

Rewiev of manegement of diabetes mellitus by using traditional medicine

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ABSTRACT:-

Traditional Medicines derived from medicinal plants are used by about 60% of the world's population. This review focuses on Indian traditional drugs and plants used in the treatment of diabetes, especially in India. Diabetes is an important human ailment afflicting many from various walks of life in different countries. In India it is proving to be a major health problem, especially in the urban areas. Though there are various approaches to reduce the ill effects of diabetes and its secondary complications, herbal formulations are preferred due to lesser side effects and low cost. A list of medicinal plants with proven antidiabetic and related beneficial effects and of traditional drugs used in treatment of diabetes is compiled. These include, *Allium sativum*, *Eugenia jambolana*, *Momordica charantia*, *Ocimum sanctum*, *Pterocarpus marsupium*, *Tinospora cordifolia*, and *Aloe vera* and *Aloe barbadensis*.

Keywords:-

Medicinal plant, India, antidiabetic, antioxidant, diabetes

I. INTRODUCTION:-

In the last few years there has been an exponential growth in the field of traditional 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 [1]. A number of medicinal plants, traditionally used for over 1000 years named rasayana are present in herbal preparations of Indian traditional health care systems

[2]. In Indian systems of medicine most practitioners formulate and dispense their own recipes

[3]. The World Health Organization (WHO) has listed 21,000 plants, which are used for medicinal purposes around the world. India is the largest producer of medicinal herbs and is called as botanical garden of the world.

[4]. The current review focuses on traditional drug preparations and plants used in the treatment of diabetes mellitus, a major crippling disease in the world leading to huge economic losses

Traditional drug with antidiabetic effect

1) *Allium sativum*: (garlic)



Fig. 1

Order: Asparagales

Family: Amaryllidaceae

Subfamily: Allioideae

Genus: *Allium*

Species: *A. Sativum*

Kingdom: Plantae

This is a perennial herb cultivated throughout India. Oral administration of the garlic Extract significantly decreases serum glucose, total Cholesterol, triglycerides, urea, uric acid, creatinine, AST and ALT levels, while increases serum insulin in Diabetic patient but not in norml person when compared with antidiabetic drug glibenclamide. The Antidiabetic effect of the extract was more effective Than glibenclamide.

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 or insulin sparing effect. S-allyl cystein sulfoxide (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 patient. Apart from this, *Allium sativum* exhibits antimicrobial, anticancer and cardioprotective activities.

A new study has found that consuming garlic could help reduce levels of blood sugar in people suffering from type 2 diabetes, as well as offering other benefits in the treatment of the metabolic condition. Although the research recommends using garlic for reducing blood sugar levels only under the guidance of your doctor, it could provide a range of benefits for diabetics in conjunction with their usual treatments of insulin and diet. It is known that garlic contains more than 400 chemical components, many of which can help prevent and treat a diverse range of health problems, but it is compounds including allicin, allyl propyl disulfide and S-allyl cysteine sulfoxide that raise insulin levels in the blood through the prevention of the liver's inactivation of insulin, so that more insulin is available in the body. The scientists found that moderate amounts of garlic supplements could offer benefits to diabetes patients, and that raw or cooked garlic or aged garlic extract can help to regulate blood glucose and potentially stop or lower the effects of some diabetes complications, as well as fighting infections, reducing bad cholesterol and aiding blood flow.

2) *Eugenia jambulana*:



Fig.2

Order: Myrtales

Family: Myrtaceae

Subfamily: Myrtoideae

Genus: *Syzygium*

Species: *S. cumini*

It is known as jamun belongs to Myrtaceae family. It contains Dried seeds and mature fruits of *Eugenia jambolana*. It contains malvidin 3-laminaribioside and ferulic acid as active constituents. Extract of dried seeds (200 mg/kg) used for treatment of diabetic patients. Ayurveda suggests Jamun as a highly effective fruit while fighting against diabetes. The seeds of the fruit have active ingredients called jamboline and jambosine that slow down the rate of sugar released into the blood and increases the insulin levels in the body. It converts starch into energy and reduces the symptoms of diabetes such as frequent urination and thirsting. 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 patient 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 patients. Insulin secretion was found to be stimulated on incubation of plant extract with isolated islets of Langerhans from normal as well as diabetic animals. These extracts also inhibited insulinase activity from liver and kidney.

