ginger and is a spice which possesses hypoglycemic activity. Studies reported its significant antidiabetic activity on type I diabetes. It also increases insulin level and decreases fasting glucose levels in diabetic rats through improving pancreatic beta-cells activity, increasing insulin sensitivity and enhancing peripheral utilization of glucose. Other mechanisms include improving the glycogen regulatory enzyme expression in liver and inhibiting carbohydrate metabolizing enzymes.

Antidiabetic Potential Mechanism

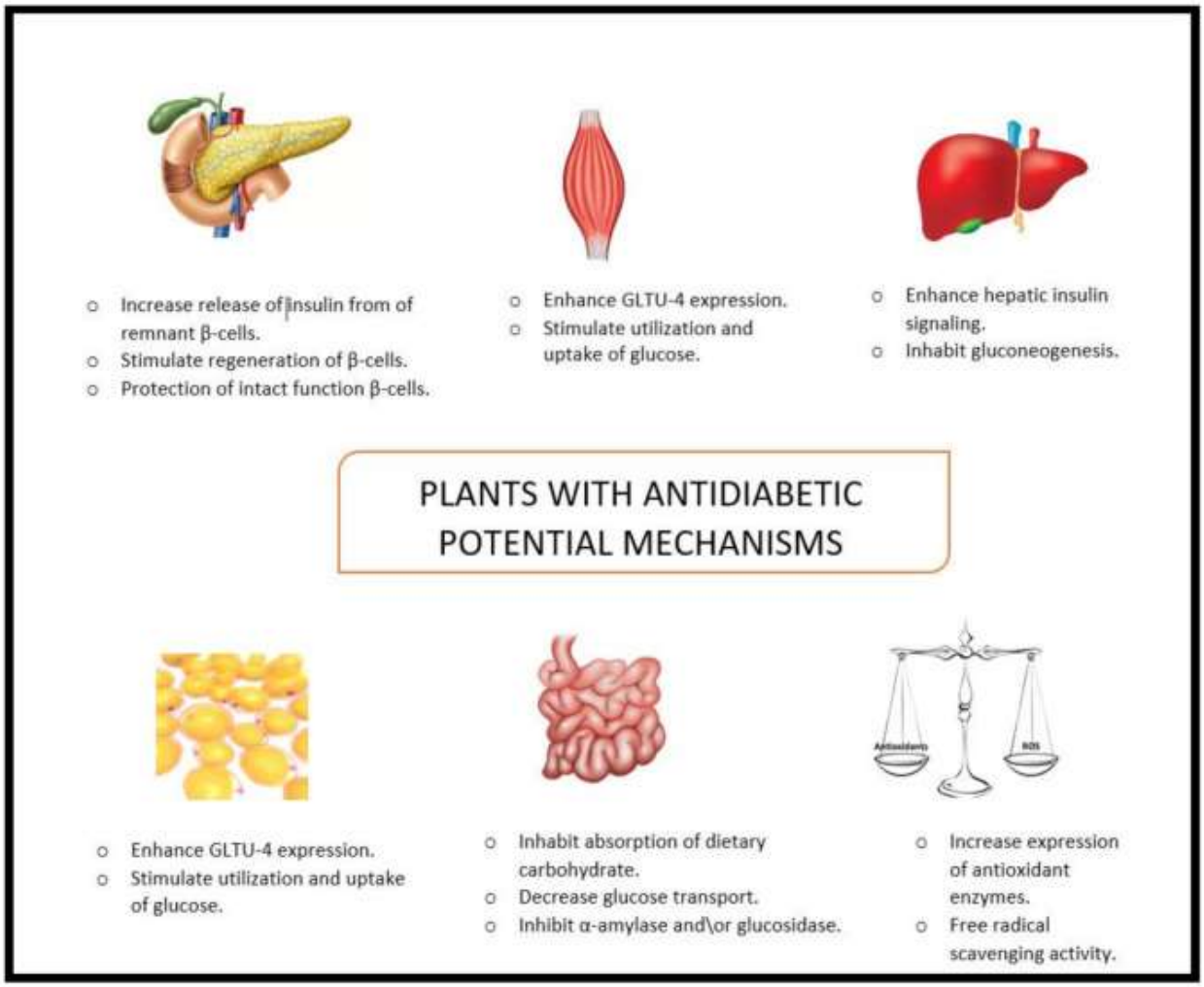

Fig.[1]: Targets of medicinal plant with antidiabetic activity

Oral Antidiabetic Agents: Current Role In Type 2 Diabetes Mellitus

Type 2 diabetes mellitus is a complex disorder that is difficult to treat effectively in long term. The majority of patients are overweight or obese at diagnosis and will be unable to achieve or sustain near normoglycaemia without oral antidiabetic agents; a sizeable proportion of patients will eventually require insulin therapy to maintain long-term glycaemic control, either as monotherapy or in conjunction with oral antidiabetic therapy. The frequent need for escalating therapy is held to reflect progressive loss of islet beta-cell function, usually in the presence of obesity-related insulin resistance. The main heterogeneous classes are in their modes of action, safety profiles and tolerability. These main classes include agents that stimulate insulin secretion , reduce glucose production , delay digestion and absorption of intestinal carbohydrates or improve insulin action (thiazolidinediones). The demonstrated and the benefits of intensified glycaemic control on microvascular complications in newly diagnosed patients with type 2 diabetes. Insulin significantly reducing cardiovascular events. The impact of oral antidiabetic agents on atherosclerosis--beyond expected effects on glycaemic control--is an increase important consideration. The overweight and obese patients randomised to initial monotherapy with metformin experienced significant reductions in myocardial infarction and diabetes-related deaths. Metformin does not promote weight gain and its beneficial effects on several cardiovascular risk factors. Metformin is the drug of choice for most patients with type 2 diabetes .The recent Steno-2 Study showed that intensive target-driven, multifactorial approach to management,

based around a sulphonylurea, reduced the risk of both micro- and macrovascular complications in high-risk patients. Theoretical advantages of selectively targeting hyperglycaemia require confirmation in clinical trials of drugs with effects on this hyperglycaemia progress. The insulin-sensitising thiazolidinedione class of antidiabetic agents has potentially effects on multiple components of the metabolic syndrome. The selection of initial monotherapy is based on biochemical and clinical assessment of patient and safety considerations . For example Pregnancy or renal impairment, insulin may be the treatment of choice when nonpharmacological measures prove inadequate. Insulin is required for metabolic decompensation, that is, incipient or actual diabetic ketoacidosis, or non-ketotic hyperosmolar hyperglycaemia. For example myocardial infarction during other acute intercurrent illness. Oral antidiabetic agents initiated at a low dose titrated according to glycaemic response, as measurement of haemoglobin , concentration, in some patients by self monitoring of capillary blood glucose. The average glucose-lowering effect of the major classes of oral antidiabetic agents is similar (1-2% reduction), alpha-glucosidase