

## Brief update on Indian herbs and spices used for diabetes in rural area of Chhattisgarh

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### Abstract

Ayurveda is a holistic science that was discovered several years ago. It is preventive as well as curative. Ayurveda is highly popular and mainly followed in India. India leads the world with largest number of diabetic subjects earning the dubious distinction. This equates to approximately three new cases every ten seconds or almost ten million per year. International diabetes federation also estimates that as many as 183 million people are unaware that they have diabetes. Diabetes has emerged as a major health care problem worldwide. Management of pre-diabetes can be done effectively with the help of combination therapies. For prevalence and treatment there are many ways such as drugs (modern medications), alternative systems like Ayurvedic, diet, lifestyle intervention and recently herb and spice therapies are seen useful and effective. A list of medicinal plant which mostly used in rural area of Chhattisgarh for treatment of diabetes is compiled in this review. This review is focused mainly on the beneficial effects of herbs and spices in the management of diabetes. It utilizes the traditional knowledge and experimental scientific studies to support the use of herbs and spices in diabetes.

**Keywords:** Diabetic, Ayurveda, Herbal

### Introduction

The term diabetes mellitus describes a metabolic disorder with heterogeneous etiologies which is characterized by chronic hyperglycemia and disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both.<sup>(1,2)</sup> There are various features which are involved directly or indirectly as etiological factors for it such as heredity, age, obesity, sex, diet, physical inactivity, hypertension, socio-economic status, sedentary lifestyle and various stresses.<sup>(3,4)</sup> People with diabetes are also at increased risk of cardiac, peripheral arterial and cerebrovascular disease.<sup>(5)</sup>

**Pre-diabetes:** Pre-diabetes is a condition that comes before diabetes. Blood glucose levels gets higher than the normal but are not to be termed as diabetes. It is often described as the "grey area" between normal blood sugar and diabetic levels. The term pre-diabetes is used for the condition in which fasting blood glucose level is  $\geq 110$  and  $< 126$  mg/dl.

### Types of diabetes mellitus

There are three main types of diabetes mellitus. These are following

1. **Type 1 diabetes mellitus:** Type I diabetes mellitus results from the body's failure to produce insulin. This group is called as insulin dependent diabetes mellitus or "juvenile diabetes Type I Diabetes.
2. **Type 2 diabetes mellitus:** Type II diabetes mellitus results from insulin resistance, a condition

in which cells fail to use insulin properly, sometimes also with an absolute insulin deficiency.

3. **Gestational diabetes mellitus:** Gestational diabetes is the third main form, is a type of diabetes that some women get during pregnancy and characterized by high blood sugar levels.<sup>(6)</sup>

### Symptoms of diabetes

The symptoms of diabetes mellitus are explained in following:

1. Elevated blood sugar levels, and loss of glucose in the urine. High amounts of glucose in the urine can cause increased urine output and lead to dehydration. Dehydration causes increased thirst and water consumption.
2. Insulin deficiency eventually leads to weight loss despite an increase in appetite.
3. Fatigue, nausea and vomiting.
4. More chances of developing infections of the bladder, skin, and vaginal areas.
5. Blurred vision. Extremely elevated glucose levels can lead to lethargy and coma.

Herbal Treatment of Diabetes Mellitus-Natural products have received considerable attention for the management of diabetes and its complications which have reached epidemic levels worldwide. For most herbs, the specific ingredient that causes a therapeutic effect is not known.<sup>(7)</sup>

### Various spices useful in Diabetes Mellitus

Herbs Spices are exerting various types of beneficial pharmacological and physiological effects including hypoglycemia. Various type of spices used in

rural area have been reported studies such as cinnamon, garlic, onion, fenugreek, turmeric, mustard, black pepper, ginger and others have been experimentally documented to possessing potential hypoglycemic activity. Coriander, cumin seeds, sumac and curry leaves also have reported anti-hyperglycemic property. Brief information on some spices is described below:

**1. Cinnamon: (*Cinnamomum zeylanicum* and *C. verum*)**

**Family:-** Lauraceae.

Cinnamon is commonly known as “Dalchini” in hindi. Phenolic extract of cinnamon (*C. zeylanicum*) shows the insulin potentiating activity. Thus its supplementation is important for in-vivo glucose control and insulin sensitivity in humans. While another species (*C. verum*) exhibits hypoglycemic activity by enhancing the insulin activity. Along with this it also shows increase in lipid metabolism and antioxidant status. It contains alkaloids, proteins, tannins, cardiac glycosides and saponins. An aqueous extract of *C. verum* bark improved insulin resistance and prevented lipid abnormalities in fructose fed diabetic rats.<sup>(8)</sup>

**2. Cumin seeds: (*Cuminum cyminum*) and Black Cumin (*Bunium persicum* Boiss)**

**Family:-** Umbelliferae.

Oral administration of this seeds shows anti-obese and hypoglycemic activity in preclinical experiments a finding of 65 weeks study perform in rats. In the management of diabetes it is more effective than glibenclamide. Hypoglycemic effect of cumin seeds also observed in normal rabbits.<sup>(9)</sup> Black cumins are proved clinically effective as anti-obesity, and hypoglycemic.