Diabetic patients can consume jamun fruit daily to control their sugar levels, which certainly helps to enhance the insulin activity and sensitivity. In addition, seeds powder can be taken as an adjuvant both for type-2 diabetes, insulin dependent or non-insulin dependent. The real benefit is at the stage of IFG (Impaired fasting glucose) which can be well-controlled with jamun, both with fruit as well as the seed powder. Regulation of IFG prevents the early onset of diabetes and further conditions.

4) *Momordica charantia*: (bitter gourd)



Fig.4

Order: Cucurbitales
Family: Cucurbitaceae
Genus: Momordica
Species: *M. charantia*
Kingdom: plantae

Bitter melon is linked to lowering the body's blood sugar. This is because the bitter melon has properties that act like insulin, which helps bring glucose into the cells for energy. The consumption of bitter melon can help your cells use glucose and move it to your liver, muscles, and fat. The melon may also be able to help your body retain nutrients by blocking their conversion to glucose that ends up in your blood stream. Bitter isn't an approved treatment or medication for prediabetes or diabetes despite the evidence that it can manage blood sugar.

Momordica charantia 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. This may be because of inhibition of glucose-6-phosphatase besides fructose-1, 6-biphosphatase in the liver and stimulation of hepatic glucose-6-phosphate dehydrogenase activities.

5) *Pterocarpus marsupium*:



Fig.5

Order: Fabales
Family: Fabaceae
Genus: *Pterocarpus*
Species: *P. marsupium*
Kingdom: plantae

Pterocarpus marsupium, also known as Malabar kino, Indian kino tree, or vijayasar. It is a deciduous moderate to large tree found in India mainly in hilly region. It is widely used in 'Ayurveda' as 'Rasayana' for Management of various metabolic disorders. An Aqueous extract of *P. marsupium* wood, at an oral Dose of 250 mg/kg, shows statistically significant Hypoglycemic activity. Marsupin, pterosupin and Iquiritigenin obtained from this plant show Antihyperlipidemic activity, its active principle, has been found to be insulinogenic, enhancing insulin Release and conversion of proinsulin to insulin in Vitro. Like insulin, (-) epicatechin stimulates oxygen Uptake in fat cells and tissue slices of various organs, increases glycogen content of rat diaphragm in a 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 extract. Flavonoid fraction from *Pterocarpus marsupium* has been shown to cause pancreatic beta cell regeneration. Marsupin, pterosupin and Iquiritigenin obtained from this plant showed antihyperlipidemic activity. Epicatechin, its active principle, has been found to be insulinogenic, enhancing insulin release and conversion of proinsulin to insulin in vitro. 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.

6) *Tinosporacordifolia*: (Guduchi)



Fig.6

Family: Menispermaceae

Genus: *Tinospora*

Species: *T. cordifolia*

Order: Ranunculales

Kingdom: Plantae

It is well-known as guduchi and consists of the Menispermaceae family. The active constituents of *T. cordifolia* are diterpene compounds which consist of tinosporone, tinosporic acid, syringin, berberine and gilosin. Root extract of *T. cordifolia* (50-200mg/kg) shows decrease in blood and urine sugar in streptozotocin-induced diabetic rats during oral administration for 6 weeks. It is mostly used in Indian ayurvedic medicines for the treatment of diabetes. Root extract also prevents the reduction of body weight [24] [28-37]. Various plant parts such as roots, stem, leaves and fruits are extracted by maceration, infusion, percolation, decoction and Soxhlet extraction generally. Mostly various solvents are used such as ethanol, methanol and petroleum ether.

It is a large, glabrous, deciduous climbing shrub. It is widely distributed throughout India and commonly known as Guduchi. Oral administration of the extract of *Tinospora cordifolia* (*T. cordifolia*) 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 and brain lipids. 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. *Tinospora cordifolia* extracts are extensively used in various herbal preparations for the treatment of different ailments for its anti-periodic, anti-spasmodic, anti-microbial, anti-osteoporotic, anti-inflammatory, anti-arthritis, anti-allergic, and anti-diabetic properties.

7) *Aloe vera*:



Fig.7

Family: Asphodelaceae

Order: Asparagales

Species: *A. vera*

Genus: *Aloe*

Aloe, a popular houseplant, 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 increase glucose tolerance in both normal and diabetic patients. 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 patients. This action of Aloe vera and its bitter principle is through stimulation of synthesis and release of insulin from pancreatic beta cells. This plant also has an anti-inflammatory activity in a dose dependent manner and improves wound healing in diabetic patients. Aloe vera juice can help improve blood glucose levels and may therefore be useful in treating people with diabetes. Decreased blood lipids (fats) in patients with abnormally high levels of these molecules in the blood (e.g., some people with type 2 diabetes) and/or acute hepatitis (liver disease) Decreased swelling and faster healing of wound injuries. Leg wounds and ulcers are common complications of diabetes, and they typically take longer time to heal than in healthy non-diabetic individuals.

