ISSN No:-2456-2165

Natural Herbs as Antidiabetics Drugs

Shreyash Bale[1]; J.V. Vyas[2]; A.W. Wankhade[3]; V.V. Paithankar[4]
Vidyabharati College of Pharmacy,Amravati

Abstract:- Diabetes mellitus syndrome is a disorder of abnormal metabolism of proteins, carbohydrates, and fats caused by either insufficient insulin secretion or decreased tissue insulin sensitivity. Diabetes is treated by utilizing pharmacological medicines for a prolonged period of time and creating undesirable side effects. 60% of people worldwide utilize traditional herbal remedies that are produced using therapeutic plants. The various Indian herbal remedies and plants that are widely used in India to treat diabetes are the subject of this review article. It is proven to be a serious health issue in India, particularly in metropolitan areas. Despite the fact that there are many ways to lessen the affects herbal remedies for diabetes mellitus and its subsequent consequences are chosen since they have fewer adverse effects.

Keywords:- *Diabetes Mellitus, Medicinal Plants, Antidiabetic Drugs, Herbal Drugs.*

I. INTRODUCTION

The main goal of herbal medicine, also known as plant medicine, is to make therapeutic use of plant components such seeds, fruits, roots, foliage, bark, or flowers. Long used outside of traditional treatment herbs but research on them is growing in significance. studies and new research show their value in treating and preventing diseases. The field of Because of its natural origins and minimal side effects, herbal medicine has grown rapidly in popularity over the past few years in both developed and developing nations.[1]

Most medicines can be used from herbs, minerals and organic substances.[2] The herbal preparations of the Indian health system consist of many medicinal herbs called Rasayana, which have been used traditionally for over 1000 years.[3] In Indian medicine, most doctors manufacture and distribute their own medicines. 21,000 medicinal plants worldwide have been registered with the World Health Organization. 150 of these 2,500 plant species are present in India, and 150 of these are widely used commercially. India is Claimed to be the world's botanical garden, The world's largest producer of medicinal herbs is India. The use of herbs and herbal remedies in the treatment of diabetes is highlighted in this review, a dangerous condition that has a significant negative impact on society. [4]

- *What is the Work of Herb?*

As with most herbs, the specific components responsible for the treatment are unknown. All plants have many components that will in concert to generate the intended medication. The nature of the surroundings in which the plant grows (climate, insects, soil quality) affects how and when the material is collected and handled, as well as its composition**.**

- *How Herbs are Utilized?*

For all the reasons mentioned in the previous section, herbalists advise against utilizing not to remove a single plant but to use the whole one. All plant extracts contain various components. These ingredients work together to provide therapeutic benefits and reduce potential side effects of any ingredient. To increase efficiency, enhance coordination, and lessen toxicity, many herbs are frequently combined. While recommending therapeutic herbs, herbalists must take a number of things into account. Consider the plant's kind and variety, its location, how it can be stored, whether there are diseases, etc.[5][6]

- *What uses is Herbal Medicine Appropriate for?*

In addition to treating a wide range of ailments, herbalists also treat irritable bowel syndrome, migraines, rheumatoid arthritis, premenstrual syndrome, eczema, menopausal symptoms, and exhaustion. The best way to prepare herbal remedies is with expert guidance. Before beginning self-medication, always speak with your physician or herbalist.

- *What will Happen to Herbal Medicine in Future?*

Despite the fact that the US herbal medicine market has recovered, the FDA still views herbal remedies as dietary supplements and prevents manufacturers from making any promises about the ability of their goods to treat or prevent specific illnesses. On the other hand, some European nations classify and regulate medicinal plants. A medical group in Germany called E is currently investigating the efficacy and safety of it.

II. DIABETES AND SIGNIFICANCE

A chronic disease that affects how fat, carbs, and proteins are metabolized, diabetes mellitus is characterized by high blood sugar and subsequently higher glucose levels. Globally, the prevalence of diabetes is expected to increase from 4% in 1995 to 5.4% in 2025. The World Health Organization predicts that developing countries will bear the lion's share of the burden. Studies conducted in India over the last 10 years have shown that the prevalence of diabetes in the urban population is not only high but also rapidly increasing. It is estimated that 33 million adults in India suffer from diabetes.[7]

Insufficient or insufficient insulin leads to the metabolic disease known as diabetes mellitus. Insulin insufficiency resulting from impaired beta cell function is the cause of insulin-dependent type I diabetes.

