A Review on Anti-Diabetic Herbs

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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 herbal drugs and plants used in the treatment of diabetes, especially in India. More than 400 traditional plant treatments more than 400 traditional plant treatments for diabetes mellitus have been recorded, but only a small number of these have received scientific and medical evaluation to assess their efficacy. Traditional treatments have mostly disappeared in occidental societies, but some are prescribed by practitioners of alternative medicine or taken by patients as supplements to conventional therapy. However, plant remedies are the mainstay of treatment in underdeveloped regions. A hypoglycemic action from some treatments has been confirmed in animal models and non-insulin-dependent diabetic patients, and various hypoglycemic compounds have dependent diabetic patients, and various hypoglycemic compounds have been identified. A botanical substitute for insulin seems unlikely, but traditional treatments may provide valuable clues for the development of new oral hypoglycemic agents and simple dietary adjuncts. Simple dietary adjuncts. A list of medicinal plants with proven Antidiabetic a list of medicinal plants with proven Antidiabetic and related beneficial effects and of herbal drugs used in treatment of diabetes is compiled. These include bael, banana, black berry, fenugreek, garlic, neem, tulasi, ginger, turmeric and sweet potato.**

***Index terms*- Diabetes, Antidiabetic Herbs**

INTRODUCTION

What is diabetes?

As per WHO Diabetes mellitus is define as " a heterogeneous metabolic disorder characterized by common feature of chronic hyperglycemia with disturbance of carbohydrate, fat and protein metabolism."

Major features of metabolic syndrome are central obesity, hypertriglyceridemia, low LDL cholesterol, hyperglycemia and hypertension. It is expected to continue as a major health problem owing to its serious complications, especially end-stage renal disease, IHD, gangrene of the lower extremities and blindness in the adults.

Diabetes is the condition in which the body does not properly process food for use as energy. Most of the food we eat is turned into glucose, or sugar, for our bodies to use for energy. The pancreas, an organ that lies near the stomach, makes a hormone called insulin to help glucose get into the cells of our bodies.

Both insulin and glucagon, pancreatic endocrine hormones, are responsible for controlling blood-glucose level within the body in an adequate level based on the body needs. Normally, insulin is secreted by the β-cells found at the islets of Langerhans in response to high levels of blood sugar. It potentiates the ability of muscle, red blood cells, and fat cells to absorb sugar out of the blood and consume it in other metabolic processes, which restore the sugar levels to the normal level

Types of Diabetes mellitus-

There are mainly two types of the diabetes mellitus discussed as bellows:

1. Type 1

Type 1 diabetes, previously called insulin-dependent diabetes mellitus (IDDM) or juvenile-onset diabetes, may account for 5 percent to 10 percent of all diagnosed cases of diabetes. Risk factors are less well

defined for Type 1 diabetes than for Type 2 diabetes, but autoimmune, genetic, and environmental factors are involved in the development of this type of diabetes.

2. Type 2

Type 2 diabetes was previously called non-insulin-dependent diabetes mellitus (NIDDM) or adult-onset diabetes. Type 2 diabetes may account for about 90 percent to 95 percent of all diagnosed cases of diabetes. Risk factors for Type 2 diabetes include older age, obesity, and family history of diabetes, prior history of gestational diabetes, impaired glucose tolerance, physical inactivity, and race/ethnicity. African Americans, Hispanic/Latino Americans, American Indians, and some Asian Americans and Pacific Islanders are at particularly high risk for type 2 diabetes.

Gestational diabetes develops in 2 percent to 5 percent of all pregnancies but usually disappears when a pregnancy is over. Gestational diabetes occurs more frequently in African Americans, Hispanic/Latino Americans, American Indians, and people with a family history of diabetes than in other groups. Obesity is also associated with higher risk. Women who have had gestational diabetes are at increased risk for later developing Type 2 diabetes. In some studies, nearly 40 percent of women with a history of gestational diabetes developed diabetes in the future.

Symptoms of Diabetic

1. Frequent urination.
2. Excessive thirst.
3. Unexplained weight loss.
4. Extreme hunger.
5. Sudden vision changes.
6. Tingling or numbness in hands or feet.
7. Feeling very tired much of the time.
8. Very dry skin.
9. Sores that is slow to heal.
10. More infections than usual.

How Does Diabetes Affect The Body?