It is known as Ghikanvar which belongs to Liliaceae family. It looks like a cactus plant with green blade shaped leaves that are heavy narrowing, hairy and filled with clear viscid gel. Oral administration of aqueous extract of Aloe Vera in a dose of 150mg/kg of body weight significantly lowering the blood glucose level.

Aloe Vera gel consists various therapeutic effects such as anti-diabetic, antioxidant, increases the decrease level of Glutathione by four times in diabetic rats. Aloe Vera gel at 200 mg/kg possesses significant anti-diabetic, cardioprotective activity, reduces the increased TBARS, maintains the Superoxide dismutase and Catalase activity up to the normal level and increases reduced glutathione by four times in Diabetic rats.

There is no fixed rule of drinking aloe vera juice, one should have it in a certain quantity and way to get most of it.

6 ounces a day for an average human being.

1 tbsp aloe vera juice per day for people with diabetes.

20 ml aloe vera juice with water everyday for weight loss.

50 ml of aloe vera juice a day to ease constipation.

People have experimented with multiple aloe vera juice dosages for diabetes. A specific dose of it is unclear. Consuming 15-150 ml juice every day of aloe vera for 4-14 weeks can prove effective, or you can use one tablespoon of aloe gel to control blood sugar levels.

8) Acacia Arabica:



Fig.8

Order: Fabales

Family: Fabaceae

Genus: Vachellia

Species: V. nilotica

The role of Acacia Arabica extract as an antidiabetic source of flavonoids, gallotannins, amino acids and other related polyphenols which have hypoglycemic, antihyperlipidemic, and of these substances with their anti-oxidant properties. It is found all over India mainly in the wild habitat. The plant extract acts as an antidiabetic agent by acting as secretagogue 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 patient induced hypoglycemic effect by initiating release of insulin from pancreatic beta cells.

Acacia Arabica seeds contained a substance(s) which depressed the blood glucose level in normoglycemic but not in alloxan-diabetic rabbits, suggesting that the mechanism of action involved release of insulin from Pancreatic beta-cells. The bark in the form of decoction (20 mg/kg) as well as the standard drug tolbutamide produced a significant reduction in blood glucose levels in mild alloxanized diabetic rabbits fasted for 18 hr 38 The A. nilotica ssp. Indica fed for one week were found to exhibit hypoglycaemic effect (blood sugar lowered By 25.05%,) in normal rats, but did not show any Significant hypoglycaemic effect in alloxanized diabetic Rats (blood sugar lowered by 2.14%). The Hypoglycaemic effect of the legumes

was due to its Direct or indirect stimulation of β -cells of islets of Langerhans to secrete more insulin.

Diabetes mellitus was induced by a single intraperitoneal injection of freshly prepared STZ (Sigma, St. Louis, MO, USA), with a dose of 50 Mg/kg body weight, freshly dissolved in 0.1 M citrate Buffer (pH-4.5). The STZ is dissolved so that 50 mg/kg Body weight is equivalent to a volume of 1 ml/kg body Weight.²⁰ Diabetes was developed and stabilized in these STZ-treated rats over a period of 5 days after which Diabetes was confirmed by measuring blood glucose concentration. Rats with blood glucose levels of above 200 mg/dl were considered to be diabetic and used for the study. The control animals were given the citrate buffer (pH-4.5 the study)

9) *Mangifera indica*: (Mango)



Fig.9

Order: Sapindales
Family: Anacardiaceae
Genus: *Mangifera*
Species: *M. indica*

It is commonly known as mango and consists of family Anacardiaceae. Managing blood sugar levels is important for diabetics. mango leaves can exhibit surprising effects on controlling blood sugar and managing diabetes. Mango leaves are loaded with pectin, vitamin C and fibre. They can help in regulating blood sugar level. Drinking mango leaves infused water regularly can be good for diabetics. Mango leaf extract (Mangiferin) has the ability to inhibit the enzyme alpha glucosidase, which helps reduce carbohydrate metabolism in intestine, and hence blood glucose levels. Mango leaves have the capability to improve insulin production and distribution of glucose. They can help in stabilising blood sugar levels. Mango leaves are also loaded with pectin, vitamin C and fibre. Together they are beneficial for both diabetes and cholesterol.

