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Ecological Studies on Medicinal Flora of Dausa Having Hypoglycemic Potential

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ABSTRACT: Low blood glucose, also called low blood sugar or hypoglycemia, occurs when the level of glucose in your blood drops below what is healthy for you. For many people with diabetes, this means a blood glucose reading lower than 70 milligrams per deciliter (mg/dL).[1] Your number might be different, so check with your doctor or health care team to find out what blood glucose level is low for you. Low blood glucose is common among people with type 1 diabetes and among people with type 2 diabetes who take insulin or some other diabetes medicines. In a large global study of people with diabetes who take insulin, 4 in 5 people with type 1 diabetes and nearly half of those with type 2 diabetes reported a low blood sugar event at least once over a 4-week period.[2]Severely low blood glucose, defined as when your blood glucose level drops so low you can't treat it yourself, is less common. Among U.S. adults with diabetes who take insulin or some diabetes medicines that help the pancreas release insulin into the blood, 2 in 100 may develop severely low blood glucose each year.[3]Mild-to-moderate low blood glucose can be easily treated. But severely low blood glucose can cause serious complications, including passing out, coma, or death. Repeated episodes of low blood glucose can lead to[4]

- high blood glucose levels, if worry or fear of low blood glucose keeps you from taking the medicines you need to manage your diabetes[8]
- hypoglycemia unawareness, a condition in which you don't notice any symptoms of low blood glucose until your blood glucose level has dropped very low[5]

There are many medicinal flora of Dausa which have hypoglycemic potential.

KEYWORDS: hypoglycemic, diabetes, drugs, Dausa, medicines, herbs, chemistry, compounds, ecological[6]

I.INTRODUCTION

Ethnobotanical studies and documentation of various uses of the plants by common man can help to preserve our traditional medicinal knowledge of plants. This paper includes ethnobotanical studies on 31 plants belonging to 23 families, used by indigenous people of the Shekhawati region, Rajasthan, India to cure their common ailments. [7]These plants also have hypoglycemic potentials. During ethnobotanical studies we have compiled important information about the medicinal uses of these selected plants. Such plants have natural power to cure the diseases without any side effect. Garlic (*Allium sativum* L., Alliaceae), Persian shallot (*Allium ascalonicum* L., Alliaceae)[8] and Sage (*Salvia officinalis* L., Lamiaceae) are believed to have hypoglycemic properties and have been used traditionally as antidiabetic herbal medicines in Iran. In this study, diabetes was induced by subcutaneous injection of alloxan monohydrate (100 mg kg^{-1}) to male Wistar rats[9]. Antidiabetic effects of methanolic extracts of the above mentioned three plants on alloxan-diabetic rats was investigated in comparison with the effects of antidiabetic drugs such as acarbose, glibenclamide and metformin by measuring postprandial blood glucose (PBG), oral glucose tolerance test (OGTT), inhibition of rat intestinal α-glucosidase enzymes activities [10]and pancreatic *Insulin* and cardiac *Glut-4* mRNAs expression. In short term period, hypoglycemic effects of *A. sativum* and *A. ascalonicum* showed significant reduction of PBG similar to glibenclamide (5 mg kg^{-1} bw) while *S. officinalis* significantly reduced PBG similar to acarbose (20 mg kg^{-1} bw). After 3 weeks of treatment by methanolic plant extracts, significant chronic decrease in the PBG was observed similar to metformin (100 mg kg^{-1} bw). For OGTT, *S. officinalis* reduced PBG in a similar way as acarbose (20 mg kg^{-1} bw). Intestinal sucrase and maltase activities were inhibited significantly by *A. sativum*, *A. ascalonicum* and *S. officinalis*.[11] In addition, we observed increased expression of *Insulin* and *Glut-4* genes in diabetic