When someone has diabetes, their body can't maintain healthy levels of glucose in the blood. Glucose is a form of sugar which is the main source of energy for our bodies. Unhealthy levels of glucose in the blood can lead to long term and short term health complications for our bodies to work properly we need to convert glucose (sugar) from food into energy. A hormone called insulin is essential for the conversion of glucose into energy. In people with diabetes, insulin is no longer produced or not produced in sufficient amounts by the body. When people with diabetes eat glucose, which is in foods such as breads, cereals, fruit and starchy vegetables, legumes, milk, yoghurt and sweets, it can' t be converted into energy. Instead of being turned into energy the glucose stays in the blood resulting in high blood glucose levels. After eating, the glucose is carried around your body in your blood. Your blood glucose level is called glycaemia. Blood glucose levels can be monitored and managed through self-care and treatment.

The Normal level of glucose in blood

Blood Glucose Levels		
CATEGORY	FASTING VALUE	2 HOURS AFTER EATING
Normal	70-100 mg	<140 mg
Early Diabetes	101-126 mg	140-200 mg
Established Diabetes	>126 mg	>200 mg

Advantages of Herbal Drugs Over Allopathic Drugs -

Allopathic drugs used for the treatment of diabetes have their own side effect & adverse effect like hypoglycaemia, nausea, vomiting, hyponatremia, flatulence, diarrhea or constipation, alcohol flush, headache, weight gain, lactic acidosis, pernicious anemia, dyspepsia, dizziness, joint pain. So instead of allopathic drugs, herbal drugs are a great choice which is having more or less no side effect & adverse effects.

The main advantages include of herbal drugs

- Natural Healing: herbal medicine doesn't obstruct the body's self-healing abilities in any way. On the contrary, they enhance the biological healing machinery so that the recovery process gets accelerated and the body is able to maintain an ideal internal environment that is crucial for such recovery.
- Continued Benefits: A lot of herbal remedies come with special instructions about diet, rest, and exercises that enhance the potency of the herb by preparing the body in such a way that it

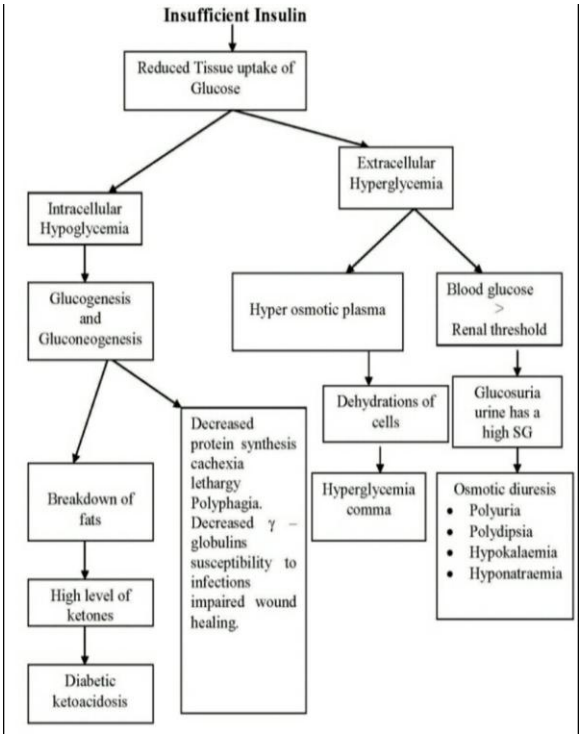
responds to the treatment in the most effective and desirable way. These dietary and lifestyle changes ultimately help the patient by getting their bodies into a healthy rhythm.

- Better Immunity: Owing to their tendency of enhancing the body's natural healing process and correcting bad habits that lead to ill-health, herbs contribute towards strengthening the immune system.
- Metabolism and Nutrition: A stronger immune system and a holistically regulated diet and lifestyle lead to improved metabolism, which in turn leads to better absorption of nutrition from one's diet.
- Side effects: the contraindications are minimal when herbal medication is taken as per prescription and under the supervision of a qualified practitioner.