ISSN No:-2456-2165

Consequently, individuals suffering from this condition are classified as insulin-independent patients, meaning they are not responsive to insulin and require medicine, diet, and exercise for management. The most common type of diabetes, type II diabetes, affects about 90% of people with the disease. High blood sugar, poor thirst, frequent urination, extreme hunger and weight loss, visual impairment, nausea and vomiting, extreme fatigue and weakness, sadness, and mood swings are some of the symptoms of both types of diabetes.

Experimental evidence indicates that free radicals are involved in both the pathogenesis and, more importantly, the development of the diabetes problem, even though diabetes's pathophysiology is not entirely known.[8]. Cell function can be altered by free radicals because they can harm lipids, proteins, DNA, and other cellular components. Numerous recent studies have demonstrated that antioxidants that can scavenge free radicals can both prevent and lessen the severity of diabetes in animal models.[9][10]

Abnormalities in lipid and protein levels are the cause of diabetes. The main target of free radicals in people with diabetes is the cells in the body as well as durable proteins like collagen, laminin, and elastin. Due to high blood sugar, these proteins are changed to become glycoproteins. Atherosclerosis, nephropathy, cataracts, microangiopathy, and other complications of diabetes are linked to modifications in proteins in tissues like the crystalline lens, vessel wall, and basement membrane. Free radicals cause lipoproteins to oxidize in diabetics. Furthermore, individuals with diabetes frequently experience abnormalities in the metabolism of low-density lipoprotein (VLDL), low-density lipoprotein (LDL), and high-density lipoprotein (HDL). In diabetics, high levels of oxidative stress lead to increased lipid peroxidation. Non-enzymatic protein glycosylation also produces advanced glycation end products (AGEs). The accumulation of long molecules from AGEs in tissues can result in abnormal cell and tissue function.[12][13]. Furthermore, by attaching to particular macrophage receptors, AGE promotes the vascular permeability of microvascular and macrovascular architectures. Free radicals and endothelial dysfunction are the results of this. A change in gene expression and mutations is brought about by AGEs on nucleic acids and histones.

Diabetes requires a multimodal approach to treatment because it is a complex illness that causes numerous issues. People with diabetes either do not produce enough insulin or their cells do not react to insulin. The patient will need to inject insulin if there is insufficient insulin. Many medications that are suspected to alter how food is metabolized for carbohydrates have been produced in circumstances where cells do not respond to insulin. Acarbose, miglitol, and voglibose, for instance, are glucosidase inhibitors that are used to regulate postprandial hyperglycemia in the gastrointestinal system. They lower the quantity of sugar in the cells by stopping the breakdown of carbs. Metformin is one of the biguanides used to treat peripheral cell glucose problems. Insulinotropic sulfonylureas, including glyburide, function as secretagogues for pancreatic cells. Even while there are many treatment options available, there are some disadvantages as well, like high expenses and unfavorable side effects (like hypoglycemia, weight gain, gastrointestinal issues, hepatotoxicity, etc.)[14]. The search for effective diabetes medications and antioxidants is still underway due to new developments and the significance that oxidative stress plays in diabetic complications.

Herbs for diabetes were once sought after by people. Samples of therapeutic plants are used to make a variety of medications. A good example of an oral hypoglycemic medication is metformin. Galega officinalis was used in its development to treat diabetes. Guanidine, a substance that lowers blood sugar, is abundant in goat beans. In Europe, oral antibiotics known as alkylbiguanide synthetic protein A and synthetic protein B were initially created in the 1920s due to guanidine's toxicity, but their usage was discontinued with the introduction of insulin. Nonetheless, the creation of metformin was facilitated by the experience with biguanide and guanidine. There are already more than 400 published herbal therapies for curing diabetes; however, only few of these have been clinically or scientifically tested for effectiveness. In type 2 diabetes models in humans and animals, certain herbs have been demonstrated to exhibit hypoglycemic properties. Further research on herbal medications is recommended by the WHO's expert committee on diabetes.

The absence of clinical and scientific evidence supporting the safety and efficacy of herbs is the main barrier to their use in modern medicine. In addition to fundamental bioassays for biological samples, chemical and toxicological studies, and the development of various animal models for testing toxicity and safety, clinical research on herbal treatments is also necessary. Determining the active components of this plant is also crucial.

