

“ Antidiabetic Herbal Drugs ”

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ABSTRACT :

Diabetes mellitus is a group of metabolic disorder characterized by a high blood sugar level over a prolonged period of time. OR It is a serious, chronic disease that occurs either when the pancreas does not produce enough Insulin, or when the body can't effectively use insulin. Herbal medicines have been commonly used by diabetic Patients for the treatment of diabetes mellitus. To include findings from different studies, publications related to In – vitro antidiabetic activities of medicinal plants in Ethiopia. Different medicinal plants parts were used experimentally for antidiabetic effects in Ethiopia. This Review focuses on Indian Herbal Drugs and plants used in the treatment of diabetes especially in India. A list of medicinal plants with proven antidiabetic and related beneficial effects and of Herbal used in treatment of diabetes is compiled. These includes *Allium sativum* , *Enicostemma littorale* blume , *Momordia charantia* , *Pterocarpus marsupium* , *Eugenia jambolana*. *C. indica* , *Ocimum sanctum* , *Tinospora cardifolia* , *Helicteres isoma* , *Phyllanthus amarus* , *Stevia rebaudiana* , *Gymnema sylvestre*.

Key Words : Medicinal plant , Antidiabetic drugs , Herbal drugs & Diabetes.

INTRODUCTION :

Herbal medicines also called as the botanical medicine or phytomedicines , refers to the use of any plants seeds , barriers , roots , leaves , bark or flowers for medicinal purposes. Many traditional medicines is use are derived from medicinal plants , minerals & organic matter. A number of medicinal plants , traditionally used for over 1000 years named Rasayana are present in Herbal preparation of India traditional Health care systems. The World Health Organization i. e. (WHO) has listed plants , which are used for medicinal purposes around the world . Among 2500 spp. are in India out of which 150 spp. are used commonly on a fairly large scale . India is the largest producer of medicinal Herbal & is known as the botanical garden of the world.

How do Herbs work :

For most Herbs , the specific ingredients that causes a therapeutic effect is not known whole Herbs contained many ingredients , and it is likely that they work together to produce the desired medical effects . The type of Environment (climate , bugs , soil quality) in which a plant grow will effects its components, as will how & when it was harvested and processed .

How are Herbs used :

The whole plant extracts have many components . These components work together to produce therapeutic effects & also to lessen the chances of side effects from any one component . The several Herbs are often used together to enhance effectiveness & synergistic actions and to reduce toxicity.

What is Herbal Medicine Good for :

Herbalists treatment many conditions such as Asthma , Migraine , Chronic fatigue , Premenstrual syndrome , Irritable bowel syndrome , Rheumatoid arthritis , Menopausal symptoms , Eczema & among other.

1) Ginkgo (*Ginkgo biloba*) :

Particularly a standardized extract known as EGB 761 appear to produce improvement in awareness , judgment & social fun in people with Alzheimer's disease.

2) Kava kava (*Piper methysticum*) :

Has become popular as a treatment for Anxiety.

3) St. John's wort (*Hypericum perforatum*) :

Is well for its antidepressant effects.

4) Valerian (*Valeriana officinalis*) :

Had a long tradition as a sleep – inducing agent.

5) Echinacea preparation (*Echinacea* spp.) :

May bolster immunity.

Diabetes Mellitus :

“ Diabetes mellitus i. e. (DM) is a Heterogeneous metabolic disorder characterized by common

features of chronic Hyperglycemia with a disturbance of carbohydrates , fats & protein metabolism. “

Insulin is secret the Langerhans of Islet.

Types of Insulin :

There are two types :

- Type 1 : Insulin dependent.
- Type 2 : Non – Insulin dependent.

1) Type 1 :

It is a characterized by low Insulin production & necessities daily Insulin administration.

2) Type 2 :

It is caused by the body’s ineffective use of insulin.

Type 2 diabetes affected the vast majority of diabetes.