ALLOPATHIC DRUGS	HERBAL DRUGS
Diabetes Medications: Many different types of medications are available to help lower blood sugar levels in people with type 2 diabetes. Each type works in a different way. It is very common to combine two or more types to get the best effect with fewest side effects. Sulfonylurea: These drugs stimulate the pancreas to make more insulin. Biguanides: These agents decrease the amount of glucose produced by the liver. Alpha-glucosidase inhibitors: These agents slow absorption of the starches and glucose. Thiazolidinediones: These agents increase sensitivity to insulin. Meglitinides: These agents stimulate the pancreas to make more insulin. D-phenylalanine derivatives: These agents stimulate the pancreas to produce more insulin more quickly. Amylin synthetic derivatives: Amylin is a naturally occurring hormone secreted by the pancreas along with insulin. An amylin derivative, such as pramlintide (Symlin), is indicated when blood sugar control is not achieved despite optimal insulin therapy. Incretin mimetics: Exenatide (Byetta) was the first incretin mimetic agent approved in the United States. It is indicated for diabetes mellitus type 2 in addition to metformin or a sulfonylurea when these agents have not attained blood sugar level control alone. Insulins: Synthetic human insulin is now the only type of insulin. It is less likely to cause allergic reactions than animal-derived varieties of insulin used in the past. Different types of insulin are available and categorized according to their times of action onset and duration. Examples of rapid-acting insulins – Regular insulin (Humulin R, Novolin R) Insulin lispro (Humalog)	Herbs for diabetes treatment are not new. Since ancient times, plants and plant extracts were used to combat diabetes. Here are some herbs that have been confirmed by scientific investigation, which appear to be most effective, relatively non-toxic and have substantial documentation of efficiency. Cinnamon: Cinnamon is the inner bark and has insulin-like properties, which able to decrease blood glucose levels as well as triglycerides and cholesterol, all of which are important especially for type 2 diabetes patients. Pterocarpus marsupium : It demonstrates to reduce the glucose absorption from the gastrointestinal tract, and improve insulin and pro-insulin levels. It also effective in β cell regeneration. Bitter melon (Momordica charantia): It lower blood glucose concentrations and acts on both the pancreas and in nonpancreatic cells, such as muscle cells.. These include charantin and an insulin-like protein referred to as polypeptide-P, or plant insulin. Gynema Sylvestre : It improves the ability of insulin to lower blood sugar in both type I and type II diabetes. This herb is showing up in more and more over the counter weight loss products and blood sugar balancing formulas. Onion: It consists of an active ingredient called APDS (allyl propyl disulphide) and it block the breakdown of insulin by the liver and possibly to stimulate insulin production by the pancreas, thus increasing the amount of insulin and reducing sugar levels in the blood. Fenugreek (Trigonella foenum-graecum): The fiber-rich fraction of fenugreek seeds can lower blood sugar levels in people with diabetes, and to a lesser extent, for lowering blood cholesterol,weight control. Ginkgo Biloba: The extract may prove useful for prevention and treatment of early-stage diabetic neuropathy. It has also been shown to prevent diabetic retinopathy. Banaba (Lagerstroemia speciosa): Banaba possesses the powerful compound corosolic acid and tannins, including lagerstroemin that lends itself to the treatment of diabetes. These ingredients are thought to stimulate glucose uptake and have insulin-like activity Babhul (Acacia arabica): The plant extract acts as an antidiabetic agent by acting as secretagouge to release insulin. Bengal Quince, Bel or Bilva (Aegle marmelos): Administration of aqueous extract of leaves improves digestion and reduces blood sugar and urea, serum cholesterol. Along with exhibiting

Insulin aspart (Novolog) Insulin glulisine (Apidra) Prompt insulin zinc (Semilente, slightly slower acting) Examples of intermediate-acting insulins – Isophane insulin, neutral protamine Hagedorn (NPH) (Humulin N, Novolin N) Insulin zinc (Lente) Examples of long-acting insulins – Extended insulin zinc insulin (Ultralente) Insulin glargine (Lantus) Insulin detemir (Levemir)	hypoglycemic activity, this extract also prevented peak rise in blood sugar at 1h in oral glucose tolerance test. Garlic (Allium sativum): This effect is thought to be due to increased hepatic metabolism, increased insulin release from pancreatic β cells and/or insulin sparing effect, thus decreased fasting blood glucose, and triglyceride levels in serum in comparison to sucrose controls. Indian Goose Berry, Jamun (Eugenia jambolana): 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. Holy Basil (Ocimum sanctum): Significant reduction in fasting blood glucose, uronic acid, total amino acid, total cholesterol, triglyceride and total lipid indicated the hypoglycemic and hypolipidemic effects of tulsi in diabetes.