A. Herbs which are used in Diabetes:

➢ *Amla (Phyllanthus Emblica)*

- *Synonym- Emblica officinalis*
- *Family- Phyllanthaceae*
- *Genus : Phyllanthus*

- *Chemical Constituent :*

β-glucogallin, galloyl glucose, gallic acids, glutamic acid , proline, aspartic acid, alanine, cysteine, lysine, emblicanin A and B,

- *Pharmacological Study :*

E. officinalis is a significant, historically utilized medicinal herb that has a strong anti-diabetic effect. Lipid peroxidation, antioxidant activity, and hypoglycemic activity are all reduced by it.[15]

➢ *Bel Patra (Aegle Marmelos)*

- *Synonym : Feronia Pellucida Roth.*
- *Family: Rutaceae*
- *Genus: Aegle*

- *Chemical Constituent :*

Alkaloids (aegelin & aegelinin), coumarin (marmesin), tannins, and active principle (marmelosin).

- *Pharmacogical Study :*

The Aegle marmelos leaf extract's hypoglycemic effect on diabetes induced by streptozocin. The trial rats' tissues had changed parameters, but the extract dramatically corrected them. The medication appears to heal the damaged pancreas, according to writers.[16]

➢ *Bitter Melon (Momordica Charantia)*

- *Synonym: Momordica elegans.*
- *Family: Cucurbitaceae*
- *Genus : Momordica*

- *Chemical Constituents:*

Momordicin Ic, apolypeptide-p, oleanolic acid 3-O-glu-curonide, and oleanolic acid 3-O-monodesmoside.

- *Pharmacological Study:*

Juice's mode of action in rats administered a single dose of 60 mg/kg body weight of streptozocin. The treated rats were given M. charantia juice (10 ml/kg) three times a day for three weeks following injection, and this reduced the insulin-induced rise in glucose absorption.[17][18]

➢ *Curry Leaves (Murraya Koenigii)*

- *Synonym: Spreng. Camunium Koenigii*
- *Family: Rutaceae*
- *Genus : Bergera*

- *Chemical Constituent :*

Mahanimbine, Isomahanine, Murrayacinine, Mahanimboline.

- *Pharmacological Study :*

One study found that an ethanolic extract of M. koenigii considerably lowered blood sugar levels. The study found that the antioxidant and insulin-mimetic qualities of M. koenigii explain its ability to lower blood sugar. Additionally, M. koenigii had a robust antioxidant activity, demonstrating a significant decrease in MDA and GSH levels in addition to a reduction in the homeostatic model assessment (HOMA)-insulin resistance index. Overall, rats exposed to M. koenigii appear to have anti-diabetic and antioxidant effects..[19]

➢ *Fenugreek (Methi) (Trigonella Foenum-Graecum)*

- *Synonym: Buceras Foenum-Graecum(L).*
- *Family: Fabaceae*
- *Genus: Trigonella*
- *Chemical Constituent: Steroid (Sapogenins), Galactomannans and Isoleucine*

- *Pharmacological Study:*

According to reports, fenugreek seed extracts have the ability to slow down the pace of glucose absorption and the time it takes for the stomach to empty. Its high fiber content, which slows the metabolism of carbs and lowers blood glucose, is primarily responsible for the small intestine's reduced uptake of glucose.[20]

➢ *Giloy (Tinospora Cordifolia)*

- *Synonym: Cocculus cordifolius (wild) DC*
- *Family: Menispernaceae*
- *Genus: Tinospora*

- *Chemical Constituents:*

They are classified into various groups, including steroids, glycosides, alkaloids, diterpenoid lactones, sesquiterpenoid compounds, phenolics, and polysaccharides.

- *Pharmacological Study:*

It has been reported that giving animals an alcoholic or aqueous extract of T. cordifolia improves their ability to tolerate glucose and lowers their blood sugar. Aqueous extract also lowered blood sugar in rats and rabbits with hyperglycemia brought on by alloxan at a dose of 400 mg/kg.. Nevertheless, a pancreatic histology test has not turned up any evidence.[21]

➢ *Gudmar (Gymnema Sylvestre)*

- *Synonym: Apocynum alterniflorum Lour.*
- *Family: Apocynaceae*
- *Genus: Gymnema*

- *Chemical Constituents: Dried Leaves:*

Active ingredients gurmenic acid. alkaloids (gymnamine), peptide gurmarin, pararabin, triterpene glycoside (gymnemic acid 6%), bitter principle (containing sialagouge action), lupenol, quercitol, coloring materials, and anthraquinones. [22]