Anti diabetic activity shows by leaves extract (250 Mg/kg) but oral administration of aqueous extract did not change the blood glucose level in alloxan induced diabetic patients. 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 *Mangifera indica* possess hypoglycemic activity. This may be due to an intestinal reduction of the absorption of glucose. The aqueous extract produces reduction of blood Glucose level in normoglycemic and glucose-induced Hyperglycemia, but does not have any effect on Streptozotocin-induced diabetic mice under the Same conditions when compared with that of an Oral dose of chlorpropamide. The result indicates That the aqueous extract of the leaves of *M. indica* Possess hypoglycemic activity.

The present study was undertaken to screen the hypoglycemic and antihyperglycemic activity of both ethanol and water extracts of leaves and stem-barks of *M. indica* in nondiabetic and diabetic model rats in different prandial state. The results showed that all of the extracts had significant antihyperglycemic effect in type 2 diabetic model rats when fed simultaneously with glucose load ($p < 0.05-0.01$; $p < 0.005-0.001$). Moreover, the ethanol extract of stem-barks showed significant antihyperglycemic effect when the extract was fed 30 min prior to the glucose load

($p < 0.01$). Investigations were carried out to evaluate the effect of *M. indica* on glucose absorption using a rat intestinal preparation in situ. The ethanol extracts of stem-barks reduced glucose absorption gradually during the whole perfusion period in type 2 diabetic patients.

10) Banaba: (*Lagerstroemia speciosa*)



Fig.10

Order: Myrtales

Family: Lythraceae

Genus: Lagerstroemia

Species: *L. speciosa*

It is commonly called as Queen's flower pride of India, giant crape-myrtle or queen's crape-myrtle. It belongs to the family Loosetrife. Queen's flower is a deciduous tropical flowering tree growing up to 50 ft. tall, it has smooth rounded, red-orange leaves having higher levels of corosolic acid. It lowers blood sugar levels (hypoglycemic effect), facilitates glucose transport into cells and reduces amount of triglycerides. Tea of the leaves is used against diabetes mellitus and for weight loss. Banaba leaves are able to lower blood sugar due to acid (triterpenoid glycoside) and other phytochemicals. The phytochemicals in the leaves of banaba works at the molecular level by fine-tuning the damaged insulin receptor, which is the cause of insulin resistance. Glucose uptake-inducing activity of banaba extract was investigated in differentiated adipocytes using a radioactive assay, and the ability of banaba extract to induce differentiation in preadipocytes was examined by Northern and Western blot analyses

[4]. Studies on the efficacy and safety of banaba (*Lagerstroemia speciosa* L.) and corosolic acid have been performed and no adverse effects of it have been observed or reported in animal studies or controlled human clinical trials [5]. The hypoglycemic effects of banaba have been attributed to both corosolic acid as well as ellagitannins. Studies have been conducted in various animal models, human subjects, and in vitro systems using water soluble banaba leaf extracts, corosolic acid, and ellagitannins. Corosolic acid has been reported to decrease blood sugar levels within 60 min in human subjects. Corosolic acid also exhibits antihyperlipidemic and antioxidant activities.

Banaba (*Lagerstroemia speciosa* L.) has been used as a folk medicine to treat diabetes in various parts of the world, primarily southeast Asia. The hypoglycemic affect of aqueous (hot water) and methanol extracts have been demonstrated in several animal models as well as a number of human studies. Most studies have focused on corosolic acid, which is isolated with an organic solvent from the leaves of the plant, and corosolic acid is used to standardize Banaba extracts [1, 2]. Some studies indicate that ellagitannins in water soluble fractions may be responsible for at least some of the insulin-like activity of Banaba, and the antioxidant and glucose regulatory properties of tannins.

11) Fenugreek: (*Trigonella foenum-graecum*)



Fig.11

Order: Fabales

Family: Fabaceae

Genus: Trigonella

Species: *T. foenum-graecum* is an herb found all over India and its seeds are usually used as one of the major constituents of Indian spices. Fenugreek a member of the legume family, has a bitter, maplelike taste. Fenugreek is used to treat numerous health problems, including insulin resistance, diabetes, poor appetite, inflammation, digestive problems and menopausal symptoms. 4-hydroxyisoleucine, a novel amino acid from fenugreek seeds increases glucose stimulated insulin release. In animal experiments, it has been shown that oral administration of plant extract decreased the blood glucose levels. Administration of fenugreek seeds improved glucose metabolism and reduced hepatic and renal glucose-6-phosphatase and fructose-1,6-biphosphatase activity