Pathophysiology of diabetes-



ANTIDIABETIC HERBS

01) Bael-

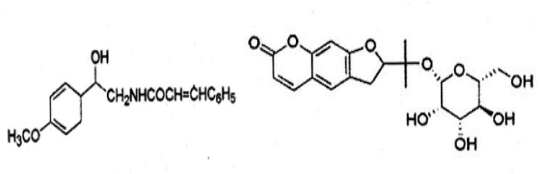
Synonym:- Bel, Indian Bael.

Family:- Rutaceae.

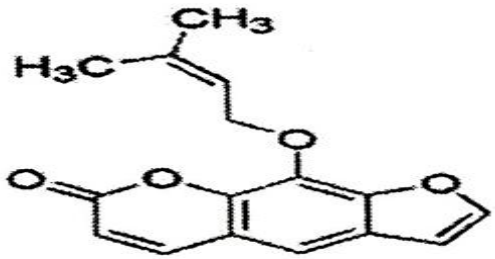
Parts used: Fruit & leaves.

Chemistry:

Tannins, active principle (marmelosin), alkaloids (aegelin & aegelinin) and coumarin (marmesin).The drug also contain carbohydrates (11-17%), protein, Vitamin C, Vitamin A and volatile oil.



Aegelin Marmesinin



Marmelosin

Pharmacological Action:

A. marmelos methanol extract decreased blood sugar in alloxan diabetic rats, lowering its oxidative stress evidenced by reducing serum and liver lipid peroxidation, conjugated diene and hydroperoxide levels, elevating catalase, glutathione peroxidase, superoxide dismutase and reduced glutathione levels. This relevant hypoglycemic effect is probably attributed to its coumarins. That stimulates insulin secretion from the pancreatic beta cells in the islets of Langerhans.

The oral administration of its seeds aqueous extract showed a significant reduction in FBG level. Besides, it decreased total cholesterol level, LDL and triglyceride with concomitant elevation in HDL.

However, oral and intraperitoneal administration of the fruit aqueous extract showed antidiabetic activity in STZ induced diabetic rats. It significantly reduced the blood-glucose level as well as glycosylated hemoglobin, while elevating both serum insulin and liver glycogen. The fruit extract at a dose of 250 mg/kg was found to be more potent than glibenclamide.

02) Ginger-

Synonym:- Sunthi, Zingiber.

Family:- Zingiberaceae.

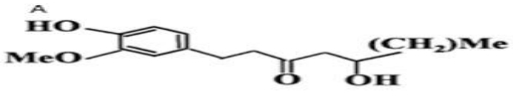
Parts used:- Rhizome and bulb.

Chemistry:-

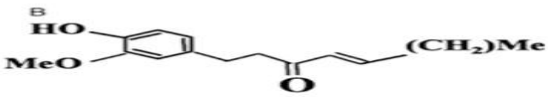
Ginger consist of volatile oil (1-4%), starch (40-60%), fat (10%0, fiber (5%), Inorganic material (6%), residual moisture (10%) and acrid resinous (5-8%). Ginger oil is constituted of monoterpene hydrocarbons, sesquiterpene hydrocarbons, oxygenated mono and phenyl propanoids.

Aroma and flavour are the main characters of the ginge. Aroma is due to fragrant principle of volatile oil while the flavour pungency and pharmacological action is exerted by phenolic ketonrs of oleo-resin.

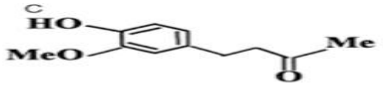
Phenolic ketones oleo resins include gingerols like shagaols, gingerone, paradols, gingediols, o-methyl ethers.



Gingerols



Shogaols



Zingerone

Pharmacological Action:-

It is commonly known as ginger, belonging to family Zingiberaceae. The juice of Z. officinal rhizome exhibited a pronounced increase in serum insulin together with a marked decrease in FBG levels in STZ induced diabetic rats. It also exerted suppression in serum cholesterol, triglyceride and blood pressure in diabetic rats. This glycemic control particularly involves serotonin (5-HT) receptors. Ginger extracts stimulate the 3T3-L1 preadipocytes differentiation. Recent studies showed that gingerol, its chief active constituent, enhanced cell-mediated glucose uptake via increasing insulin-sensitivity, thus improving chronic disease, as diabetes.

03) Garlic

Synonym:- Allium.

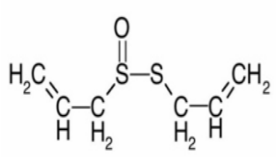
Family:- Liliaceae.