- *Pharmacological Study:*

The hypoglycemic impact of Gymnema sylvestre leaves on rats was observed in their water-soluble acidic component. Rats with streptozotocine-induced diabetes were used to test the medication. It was found that G.sylvetre increases insulin levels. However, the exact mechanism of action is still unknown. Gymnemic acid is a component of Gymnema sylvestre.[23]

➢ *Java Plum (Syzygium Cumini)*

- *Synonym: Syzygium Jambolana.*
- *Family: Myrtaceae*
- *Genus: Syzygium*

- *Chemical Constituents:*

Glucoside, ellagic acid, anthocyanins, isoquercetin, kaemferol, and myrecetin. It is stated that the seeds contain the glycosides jambolin or antimellin, as well as the alkaloid jambosine.

- *Pharmacological Study:*

In this work, streptozotocin-induced diabetic rats were used to test the hypoglycemic effects of several Eugenia jambolana seed components, including the total seed, kernel, and seed coat. The hypoglycemia effect of the whole seed was mild, but the hypoglycemic effect of the seed coat was nonexistent. The hypoglycemic efficacy was compared to glibenclamide, a common hypoglycemic drug.. [24]

➢ *Tulsi (Ocimum Sanctum Linn)*

- *Synonym: Ocimum monachorum L*
- *Family: Labiatae*
- *Genus: Ocimum*

- *Chemical Constituents:*

Volatile oil (caryophyllene and eugenol), flavonoids, saponins, and triterpenoid compounds (ursolic acid and rosmarinic acid).

- *Pharmacological Study:*

Ocimum sanctum medication caused a significant decrease in blood glucose levels throughout fasting and after meals when compared to a placebo. In addition, the overall cholesterol levels somewhat decreased.. Although the exact mechanism underlying sacred basil's hypoglycemic action is unknown, Gymnema sylvestre increases insulin levels.[25]

➢ *Vijaysar (Pterocarpus Marsupium)*

- *Synonym: Lingoum marsupium.*
- *Family: Fabaceae*
- *Genus: Pterocarpus*

- *Chemical Constituents:*

Pterostilbene is a substance that is obtained from this plant's wood. From this plant, marsupin, pterosupin, and liquiritigenin are produced. Epicatechin its active constituent.

- *Pharmacological Study:*

This plant's wood contains a component called pterostilbene, which has hypoglycemic effects. Because this extract contains tannates, it has hypoglycemic properties. It has been shown that the percentage of Pterocarpus marsupium flavonoids causes regranulation of the beta cells in the pancreas. This plant's ligurigenin, pterosupin, and marsupin all shown antihyperlipidemic qualities. The active ingredient, epicatechin, has been demonstrated to be insulinogenic, which means that it stimulates proinsulin conversion to insulin and insulin release in vitro.[26]

III. CONCLUSION

In conclusion, these plants have well-established antidiabetic properties, and a vast array of other plants may also have this property. Additionally, it has been claimed that these plants aid in the management of diabetes-related problems. Future research might concentrate on isolating, purifying, and characterizing the bioactive substances found in these plants. The results of these investigations could serve as a springboard for the creation of potential anti-diabetic medications. The use of herbal therapy is expected to enhance the condition of diabetes patients and promote excellent health. Therefore, the management of diabetes may benefit from this review. Herbs used naturally for diabetes.

REFERENCES

[1]. Ang-Lee MK, Moss J, Yuan CS. Herbal medicines and perioperative care. Jama. 2001 Jul 11;286(2):208-16.
[2]. Grover JK, Yadav S, Vats V. Medicinal plants of India with anti-diabetic potential. Journal of ethnopharmacology. 2002 Jun 1;81(1):81-100.
[3]. Scartezzini P, Speroni E. Review on some plants of Indian traditional medicine with antioxidant activity. Journal of ethnopharmacology. 2000 Jul 1;71(1-2):23-43.
[4]. Seth SD, Sharma B. Medicinal plants in India. Indian Journal of Medical Research. 2004 Jul 1;120(1):9.
[5]. D'Epiro NW. An historical, regulatory, and medical use perspective on nine common herbs. In: Micozzi MS, Bacchus AN, eds. The Physician's Guide to Alternative Medicine. Atlanta, Ga. American Health Consultants. 1999:21-30.
[6]. Fugh-Berman A, Ernst E. Herb–drug interactions: review and assessment of report reliability. British journal of clinical pharmacology. 2001 Nov;52(5):587-95.
[7]. Ramachandran A, Snehalatha C, Viswanathan V. Burden of type 2 diabetes and its complications–The Indian scenario. Current science. 2002 Dec 25:1471-6.
[8]. Lipinski B. Pathophysiology of oxidative stress in diabetes mellitus. Journal of Diabetes and its Complications. 2001 Jul 1;15(4):203-10.
[9]. Michael Kubisch H, Wang J, Bray TM, Phillips JP. Targeted overexpression of Cu/Zn superoxide dismutase protects pancreatic β-cells against oxidative stress. Diabetes. 1997 Oct 1;46(10):1563-6.
[10]. Naziroğlu M, Çay M. Protective role of intraperitoneally administered vitamin E and selenium on the antioxidative defense mechanisms in rats with diabetes induced by streptozotocin. Biological trace element research. 2001 Feb;79:149-59.