Chemical constituents of the plant include saponins, many of which are glycosides of diosgenin. The seeds also contain the alkaloids trigonelline, gentianine, and carpine compounds. Other components of the seeds include several C-glycosides. The seeds contain up to 50% mucilaginous fibre. Other seed constituents include 4-hydroxyisoleucine, an amino acid, and fenugreekine. Fenugreek is thought to delay gastric emptying, slow carbohydrate absorption, and inhibit glucose transport. It has been shown to increase erythrocyte insulin receptors and improve peripheral glucose utilization, thus showing potential pancreatic as well as extrapancreatic effects. Various components of the seeds have varying activities. For example, the component called fenugreekine, a steroidal saponin peptide ester, may have hypoglycaemic properties. Trigonelline, another component, may exert hypoglycaemic effects in healthy patients without diabetes, but other studies have shown that fenugreek has no effect on fasting or postprandial blood glucose levels in nondiabetic subjects.

12) Holy basil: (*Ocimum sanctum*)



Fig.12

Order: Lamiales

Family: Lamiaceae

Genus: *Ocimum*

Species: *O. tenuiflorum*

It is commonly called as Holy Basil, Tulsi, or Tulasi. Holy Basil is a tropical, much branched, annual herb, upto 18 inches tall, it grows into a low bush. Along with its religious significance, it also has substantial medicinal meaning and is used in Ayurvedic treatment. It may have a positive effect on fasting blood sugar and on blood sugar following meals. The plant plays a role in the management of immunological disorders such as allergies and asthma. The juice of the leaves is used against diabetes and fever. It's anti-spasmodic properties, relieves abdominal pains and helps in lowering the blood sugar level. Some of the phytochemical constituents of tulsi are oleanolic acid, ursolic acid, rosmarinic acid, eugenol, carvacrol, linalool, and β -caryophyllene (about 8%). Tulsi essential oil consists mostly of eugenol (~70%) β -elemene (~11.0%), β -caryophyllene (~8%), and germacrene (~2%), with the balance being made up of various trace compounds, mostly terpenes.

Tulsi leaves are known as elixir of life because of their diverse healing properties. From warding off some of the most common ailments, strengthening immunity, to fighting bacterial & viral infections-the benefits of tulsi are multifarious. This herb is said to improve pancreatic beta-cell function and insulin secretion, and further increases the uptake of glucose by

muscle cells. Tulsi leaves are said to have hypoglycaemic properties, which lower blood sugar levels and help prevent complications of diabetes.

How to use tulsi leaves to manage diabetes naturally?

- You can chew some tulsi leaves every day in order to soak all the goodness from them.
- You could also make some tulsi tea by adding a few leaves in boiling water. After about two- three minutes, strain the water and drink a cupful every day.
- Soak some tulsi leaves in water and leave it overnight and drink the tulsi water first thing in the morning on an empty stomach.

13) Ginseng: (Panax/Eleutherococcus)



Fig.13

Order: Apiales
Family: Araliaceae
Genus: Eleutherococcus
Species: E. senticosus

Ginseng is a slow-growing perennial plant with fleshy roots, belonging to the genus *Panax* of the family Araliaceae. A variety of products are called “ginseng.” The most commonly used are three different botanicals: Asian or Korean ginseng (*Panax ginseng* C.A. Meyer), American ginseng (*Panax quinquefolius* L.), or Russian or Siberian ginseng (*Eleutherococcus senticosus* Maxim). Root of Asian ginseng is useful in reducing the level of glucose in the blood. It has the ability to enhance the release of insulin from the pancreas and increase the number of insulin receptors. In clinical studies, Asian ginseng has demonstrated a

direct blood-sugar lowering effect. American ginseng has also been demonstrated to reduce postprandial glycemia in nondiabetic subjects and subjects with type 2.

Previous study designed to screen the effect of syringin; an active principle purified from the rhizome and root parts of *Eleutherococcus senticosus*, on the plasma glucose demonstrated decrease in plasma glucose in a dose-dependent manner 1 hr after intravenous injection of syringin into fasting wistar rats. The results suggest that syringin has an ability to raise the release of acetylcholine from nerve terminals, which in turn stimulate muscarinic M3 receptors in pancreatic cells and augment the insulin release to result in plasma glucose lowering action.