Parts used:- Ripe Bulbs.

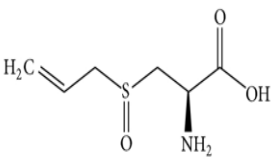
Chemistry:-

Garlic bulb contains carbohydrates (29%), proteins (56%), fat (0.1%), mucilage, volatile oil (0.06%). It also contains phosphorus, iron and copper.

Volatile oil of the drug is the chief active constituents and contains allyl propyl disulphide, diallyl disulphide, alliin and allicin. Allin by action of enzyme allinlyase is converted into allicin. Garlic oil is yellow in colour.



Allicin



Alliin

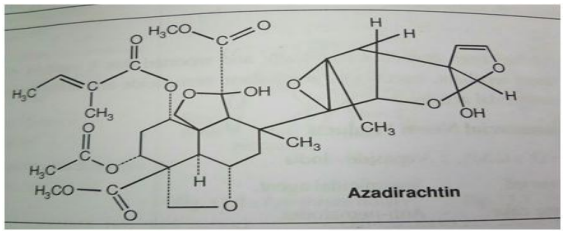
Pharmacological Action:-

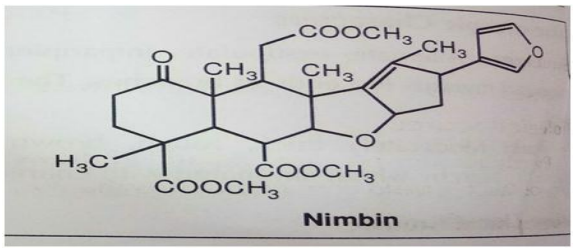
The main active components present are sulfur-containing compounds being diallyl disulfide (allicin) in garlic and allyl propyl disulfide (APDS) in onions. These active secondary metabolites present in the

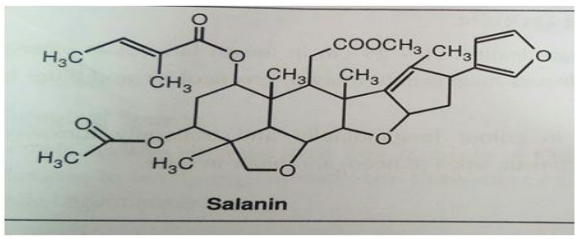
form of cysteine derivatives, as. S-alkyl cysteine sulfoxides that decompose upon extraction into polysulfides and thio-sulfinates in the presence of allinase. The potent antidiabetic activity of both plants may be attributed to the presence of these volatile decomposed products that predominate in their oils in addition to other nonvolatile sulfur-containing peptides and proteins.

04)Neem-
Synonym:- Margosa.
Family:- Meliaceae
Parts used:- Whole plants.

Chemistry:-
Nimbidin is major source from seed oil, It is crude bitter principle. It also contains nimbin, nimbinin, nimbidinin, nimbolide, nimbilic acid. Gedunin obtained from neem's seed. It also contains mahmoodin, Azadirachtin. It also contains some tannin like, Gallic acid. There are also present of Margolonon, Polysaccharide.



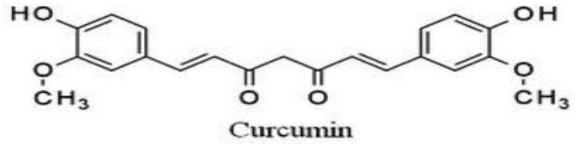


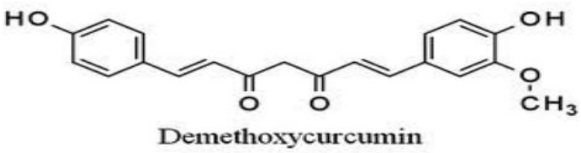


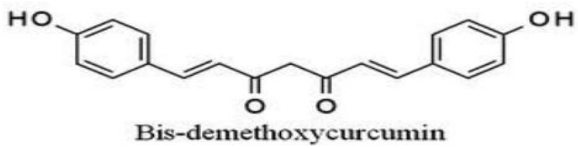
Pharmacological Action:-
It belongs to the family Meliaceae and has been used for a long time in traditional medicine in treating several ailments, including diabetes. Its leaves stem bark and seeds possess hypoglycemic activity via increasing insulin secretion from the beta cells of the pancreas. Its leaves are characterized by the presence of high fiber content that is potent in diabetes management and controlling of post-prandial hyperglycemia through delaying gastric emptying, increasing viscosity of GIT content thus, suppressing digestion and absorption of carbohydrate with no risk of hypoglycemia, hyperinsulinemia and undesirable weight gain.