inhibitors is less effective .The treatment to the individual patient is an important principle. Doses are titrated up according to response. The maximal glucose-lowering action for sulphonylureas is usually attained at lower doses (50%) than the manufacturers' recommended daily maximum. Combinations of certain agents, for example a thiazolidinedione, are logical used, and combination preparations are available . The benefits of metformin added to a sulphonylurea were initially less favourable , long-term data have concern. When considering long-term therapy, issues such as tolerability and convenience are important additional considerations. Sulphonylureas are able to alter the rate of progression of hyperglycaemia in patients with type 2 diabetes.

CONCLUSION

Diabetes mellitus is a syndrome, initially characterized by loss of glucose homeostasis resulting from defects in insulin secretion, insulin action both resulting in impaired metabolism of glucose and other energy-yielding fuels such as lipids and proteins . Currently, many countries face large increases in the number of people suffering from Antidiabetic potential of medicinal plants 117 diabetes. The World Health Organization estimated that about 30 million people suffered from diabetesin 1985 and the number increased to more than 171million in 2000. It is estimated that number will increase to over 366 million by 2030 and that large increases will occur in developing countries, in people aged between 45 and 64 years. Experimental diabetes in animals has provided considerable insight into the physiological and bio-chemical derangement of the diabetic state. Many of these derangements have been characterized in hyperglycemic animals. Significant changes in structure and lipid metabolism occur in diabetes. In these cases the structural changes are clearly oxidative in nature and are associated with development of vascular disease in diabetes. In diabetes, increased lipid peroxidation is also associated with hyperlipidemia .The liver, an insulin dependent tissue that plays a vital role in glucose and lipid homeostasis, is severely affected during diabetes. The liver and kidney participate in the uptake, oxidation and metabolic con-version of free fatty acids, synthesis of cholesterol ,phospholipid. During diabetes, found alteration in the concentration and composition of lipids occurs. Despite the great strides that have been made in the understanding and management of diabetes, the disease and disease related complications are increasing unabated . Inspite of the presence of known antidiabetic medicine in the pharmaceutical market, remedies from medicinal plants are used with success to treat this disease. Many traditional plant treatments for diabetes are used throughout the world. Plant drugs and herbal formulations are frequently considered to be less toxic and free from side effects than synthetic ones. Based on the WHO recommendations, hypoglycemic agents of plant origin used in traditional medicine are important. The attributed antihyperglycemic effects of these plants are due to their ability to restore the function of pancreatic tissues by causing an increase in insulin output or a decrease in the intestinal absorption of glucose. Hence, treatment with herbal drugs has an effect on protecting β-cells and smoothing out fluctuation in glucose levels. In general, there is very little biological knowledge on the specific modes on action in the treatment of diabetic .Most plants contains substance that are implicated having antibiotic effects.

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