[11]. Giugliano D, Ceriello A, Paolisso G. Oxidative stress and diabetic vascular complications. Diabetes care. 1996 Mar 1;19(3):257-67.
[12]. Brownlee, MD M. Advanced protein glycosylation in diabetes and aging. Annual review of medicine. 1995 Feb;46(1):223-34.
[13]. Elgawish A, Glomb M, Friedlander M, Monnier VM. Involvement of hydrogen peroxide in collagen cross-linking by high glucose in vitro and in vivo. Journal of Biological Chemistry. 1996 May 31;271(22):12964-71.
[14]. Dey L, Attele AS, Yuan CS. Alternative therapies for type 2 diabetes. Alternative medicine review. 2002 Feb 1;7(1):45-58.
[15]. KC SK, Müller K. Medicinal plants from Nepal; II. Evaluation as inhibitors of lipid peroxidation in biological membranes. Journal of Ethnopharmacology. 1999 Feb 1;64(2):135-9.
[16]. Das AV, Padayatti PS, Pauiose C. Effect of leaf extract ofv4cg/emarmelose (L.) Correa ex Roxb. on histological and ultrastructural changes in tissues of streptozotocin induced diabetic rats. Indian J Exp Biol. 1996 Apr;34:341-5.
[17]. Raman A, Lau C. Anti-diabetic properties and phytochemistry of Momordica charantia L.(Cucurbitaceae). Phytomedicine. 1996 Mar 1;2(4):349-62.
[18]. Ahmed I, Chandranath I, Sharma AK, Adeghate E, Pallot DJ, Singh J. Mechanism of hypoglycemic action of Momordica charantia fruit juice in normal and diabetic rats. J Physiol. 1999;520:25.
[19]. Husna F, Suyatna FD, Arozal W, Poerwaningsih EH. Anti-diabetic potential of Murraya koenigii (L.) and its antioxidant capacity in nicotinamide-streptozotocin induced diabetic rats. Drug Research. 2018 Nov;68(11):631-6.
[20]. Patel DK, Prasad SK, Kumar R, Hemalatha S. An overview on antidiabetic medicinal plants having insulin mimetic property. Asian Pacific journal of tropical biomedicine. 2012 Apr 1;2(4):320-30.
[21]. Patel DK, Prasad SK, Kumar R, Hemalatha S. An overview on antidiabetic medicinal plants having insulin mimetic property. Asian Pacific journal of tropical biomedicine. 2012 Apr 1;2(4):320-30.
[22]. Matsuda H, Morikawa T, Yoshikawa M. Antidiabetogenic constituents from several natural medicines. Pure and Applied Chemistry. 2002 Jan 1;74(7):1301-8.
[23]. Shanmugasundaram ER, Gopinath KL, Shanmugasundaram KR, Rajendran VM. Possible regeneration of the islets of Langerhans in streptozotocin-diabetic rats given Gymnema sylvestre leaf extracts. Journal of ethnopharmacology. 1990 Oct 1;30(3):265-79.
[24]. Ravi K, Sivagnanam K, Subramanian S. Anti-diabetic activity of Eugenia jambolana seed kernels on streptozotocin-induced diabetic rats. Journal of medicinal food. 2004 Jun 1;7(2):187-91.
[25]. Agrawal P, Rai V, Singh RB. Randomized placebo-controlled, single blind trial of holy basil leaves in patients with noninsulin-dependent diabetes mellitus. International journal of clinical pharmacology and therapeutics. 1996 Sep 1;34(9):406-9.
[26]. Chakrabarti D, Ghosh A, Banerjee N, Majumder, PC and Gupta. M. Plant .Res. 1995: 21 -23,30. 32.