05) Turmeric-
Synonym:- Curcuma Longa
Family:- Zingiberaceae
Parts used:-Rhizoms and bulb

Chemistry:-
Turmeric rhizomes contain about 5% curcuminoids consisting of a mixture of compound and it' s derivatives. The standerdiesed extracts of curcumin generally consist of curcumin, desmethoxy curcumin and bisdesmethoxy curcumin.
Curcumin, Turmeric Extract, Food Color E100 , diferuloylmethane,1,7- Bis (4-hydroxy-3-methoxyphenyl) -1,6- heptadiene-3,5-dione Chemical Formula: C21H20O6.







Pharmacological Action:-

The effect of Aqueous Extract of Curcumalonga (AEC) on insulin secretion in pancreatic tissues with acute incubations under hyperglycaemic conditions and also chronic incubations under both basal and hyperglycaemic conditions were examined in vitro. Under hyperglycaemic culture conditions all the doses of AEC over 30 min of incubation showed an inhibited insulin release which was significantly different from the control ($p < 0.05$).

06) Sweet Potato-

Synonym:- Ipomoea batatas

Family:- Convolvulaceae

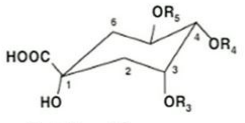
Parts used:-

Chemistry:-

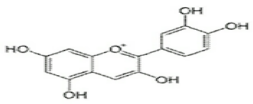
The major phytochemicals that are generally present in sweet potato are flavonoids,

terpenoids, tannins, saponins, glycosides, alkaloids, steroids and phenolic acids. These constituents may vary with varieties depending on flesh and skin colours. Orange varieties are particularly rich in beta-carotene, while purple sweet potato contains higher anthocyanin content than other varieties of sweet potato.

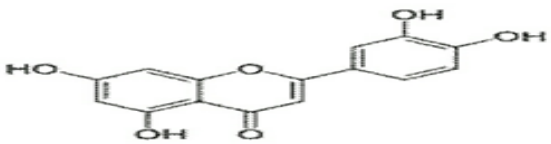
Phenolic acids such as chlorogenic, isochlorogenic, caffeic, cinammic, and hydroxycinammic acids are also generally present in sweet potato. Other important chemical compositions of sweet potato include starch, protein, vitamins, minerals and dietary fiber. Luteolin, a flavonoid was found in orange and purple varieties but was absent in the white ones.



Quinic acid



Cyanidin



Luteolin

Pharmacological Action:-

A trailing herb cultivated for its succulent tuberous roots. Oral administration of Ipomoea batatas reduces hyperinsulinemia in Zucker fatty rats by 23, 26, 60 and 50% after 3, 4, 6 and 8 weeks, respectively. In addition, inhibition of blood glucose level after glucose loading was observed after 7 weeks of treatment along with regranulation of pancreatic beta cells and reduction in insulin resistance. Hypolipidemic activity has also been described.

07) Black Berry-

Synonym:- Syzigium cumini, Eugenia jambolana

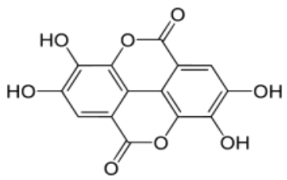
Family:- Myrtaceae

Parts used:- Fruit, Leaf, stem bark

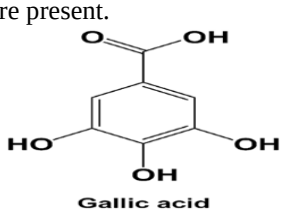
Chemistry:-

Seeds of Eugenia jambolana contain glycosides, a trace of pale yellow essential oil, fat, resin, albumin, chlorophyll, an alkaloid- jambosine, gallic acid, ellagic acid, corilagin and related tannin, 3,6-hexahydroxy diphenoyl glucose, 1- galloylglucose, quercetin and elements such as zinc, chromium, vanadium, potassium and sodium.