Etiopathogenesis (causes) :

Type 1 Diabetes mellitus :

- 1) Genetic factors
- 2) Autoimmune factors
- 3) Environmental factors.

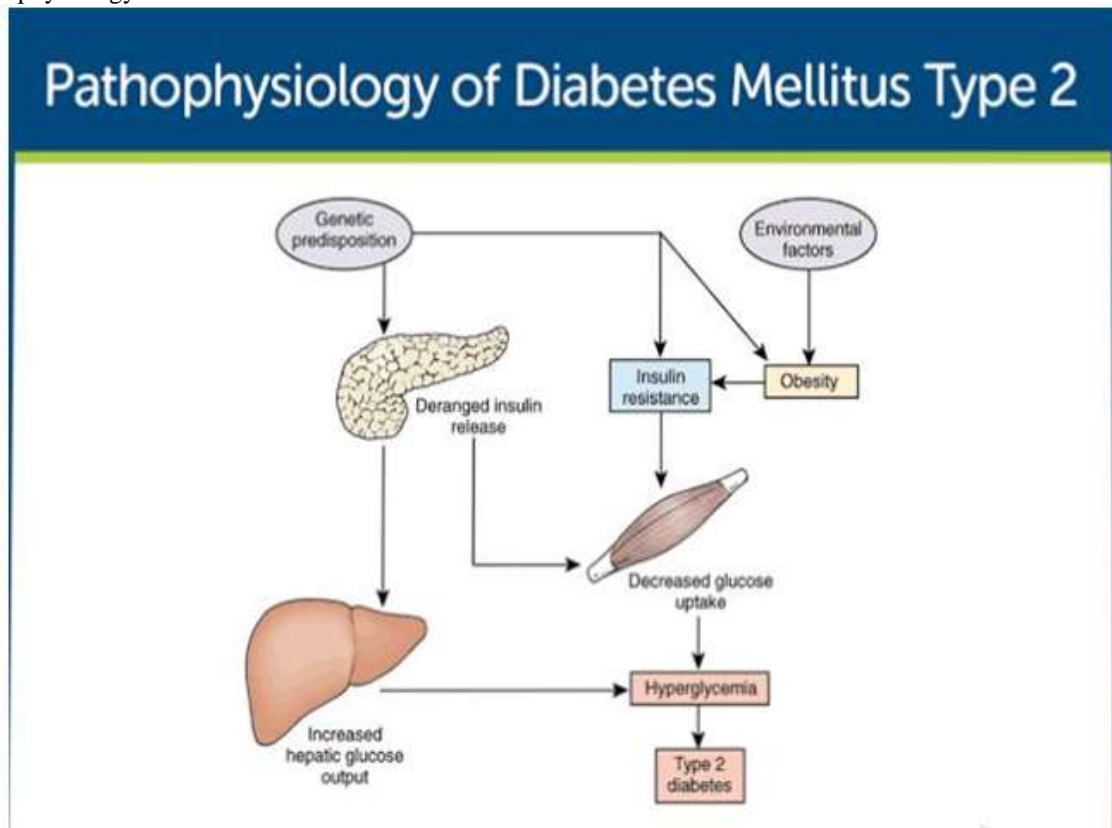
Type 2 Diabetes mellitus :

- 1) Genetic factors
- 2) Constitutional factors
- 3) Insulin resistance
- 4) Impaired Insulin Secretion
- 5) Increase Hepatic glucose synthesis.

Clinical manifestation (Symp.) :

- 1) Polyphesia
- 2) Polydipsia
- 3) Fatigue
- 4) Irritability
- 5) Vision is hazy
- 6) Wt. Loss
- 7) Obesity
- 8) Glycosuria
- 9) Ketoacidosis
- 10) Slow healing of wound
- 11) Blur vision
- 12) Frequent infection
- 13) Normal blood sugar level .