Ginseng contains a family of steroid-like compounds called ginsenosides. Although there are many subtypes, ginsenosides are tetracyclic triterpenoid saponin glycosides thought to have various hormonal and central nervous system (CNS) effects. Some ginseng compounds show contradictory effects; for example, ginsenoside Rg1 has hypertensive and CNS-stimulant effects, whereas ginsenoside Rb1 has hypotensive and CNS-depressant effects. “Ginseng abuse syndrome” is a controversial adverse effect that was reported in 14 of 133 long-term users of high daily doses. This syndrome consisted of hypertension, nervousness, sleeplessness, skin eruptions, increased libido, and morning diarrhea.

14) Chamomile (*Matricaria chamomilla*) and chamomile tea



Fig.14

Family: Asteraceae.

Species: *Matricaria recutita*

Genus: *Chamomilla*

Chamomile or camomile is the common name for several daisylike plants of the family Asteraceae. Chamomile tea has shown some evidence of being able to lower blood sugar and thus prevent the progression of type-2 diabetes and prevent some of the damage associated with high blood sugar levels. Studies have exhibited the effects of chamomile hot water extract and its major components on the prevention of hyperglycemia and the protection or improvement of diabetic complications in diabetes mellitus [50]. Chamomile extract showed potent inhibition against aldose reductase (ALR2), and its components, umbelliferone, esculetin, luteolin, and quercetin, have been shown to significantly inhibit the accumulation of sorbitol in human erythrocytes. These results clearly suggested that daily consumption of chamomile tea with meals could contribute to the prevention of the progress of hyperglycemia and diabetic complications.

The chamomile tea group had significantly reduced HbA1c and serum insulin levels, as well as significantly increased total antioxidant capacity compared to those in the control group. The researchers concluded that chamomile tea could be useful in reducing diabetes risk factors. They added: "Short-term intake of chamomile tea has beneficial effects on glycemic control and antioxidant status in patients with type 2 diabetes." However, the researchers noted that a larger sample population and a longer intervention period would be necessary in order to demonstrate significant clinical improvements.

15) Blueberry:



Fig.15

Order:Ericales

Family:Ericaceae

Genus:*Vaccinium*

It is a low-growing shrub belonging to the genus *Vaccinium* (family Ericaceae) bearing edible, nearly black berries. They are closely related to the European bilberry. There are several species of blueberries exist- including *V. pallidum* and *V. corymbosum* and grow throughout the United States. Its leaves are the primary part of the plant used medicinally. Blueberry is a natural method of controlling or lowering blood sugar levels the leaves have an active ingredient with a remarkable ability to get rid the body of excessive sugar in the blood. It is a good astringent and helps relieve of the kidney, bladder and prostate Various independent studies have concluded bilberry as a possibly effective use for treatment of eye problem linked to diabetes. blueberry may help prevent diabetes related blood vessel damage known Figure 14 Indian Kino (*Pterocarpus marsupium*). to affect the retina nerve and vessel functions. Anthocyanosides are bioflavonoids, chemical constituents in bilberry fruit thought to be responsible for some of its vascular effects. Anthocyanosides are thought to decrease vascular permeability and redistribute micro vascular blood flow. They are similar to some of the agents in grape seed. The mechanism in diabetes may be related to the high chromium content in bilberry leaf (9 parts per million), but further research is needed to determine this.

II. CONCLUSION:

There is a continuous rise in the prevalence of diabetes cases. Major cause is our eating habits and sedentary lifestyle, even gestational diabetes is not uncommon. Active lifestyle and proper medical intervention can prevent progression to diabetes. Natural God gifted herbs that prevent diabetes have no ill side effects unlike the man-made market pharmaceuticals and food enhanced chemicals. Incorporating these herbs in our daily routine can surely help pre-diabetes stay healthy for longer time without progressing to type-2 diabetes.

Although the above-described herbs have potential to help prediabetics maintain lower blood sugar and reach a Hemoglobin A1c goal of <7.0, but much more research is needed. Many different plants have been used individually or in formulations for treatment of diabetes and its complications. One of the major problems with herbal formulation is that the active ingredients are not well defined. It is important to know the active component and their molecular interaction, which will help to analyse therapeutic efficacy of the

product and also to standardize the product. Major hindrance in amalgamation of herbal medicine in modern medical practices is lack of scientific and clinical data proving their efficacy and safety. Efforts are now being made to investigate mechanism of action of some of these plants using model systems. Though information is available about some of the herbs included in the text, there is a need for conducting clinical research in herbal drugs, developing simple bioassays for biological standardization, pharmacological and toxicological evaluation, and developing various animal models for toxicity and safety evaluation of most of them.

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