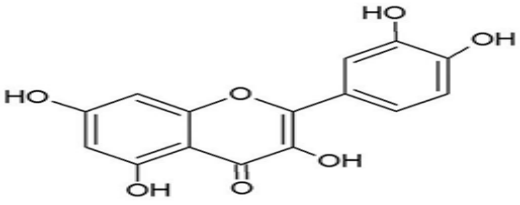
Fruits of Eugenia jambolana have been reported with raffinose, glucose, fructose, citric acid, mallic acid and gallic acid. Flowers of Eugenia jambolana contain oleanolic acid; two other triterpenoids ellagic acids and flavanols isoquercetin, quercetin, kampferol and myricetin are present.



Ellagic Acid



Gallic acid



Quercetin

Pharmacological Action:-

The present study evaluated the hypoglycemic activity of different parts of Eugenia jambolana seeds such as whole seed, kernel, and seed coat on streptozotocin-induced diabetic rats. Administration of the ethanolic extract of kernel at a concentration of 100 mg/kg of body weight significantly decreased the levels of blood glucose, blood urea, and cholesterol, increased glucose tolerance and levels of total proteins and liver glycogen, and decreased the activities of glutamate oxaloacetate transaminase and glutamate pyruvate transaminase in experimental diabetic rats. Whole seed showed a moderate hypoglycemic effect, and seed coat did not show any hypoglycemic effect. The hypoglycemic efficacy was compared with that of glibenclamide, a standard hypoglycemic drug.

08) Banana –

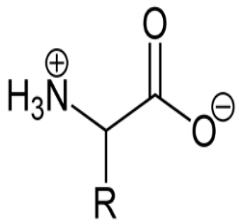
Synonym:- Musa Paradisiacal

Family:-Musaceae

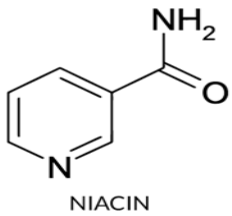
Parts used:- Seed, fruit.

Chemistry:-

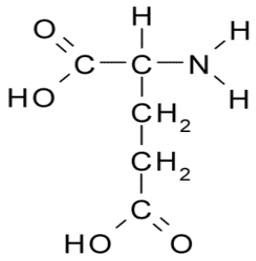
It is the rich source of Carbohydrate, fair source of Vitamins, Minerals. Starch (Amylose-20.5%) present in unripe fruit. It also contain Protein like; Albumin, Globulin, Glutelin, Prolamine. It also contain some freeamino-acids. E.g. Glutamic acid, Gama amino butyric acid. It also contain calcium, Iron, Potassium, Magnesium, Sodium, and Phosphorous. Different vitamins present in fruits like; Carotene, Niacin, Ascorbic acid, Riboflavin, Folic acid, Biotin, Pyridoxine, Inositol.



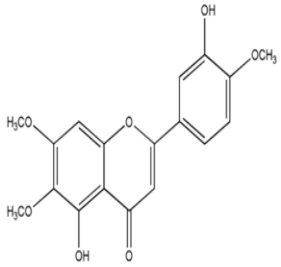
Amino Acid



NIACIN



Glutamic Acid



Albumin

Pharmacological Action:-

Diabetes mellitus is a debilitating hormonal disorder in which strict glycemic control and prevention of associated complications are of crucial importance. This study was designed to evaluate the hypoglycemic effect of methanolic extract of mature, green fruits of Musa paradisiaca (MEMP) in normal (normoglycemic) and streptozotocin (STZ)- treated, diabetic (hyperglycemic) mice, using chlorpropamide as the reference Antidiabetic agent. MEMP (100-800 mg/kg p.o.) induced significant, dose-related ($p < 0.05$-0.001) reductions in the blood glucose concentrations of both normal and diabetic mice. Chlorpropamide (250 mg/kg p.o.) also produced significant ($p < 0.01$-0.001) reductions in the blood glucose concentrations of normal and diabetic mice. The results of this experimental study indicate that, in the mammalian model used, MEMP possesses hypoglycemic activity.

09) Ginseng-

Synonym:- Ninjin, Pannag, Panax.

Family:- Araliaceae.

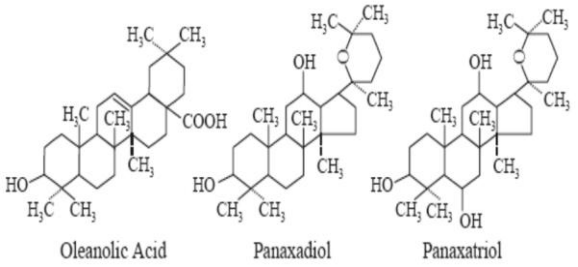
Parts used:-Root.