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rats treated with these plants extracts. Up regulation of *Insulin* and *Glut-4* genes expression and inhibition of *α*-glucosidaseactivities are the two mechanisms that play a considerable role in hypoglycemic action of garlic, shallot and sage. These herbs are found in Dausa city of Rajasthan easily.[12] These are antidiabetic medicinal plants to cure diabetes. From the review it was suggested that, plant showing hypoglycemic potential mainly belongs to the family Leguminoseae, Lamiaceae, Liliaceae, Cucurbitaceae, Asteraceae, Moraceae, Rosaceae and Araliaceae. The most active plants are *Allium sativum, Gymnema sylvestre, Citrullus colocynthis, Trigonella foenum greacum, Momordica charantia* and *Ficus bengalensis*.[40] The review describes some new bioactive drugs and isolated compounds from plants such as roseoside, epigallocatechin gallate[13], beta-pyrazol-1-ylalanine, cinchonain Ib, leucocyandin 3-O-beta-d-galactosyl cellobioside, leucopelargonidin-3- O-alpha-L rhamnoside, glycyrrhetinic acid, dehydrotrametenolic acid, strictinin, isostrictinin, pedunculagin, epicatechin and christinin-A showing significant insulinomimetic and antidiabetic activity with more efficacy than conventional hypoglycaemic agents.[39] Thus, from the review majorly,[14] the antidiabetic activity of medicinal plants is attributed to the presence of polyphenols, flavonoids, terpenoids, coumarins and other constituents which show reduction in blood glucose levels. [15]

Table of plants found in Dausa city of Rajasthan, India having hypoglycemic activity (anti-diabetic activity) and reducing diabetes:-

S. No.	Plant part	Name of plants
1	Aerial parts	*Artemisia pallens, Bidens pilosa, Bixa orellana, Teramnus labialis*
2	Bark	*Cinnamomum zeylanicum, Croton cajucara*
3	Bulb	*Allium cepa, Allium sativum*
4	Flower	*Cassia auriculata, Gentiana olivier, Musa sapientum*
5	Fruit	*Carum carvi, Coriandrum sativum, Embellica officinalis, Juniperus communis, Momordica charantia, Xanthium strumarium*
6	Leaves	*Aloe barbadensis, Annona squamosa, Averrhoa bilimbi, Azadirachta indica, Beta vulgaris, Camellia sinensis, Cassia alata, Eclipta alba, Eucalyptus globulus, Euphrasia officinale, Ficus carica, Gymnema sylvestre, Gynura procumbens, Ipomoea aquatica, Mangifera indica, Myrtus communis, Memecylon umbellatum, Morus indica, Ocimum sanctum*
7	Rhizome	*Nelumbo nucifera*
8	Roots	*Clausena anisata, Glycerrhiza glabra, Helicteres isora, Pandanus odorus*
9	Seed	*Acacia arabica, Agrimony eupatoria, Lupinus albus, Luffa aegyptiaca, Lepidium sativum, Mucuna pruriens, Punica granatum*
10	Stem	*Amaranthus spinosus, Coscinium fenestratum*
11	Tubers	*Ipomoea batata*
12	Whole plant	*Abies pindrow, Achyranthus aspera, Ajauga iva, Aloe vera, Anacardium occidentale, Andrographis paniculata, Capsicum frutescens, Cryptolepis sanguinolenta, Enicostemma littorale, Ficus religiosa*

II.DISCUSSION

According to the search several plant species have been described as hypoglycaemic such as *Opuntia streptacantha, Trigonella foenum graecum, Momordica charantia, Ficus bengalensis, Polygala senega, Gymnema sylvestre, Allium sativum, Citrullus colocynthis* and *Aloe vera*.[38] The main focus of the present review is concerned about the experimental studies performed on hypoglycaemic activity of the plant material and the bioactive components related to the seceration of insulin or its action.[16]

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Table showing list of plant phytoconstituents having insulin secretions

S. No.	Plant botanical name	Family	Active constituents
1	*Aloe vera*	Liliaceae	Pseudoprototinosaponin AIII and prototinosaponins AIII
2	*Anemarrhena asphodeloides*	Liliaceae	Mangiferin and mangiferin-7-O-β-dglucoside
3	*Bauhinia variegata*	Caesalpiniaceae	Roseoside
4	*Camellia sinensis*	Theaceae	Epigallocatechin gallate
5	*Citrullus colocynthis*	Cucurbitaceae	Beta-pyrazol-1-ylalanine
6	*Ephedra distachya*	Ephedraceae	L-ephedrine
7	*Eriobotrya japonica*	Rosaceae	Cinchonain ib
8	*Eugenia jambolana*	Myrtaceae	Pandanus odorus (Toei-hom) a 4- hydroxybenzoic
9	*Ficus bengalensis*	Moraceae	Leucocyandin 3-O-beta-d-galactosyl cellobioside, leucopelargonidin-3- O-alpha-L rhamnoside
10	*Glycyrrhizae radix*	Fabaceae	Glycyrrhetinic acid, dihydroxy gymnemic triacetate
11	*Momordica charantia*	Cucurbitaceae	Momordicin, charantin, and galactose-binding lectin
12	*Panax ginseng*	Araliaceae	Polypeptides
13	*Prunella vulgaris*	Labiatae	Jiangtangsu
14	*Psidium guajava*	Myrtaceae	Strictinin, isostrictinin and pedunculagin
15	*Pterocarpus marsupium*	Fabaceae	Epicatechin
16	*Semen coicis*	Gramineae	Coixans
17	*Stevia rebaudiana*	Asteraceae	Stevioside, steviol
18	*Swertia chirayita*	Gentianaceae	Swerchirin
19	*Teucrium polium*	Lamiaceae	Apigenin
20	*Trigonella foenum-graecum*	Leguminosae	4-hydroxyleucine and hydroxyisoleucine
21	*Zizyphus spina-christi*	Rhamnaceae	Christinin-A