Pathophysiology :



Do's and Don'ts for Diabetes :

- 1) Controlling diet & eating right is very important for diabetes patient & their Health.
- 2) Low fat diet & vegetables like Spinach , Cucumber must be taken as they are good for controlling diabetes.
- 3) Onion , Sprouts , beans , garlic in the diets of diabetes low down the sugar levels in the body.
- 4) Tomatoes , vegetables salad , fruits & milk products like cheese around be taken.
- 5) Starchy food products like white breads , rice , potatoes
Should be avoided as they are not easily digestible.
- 6) Diabetic patients should not be Scared of eating sugar rich fruits
There are safe & do not increased insulin production.
- 7) Less amount of oil should be taken & coffee , sugar refined flour, alcohol, Heavy metal should be avoided.
- 8) Meals should be small as the foods are easily digestible & are good for the health of diabetes.
- 9) Taking Stress should be avoided as it worsens the conditions.
- 10) Avoiding matters, excess salt in the meal will help in controlling the body weight & Diabetes.
- 11) Avoiding junk food & oily food will controlled the level of cholesterol, lower the blood pressure & diabetes.

Diabetic Prevention :

- 1) It is not yet to known how to prevent type 1 diabetes & type 2 diabetes, However, can be prevented in some cases.
- 2) Controlled weight to normal or near – Normal levels by eating a healthy low – fat, high – fiber diet.
- 3) Regular exercise is crucial to the prevention of type 2 diabetes.
- 4) Keep alcohol consumption low.
- 5) Quit smoking.
- 6) Reduce intake of carbohydrates.
- 7) Reduce stress.
- 8) Wound healing slow.
- 9) If a person has high blood fat levels (such as high cholesterol) or high B. P. take all medications as directed.
- 10) Lifestyle modifications & or certain medications can be used in people with prediabetes to prevent progression to diabetes.

Ayurvedic Herbs In The Treatment of Diabetes mellitus:

Diabetes mellitus in Ayurveda is known as Madhu – meha . Several Ayurvedic formulations have been used in the treatment of diabetes mellitus for centuries .

Medicinal Herbs like Coccinia gluaca , Mamoranda marasmus , Gymnema sylvestre , Salacia reticulate , Elicostermma littorale , Trigonella foneum gracium are prescribed as single powder drugs in combination.

The article deals with work done on Indian medicinal plants with antidiabetic potential (Sadhu , 2008) etc.

1) Azadirachta Indica :

Common name : Limdo (Guj) , Neem (Hindi)

Family : Meliaceae

Parts used : Whole parts

Pharmacology :

Antidiabetic , Antipyretic, Antibacterial, Anti-inflammatory , Immunomodulatory , Antifungal , Antimalarial , Anti- tumour , Anti- arthritis , Diuretics and Spermicidal etc.

Pharmacological Study :

Researchers at Indian's university of Madras in the early 1990s found that high doses (40 gm of dried herb daily) of Azadirachta Indica extracts may actually help to repair or regenerate the pancrea's beta cells, which play a crucial role in the production and secretion of insulin. Few other substances, synthetic or natural, offer such promise for reversing beta cells damage and at least partially reducing diabetcs' need for insulin and other drugs on the other hand, do not have diabetes do not produce more insulin after consuming Azadirachta Indica (Neem).

2) Aegle marmelos carr. exRoxb. (Bilava) :

Common name : Wood apple

Family : Rutaceae

Parts used : Leaves & Fruits

Geographical source : India

Chemical constituents :

Tannis , Coumarin (marmesin) , active principal (marmelosin) , alkaloids (aegelin & aegelin) etc.

Pharmacological Study :

Das, Padaytil & Paulose

(1990)studied the Hypoglycemic activity of leaf extract of Aegle marmelos in Streptomycin induced diabetes. The extract significantly reversed altered parameters in tissue of the experiment rats.

According to authors, the drug seems to repair the injured pancreas (Das, et al 1996).

3) Andrographis Paniculata Nees. I :

Common name : Kalmegh

Family : Rutaceae

Part used : Whole part

Geographical source : India

Chemical constituents :

Diterpene lactones (andrographolide) , neoandrographolide & Kalmegh.) etc.