Chemistry:-

It also contain other constituents which include traces of volatile oil, polyacetylenes, sterols, polysaccharides, starch, β-amylase, free sugars, choline, fats and minerals along with vitamin BBB panthothenic acid and biotin. It contains variety of

tetracyclic dammaranetype sapogenins such as protopanaxadiol and their glycoside.

Ginsenosides contain aglycone dammarol while panaxosides have oleanolic as aglycone. About 13 ginsenosides have been identified. Panaxosides give oleanolic acid, panaxadiol and panaxatriol on decomposition.



Pharmacological Action:-

Ginseng root (Araliaceae) has been used for over 2,000 years in the Far East for its health-promoting activities. It contained triterpene glycosides (saponins), commonly referred to as ginsenosides, peptides, polysaccharides, fatty acids and polyacetylene alcohol. The hypoglycemic effect of ginseng root may be attributed to blocking intestinal glucose absorption and inhibiting hepatic glucose- 6-phosphatase activity resulting in delaying of food digestion and carbohydrate absorption rate [70]. Ginseng polypeptide, isolated from the root was effective in decreasing liver glycogen and blood-sugar levels while, its aqueous extract showed a remarkable hypoglycemic activity, increasing insulin production, reducing pancreatic β-cells death and resistance to insulin, thus improving postprandial glycemia in diabetic patients.

10) Tulasi-

Synonym:- Holy basil, Sacred basil.

Family:- Labiatae

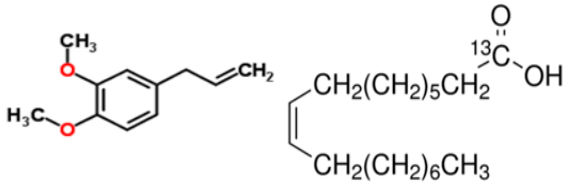
Parts used:-whole plant

Chemistry:-

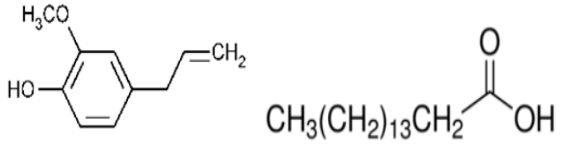
The plant is contain alkaloids, glycosides, saponin, tannins, vitamin C, and maleic, citric, and tartaric acid. The leaves contain a high content of essential oils which include Toluene, Camphene, Octane, Benzene, Citronellel, Sabinene, Limocene, Ledol, Dimethylbenzene, Ethyl-2- methylbutyrate, Eugenol, Terpiniolene.

It contain eugenol, carvacrol, caryophyllin, and eugenol-methyl-ether.

Seeds of this plant are chief source of fixed oils such as Oleic acid, Stearic acid, Hexourenic acid, Palmitic acid, Linodilinolin and Linolenic acid.



Methyl eugenol Oleic Acid



Eugenol Palmitic acid

Pharmacological Action:-

It is commonly known as Holy basil (Labiateae). Administration of O. sanctum leaves alcohol extract, orally, significantly reduced glycemia and enhanced exogenous insulin action. Administration of leaf powder to healthy and diabetic rats resulted in reduction of FBG after one month. Its pronounced therapeutic potential as antidiabetic agent can be attributed to the presence of eugenol, its chief active constituent, reducing elevated serum sugar, cholesterol triglyceride levels as well as lactate dehydrogenase, alanine transaminase, aspartate transaminase and alkaline phosphatase.

CONCLUSION

Diabetes is possibly the world's fastest growing metabolic disease, and as knowledge of the heterogeneity of this disorder increases, so does the need for more appropriate therapies. Traditional plant medicines are used throughout the world for a range of diabetic presentations. An oral hypoglycemic agent having hypolipidemic, and antioxidant action would be better for the treatment of diabetes. Few of the herbs mentioned above may have all these actions and prove to be promising in the treatment of

diabetes and its complications in the near future. Therefore, there is a need of more well documented clinical trials and more laboratory work to isolate the active principles, their pharmacological actions and toxicity. Herbal therapy for diabetes has been followed all over the World successfully. Herbs are used to manage Type 1 and Type II diabetes and their complications. For this, therapies developed along the principles of western medicine (allopathic) are often limited in efficacy, carry the risk of adverse effects, and are often too costly, especially for the developing world.

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