III.RESULTS

The Dausa city in Rajasthan, India have natural products classified into terpenoids, alkaloids, flavonoids, phenolics[37], and some other categories have shown antidiabetic potential through the insulinomimetic activity of the plant extract.[17] Roseoside, epigallocatechin gallate, beta-pyrazol-1-ylalanine, cinchonain Ib, leucocyandin 3-O-beta-d-galactosyl cellobioside, leucopelargonidin-3-O-alpha-L rhamnoside, glycyrrhetinic acid, dehydrotrametenolic acid, strictinin, isostrictinin and pedunculagin, epicatechin and christinin-A isolated from the plant material[36] have shown significant insulinomimetic activity along with significant antidiabetic potential.[18] Additionally, some flavonoids and polyphenols, as well as sugar derivatives, are found to be effective due to some other extrapancreatic mechanisms. [19]In this review so many number of plants are included which have shown antidiabetic action through relese of insulin and some extra pancreatic mechanisms[35].Plants such as *Allium cepa*, *Clerodendron phlomoides*, *Cinnamomum tamala*, *Coccinia indica*, *Enicostemma littorale*, *Ficus bengalensis*, *Gymnema sylvestre* leaves, *Momordica charantia*, *Pterocarpus marsupium* and *Syzygium cumini* have a great antidiabetic potential,[20] which have already been subjected to the clinical trial are included in the list, whereas some marketed herbal formulations (diasulin, pancreatic tonic 180 cp, chakrapani,

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diabecon, bitter gourd powder, dia-car, diabetes-daily care, gurmar powder, epinsulin, diabecure, syndrex, diabetawhich)[21] which have been proved for its antidiabetic activity. The anti-diabetic plants used in the treatment of diabetes mellitus[34] are many and found in Dausa city of Rajasthan, India. [22] It showed that these plants have hypoglycaemic effects and can be used to treat various type of secondary complications[33] of diabetes mellitus. Plants have been a good source of medicine for the treatment of various type of disease, still many plants and active compounds obtained from plants have not been well characterized.[23] More investigations must be carried out to evaluate the exact mechanism of action of medicinal plants with antidiabetic [32]and insulino mimetic activity. It is always believed that plant is safe, but so many plant materials are not safe for the human being, that's why toxicity study of these plants should also be elucidated before consumption of these plant materials.[24]

IV.CONCLUSIONS

Diabetes mellitus (DM), both insulin-dependent DM (IDDM) and non-insulin dependent DM (NIDDM) is a common and serious metabolic disorder throughout the world.[31] Traditional plant treatments have been used throughout the world for the therapy of diabetes mellitus. Among many medications and polyherbal plants, several herbs have been known to cure and control diabetes[25]; additionally they have no side effects. Diabetes mellitus is a dreadful disease found in all parts of the world and is becoming a serious threat to mankind health. Diabetes mellitus is a group of metabolic diseases characterized by high blood sugar[30] (glucose) levels thatresult from defects in insulin secretion, or action, or both[26]. Thus, plants are a potential source of anti-diabetic drugs which can be proved by the ethnobotanical information reports about 800 plants that may possess anti-diabetic potential. Although, synthetic oral hypoglycemic agents/insulin is the mainstream treatment of diabetes[27] and effective in controlling hyperglycaemia, they have prominent side effects and fail to significantly alter the course of diabetic complications. This forms the main reason for an increasing number of people finding alternating therapies that may have less severe or no side effects.[28] We have discovered many herbs in Dausa city of Rajasthan which prove anti-diabetic potential and are safe without any side effects.[29]

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