Pharmacological Study :

Ahmad & Admawi (1992) reported Hypoglycemic activity of Andrographis paniculata. A significant decrease in the blood glucose levels was observed on glucose tolerance test as compared to the untreated group. The authors concluded that the drug inhibits glucose absorption in the intestine (Ghos, et al. 1990).

4) Allium sativum (Lahsun) :

Common name : Lasan (Guj) , Garlic (Eng) , Lasun (Hindi) , Lashuna (Sanskrit).

Family : Liliaceae

Part used : Ribe Bulbs.

Geographical source :

India , Central Asia , USA and Southern Europe.

Chemical constituents :

Allicin (allin) , It also contain 65 % , Water , 2.3 % Organosulphur compounds , 2% free amino acid , 28% Carbohydrates , 2% Proteins , 0.15% Lipid , 0.07 % Saponin , 1.5 % Fiber and 0.08 % Phytic acid etc.

Pharmacological Study :

S - allyl cysteine sulfoxide (SACS), the precursor of Allicin and garlic oil, is a sulfur containing amino acid, which controlled lipid peroxidation better than glibenclamide & insulin. It also improved diabetic conditions. SACS also stimulate in vitro insulin secretion from beta cells isolated from normal rats. Apart from this, Allium sativum exhibits antimicrobial, anticancer & Cardioprotective activities.

5) Asphaltum Punjabianum (Shilajeet):

Common name : Mineral pitch or black bitumen

Chemical constituents :

Folic acid and Hippuric acid etc .

Pharmacological study :

Trivedi, Saxena, Mazumdar, Bhatt & Hemavathi (2001) studied the effects of Asphaltum punjabianum on blood glucose, lipid profile & vascular preparation in alloxan induced diabetic rats. Diabetes was induced in albino rats by administration of alloxan 5% (125 mg/kg, I. P.). Effect of three different doses of Asphaltum punjabianum (50, 100 & 200 mg /kg, P. o., daily) were studied on fasting blood glucose & lipid profile at the end of the 4th week. All three doses of Asphaltum punjabianum not only reduce blood glucose level in dose dependent manner, but significant reduction in blood cholesterol & triglycerides was observed.

6) Coccinia indica :

Family : Cucurbitaceae

Part used : Leaves.

Pharmacological Study :

Antia B. S, et al. 1999 to study dried extracts of Coccinia indica (C. indica) (500 mg/kg body weight) were administered to diabetic Patients for 6 weeks. These extracts restored the activities of enzyme lipoprotein lipase (LPL) that was reduced & glucose - 6 - phosphatase & lactate dehydrogenase, which were raised in untreated diabetics. Oral administration of 500 mg/kg of C. indica leaves showed significant Hypoglycemia in alloxanized diabetic drugs & increase glucose tolerance in normal & diabetic drugs (Antia, 1999).

7) Caesalpinia bonducella F.(Karanja):

Common name : Nicker tree

Family : Leguminaceae

Parts used : Seeds , leaves & oil expressed from kernal of seeds.

Geographical source :

Tropical parts found in the Asia and Africa.

Chemical Constituents :

Bitter principle i. e. The (bonducin) etc.

Pharmacological Study :

Biswas & workers (1997) studied the Hypoglycemic activity of aqueous extract of caesalpinia bonducella. The drug was tested in fasted, fed, glucose loaded, streptozocin induced diabetes extract administered was 250 mg/kg of rat body weight. The extract was found to be effective in glucose loaded, streptozocin induced diabetes and alloxan induced diabetic rats. According as good oral Hypoglycemic agents. (Biswas, 1997).

8) Curcuma Longa :

Family : Zingiberaceae

Chemical constituents :

Curcumin , food colour E100 , Tumeric extract , Duferulomethane , 1,7- Bis (4 – hydroxy – 3 – methoxyphenyl) – 1,6- heptadiene – 3-5- dione .

Chemical formula : C₁₂H₂₀O₆.

Clinical Study :

These statements have not been evaluated by the FDA. These products are not intended to diagnose, treat, cure or prevent any disease. Pregnant or lactating women, diabetics, Hypoglycemics and people with known medical conditions & /or taking medicines should consult with a licensed physician & /or pharmacist prior to taking dietary supplements. (Subbaraj, 1995).

9) Enicostemma littorale blume :

Common name : Majmakbooti

Family : Gentiaceae

Part used : Whole part

Geographical source : India height of the 1500 ft.

Chemical constituents :

Ophelic acid , alkaloids (gentianine) , tannins , Bitter principle (Swertimarine).

Pharmacological Study :

In a study, Maroo and workers have shown Hypoglycemic & antioxidants activity of Methanol extract of Enicostemma littorale. Administration of Methanol extract (2.5 g/kg body weight /day) to diabetic rats for 20 days reduced blood glucose levels from 466.5 + 37.07 to 237.20 + 28.22. The extract not only raised the serum Insulin levels but improved the antioxidants status of the rats also. (Maroo, 2003).

10) Gymne Sylvestre R. Br :

Common name : Gurmar booti

Family : Asclepiadaceae

Chemical constituents :

● Dried leaves :

Resin, Pararabin, Triterpene glycoside, Peptide gurmardin, Bitter principle, Lupenol, quercitol, Anthraquinones & colouring matter.

● Bark :

Calcium and Starch.

● Alcoholic extract :

Saponin

● Ash :

Alkali, Phosphoric acid & Magnese.

Pharmacological Study :

Shanmugassundaram & workers (1991) tested the hypoglycemic activity of water - soluble acidic fraction of the Gymnema sylvestre leaves in rats. The drug was tested in Streptozocin induced diabetic rats. It was concluded that G. sylvestre raises levels of insulin. Mechanism of action however remains unclear & gymneric acid is a constituent of Gymnema sylvestre (Shanmugassundaram, 1990).

11) Helicterus Isora :

Family : Sterculiaceae

Part used : Roots.

Pharmacological Study :

The different extracts of the roots of Helicteres isora were tested for anti - diabetic activity, by glucose tolerance test in normal rats & alloxan induced diabetic rats. Aqueous ethanol & butanol extracts had shown significant protection & lowered the blood glucose levels to normal in glucose tolerance test. In alloxan induced diabetic rats the maximum reduction in blood glucose was observed after 3h at a dose level of 250 mg/kg of body weight. The percentage protections by aqueous ethanol & butanol extracts were 30 & 40 % respectively.

12) Syzygium cumini :

Common name : Jambul

Family : Myrtaceae

13) Momardica Charantia :

Common name : Karvellaka

Family : Cucurbitaceae

Pharmacological Study :

Ahmed, et al. (1999) studied the mechanism of action of juice in rats were rendered diabetic by single injection (60 mg /kg body weight) of streptozocin. One week after injection, treated animals were fed with juice of M. Charantia (10 ml/kg) daily for three in glucose uptake & it attenuated the insulin induced increase in glucose uptake (Ahmed, 1999).

14) Musa Paradisiacal :

Common name : Banana & Pisang

Family : Musaceae

Parts used : seeds & Fruits.

Pharmacological Study :

Diabetes mellitus is a debilitating hormonal disorder in which strict glycemic control & prevention of associated complications are of crucial importance. This study was designed to evaluate the hypoglycemic effects of methanolic extract of mature, green fruits of *Musa paradisiaca* (MEMF) in normal (normoglycemic) & (Hypoglycemic) mice. Using chloropamide as the reference antidiabetic agent.

15) *Ocimum Sanctum* Linn. :

Common name : Tulsi

Family : Labiatae

Clinical Study :

Agrawal, Rai & Singh (1996) in randomized placebo - controlled, single - blind, crossover trial studied the effects of *Ocimum sanctum* (dried leaf 2.5 g daily) on fasting and post prandial blood glucose & serum cholesterol levels in Patients diagnosed with non- insulin dependent diabetes mellitus. 40 patients, 20 of whom were receiving oral hypoglycemic drugs & twenty of whom were newly diagnosed without a history of antidiabetic drug use, took 2.5 g of *Ocimum sanctum* leaf or placebo in water on an empty stomach upon Rising, followed by the other treatment for four week's. Investigators were blinded to the sequence of treatments. The results showed that *Ocimum sanctum* treatment caused a significant decrease in both fasting & postprandial blood glucose levels compared with placebo. A mild reduction in total cholesterol levels was also observed. The mechanism responsible for the hypoglycemic activity of sacred basis is not known but *Gymnema sylvestre* raises levels of insulin. (Agrawal, et al. 1996).

16) *Pterocarpus Marsupium* :

Family : Fabaceae

Chemical constituents :

Flavonoids, Pterostilbene , Pterosupin, Marsupin, Epicatechin, Liquiritigenin & Active principal etc.

Pharmacological Study :

It is a deciduous moderate to large tree found in India mainly in hilly region. Pterostilbene, a constituent derived from wood of this plant caused hypoglycemia in dogs showed that the hypoglycemic activity of this extract is because of presence of tannates in the extract. Flavonoids fraction from *Pterocarpus marsupium* has been shown to cause pancreatic beta cell regeneration.

Marsupin, Pterosupin from this plant showed antihyperlipidemic activity. (-) Epicatechin, its active principle, has been found to be insulinogenic, enhancing insulin released & conversion of proinsulin to insulin in vitro. Like insulin, (-) Epicatechin stimulates oxygen uptake in fat cells & tissue slices of various organs, increase glycogen content of rat diaphragm in a dose - dependent manner (Chakrabarti, et al. 1996).

17) *Phyllanthus niruri* :

Family : Euphorbiaceae

Clinical Study :

In the above 1995 study, researcher also reported that blood sugar levels were reduced significantly in Human subjects studied. Two other studies with rabbits and rats document the hypoglycemic effect of Chanca Piedra in diabetic animals. Yet another study documented Chanca Piedra with aldose reductase inhibition (ARI) properties.

18) *Polyalthia Longifolia* Var. *Angustifolia* :

Family : Annonaceae

Part used : Bark

Chemical constituents :

Alkaloids , glycoside , saponin , polyphenolic compounds, Diterpenoids and tannins .

Pharmacological Study :

The chloroform extract of stem Bark of *Polyalthia* var. *Angustifolia* was evaluated for its antidiabetic activity in alloxan induced diabetic rats & euglycaemic rats after a single dose of 200 mg/kg p. o & prolonged treatment of 100 mg/ kg P. o. For 10 days. The result revealed significant antihyperglycemic activity (P20. 01). Glibenclamide showed hypoglycemic activity in euglycaemic rats but the said extract did not show hypoglycemic activity (Andier, 1990).

19) *Pterocarpus santalinus* L. F :

Family : Fabaceae (Papilionaceae)

Chemical constituents :

Natural santalin , contains a Alkaloids ether santal , Pterocarpine , Homopterin , tannin , Kino tannic acid , It also present in Calocedrin , Triterpene , Isoflavone , Lignan , Savinin , Calocedrine & Glucosides savinin etc .

Medicinal Impotence :

Ethanol extract of stem Bark at 0.25 g/kg body weight was reported to possess anti-hyperglycemic activity.

20) Stevia Rabudiana :

Family : Asteraceae

Chemical constituents :

Steviol , Sweet glycoside : Stevioside and Rebaudioside etc .

Clinical Study :

Jappesen, et al, 2004 Sterioside is present in the plant Stevia rebaudiana Bertoni (SrB). Extracts of SrB have been used for the treatment of diabetes in, For example, Brazil, although a positive effect on glucose metabolism has not been unequivocally demonstrated thus studied the acute effects of Sterioside in type 2 diabetic patients. (Jappesen, et al. 2004).

21) Saraca Indica (Ashoka Bark) :

Common name : Ashok (Hindi) & Asok (Bengali)

Family : Leguminosae

Chemical constituents :

6 % Condensed tannins, Anthocyanin derivatives, Catechols, Sterol, Haemotoxin, Phlobaphenones, Organic calcium compound Ketosterol, Phenolic, Nano – phenolic & Glycosides .

Use : In diabetes mellitus, Uterine stimulant, sedative, oxytocic activity, In menorrhagia non phenolic glycoside has parasympathomimetic activity. In intrinsic haemorrhages Ashoka flower are used in burning sensation. Dried flower used in diabetes (Rangari, 2007).

22) Scopario dulcis :

Family : Scrophulariaceae

Chemical constituents :

Flavone , Terpene , Scopadulcic acids A & B , Scopadiol , Scopadulciol , Scopadulin , Betulinic acid Which includes Acacetin , Amyrin , Apigenin , Benzoxazolin , Cirsimarin ,Cirsitakaoside , Coixol , Dulcinol , Dulcionic acid , Friedelin ,Gentisic acid , Glutinol , Stigmasterol , Taraxerol , Vicenine and Vitexin etc .

Pharmacological Study :

In 2002, researchers in India verified Vassourinha's antidiabetic blood sugar - lowering effects in rats.

23) Satureja Khuzestanica :

Family : Lamiaceae

Chemical constituents :0.5 % Essential oil , Carvacrol , Flavones , Triterpenoides , Steroides and Tannin etc .

Pharmacological Study :

Sanaz Vasaugh - Ghanbari, Raja Rahimi, Shima Zeinali, Mohammad abdollahi study the Investigate the effect of S. Khuzestanica supplement in metabolic parameters of hyperlipidemic patients with type 2 diabetes mellitus.

24) Salacia reticulata & Salacia Oblonga Wall :

Common name : Saptchakra

Family : Hippocrateaceae

Chemical constituents :

Flavonoids , Salacinol and Kotalanol .

Pharmacological Study :

Augusti, Joseph & Babu (1995) studied the hypoglycemic activity of chloroform eluted fraction of the petroleum ether extract of the root Bark of Salacia demonstrated potent hypoglycemic activity in rats when compared to tolbutamide, (Augusti, et al. 1995).

25) Tinospora Cardifolia :

Common name : Gaduchi

Family : Menispermaceae

Chemical constituents :

Alkaloids , Diterpenoids , Lactones , Glycosides , Steroides, Sesquiterpenoides , Phenolics, Aliphatic compounds & the Polysaccharides etc.

Pharmacological Study :

In blood glucose & brain lipids. Though the aqueous extract at a dose of 400 mg/kg could elicit significant antihyperglycemic 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. Cardifolia decrease the blood glucose level increase the glucose tolerance in rodents. Aqueous extract also caused a reduction in blood sugar in alloxan-induced hyperglycemia in rats & rabbits in the dose of 400 mg /kg. However, histological examination of pancreas has not revealed any evidence. (Gangan, et al. 1996).



REFERENCES :

- 1) Internet
- 2) Diploma in pharmacy second year books pharmacotherapeutics Nirali and PV prakashan. Authers : Dr . Arun K. Mishra And Dr . Harpreet Singh.
- 3) Chakrabarti, D ; Ghosh , A ; Banerjee. N ; Majumder, PC and Gupta , M (1995) Plant. Res.
- 4) Coon JT, Ernest E. (2002), "Panax ginseng ; a systematic review of Adverse effects & Drugs in treatment , Drug saf .
- 5) Ghos , D ; Uma, R ; Thejamoorthy , P ; Velluchamy , GJ (1990) "Res in Ayur. sid, Vol 11.
- 6) LM, Tierney D (2007), Pharmacognosy Phytochemistry " Vol. 1 first Edition.
- 7) Sivaranjan w and Indira , Balachandran (2004) " Ayurvedic Drugs and their plant source " , first Edition Reprint Oxford etc .