**3. Curry leaves: (*Murraya koenigii*)**

**Family:** Rutaceae.

Plant *Murraya koenigii* is commonly known as Curry leaves. It is widely and regularly used as a spice – condiments in India and its subcontinent. The aqueous extract is proved for its effective hypoglycemic property in preclinical studies. The clinical study also proved effective as taken by Iyer and Mani in 1990 in which reduction in blood glucose levels are seen. Leaf extract supplementation decreases blood cholesterol and blood glucose concentration with reduction in body weight of experimental mice.<sup>(10)</sup> It is also observed that glucose lowering effect of aqueous leaf extract of *M. koenigii* was higher in alloxan induced diabetic animals than in normoglycemic animals.<sup>(11)</sup>

**4. Fenugreek: (*Trigonella foneum graecum*)**

**Family:** Leguminosae.

*Trigonella foneum* is also known as Fenugreek or Methika which is used as food and for medicinal purpose. It is good source of many essential elements such as iron, phosphorus, sulphur etc. It is a known

hypoglycemic agent used in traditional Indian medicinal practice. Extract prepared with different parts of the plant of Methika shows significant hypoglycemic activity. An amino acid ‘4-hydroxyleucine’ is a novel component from fenugreek which reportedly increases glucose-induced-insulin resistance. It reduces the blood glucose level along with the elevated TC, TG but not affecting HDL.<sup>(12)</sup>

**5. Garlic: (*Allium sativum*)**

**Family:** Liliaceae

Since a long time it is used and well known for good carminative, it is an anti-obese spice. Garlic, also known as “Lahsun”, is essential dietary spice component cultivated throughout India and familiar for its various uses. Garlic contains S-allyl cysteine sulphoxide, a sulfur containing amino acid, which produces significant blood glucose lowering activity in animal studies. Apart from hypoglycemic effect it is also reported to have antihypertensive and atherosclerosis activity. *Allium sativum* have capacity to stimulate the production of insulin by pancreatic beta-cells and this keeps diabetes under control<sup>[13]</sup>.

**6. Ginger: (*Zingiber officinale*)**

**Family:** Zingiberaceae

*Zingiber officinale* is also known as Ginger and is dietary spice component widely cultivated, used throughout in India which possesses hypoglycemic activity. Animal experimentation has done on Ginger shows its significant antidiabetic activity on type I diabetes. It also produces a significant increase in insulin levels and a decrease in fasting glucose level in diabetic rats. Ginger is commonly used spice in tea preparation all over India.<sup>(13)</sup>

**7. Mustard: (*Brassica nigra*)**

**Family:** Cruciferae.

*Brassica nigra* is a small herb spice cultivated in India and commonly used spice as food supplementary in various food items. It is well known as “Rhai”. Oral administration of mustard exerts significant hypoglycemic activity. The hypoglycemic effect of Rhai was attributed to stimulation of glycogen synthetase and suppression of various glycolytic enzymes.<sup>(14)</sup>

**8. Onion: (*Allium cepa*)**

**Family:** Liliaceae.

Onion shows stimulation of production of insulin thus produces hypoglycemic activity. Onion contains various elements and among these sulfur containing amino acids S-methylcysteine sulphoxide shows the hypoglycemic effect and stimulates the insulin production by activating pancreatic cells.<sup>(15)</sup>

### 9. **Pippali: (*Piper nigrum* and *P. longum*)**

**Family:** Piperaceae.

Black pepper is well acknowledged as “Pippali” in India is often used as spice in various food preparations for its taste and carminative properties. In combination with some other herbs it is used in various antidiabetic polyherbal formulations. *Piperine*, the active alkaloid of *Pipernigrum* has been evaluated for its glucose regulatory efficacy and daily oral administration for 15 days lowered blood glucose concentrations and hepatic glucose-6-phosphatase enzyme activity.<sup>(16)</sup>

### 10. **Turmeric: (*Curcuma longa*)**

**Family:** Zingiberaceae.

It reduces effect of enzymes responsible for converting dietary carbohydrates into glucose, leading to a decrease in blood glucose level. In animal studies curcumin shows reduction in blood glucose, hemoglobin, and glycated hemoglobin levels. Ferulic acid or 4-hydroxy-3-methoxy-cinnamic acid found in turmeric exhibits hypoglycemic action in both type I and type II diabetes. Some amide compound derived from ferulic acid has evidence for insulin secretion from pancreatic beta cells.<sup>(17)</sup>

### Various herbs useful in diabetes Mellitus

Herbalists treat many conditions such as diabetes, asthma, eczema, premenstrual syndrome, rheumatoid arthritis, migraine, menopausal symptoms, chronic fatigue, and irritable bowel syndrome, among others. Some common herbs and their uses are discussed below.

1. **Aloe vera and Aloe barbadensis:** Aloe plant can be separated into two basic products: gel and latex. This action of Aloe vera and its bitter principle is through stimulation of synthesis and/or release of insulin from pancreatic beta cells.<sup>(18)</sup>
2. **Mangifera indica: (Mango)** The leaves of this plant are used as an antidiabetic agent in Nigerian folk medicine. Aqueous extract of *Mangifera indica* possess hypoglycemic activity due to an intestinal reduction of the absorption of glucose.<sup>(19)</sup>
3. **Tinospora cordifolia: (Guduchi)** It is a large, glabrous, deciduous climbing shrub belonging to the family Menispermaceae. It is commonly known as Guduchi. Oral administration of the extract of *Tinospora cordifolia* roots for 6 weeks resulted in a significant reduction in blood and urine glucose and in lipids in serum and tissues in alloxan diabetic rats.<sup>(20)</sup> The extract also prevented a decrease in body weight. *T. cordifolia* is widely used in Indian ayurvedic medicine for treating diabetes mellitus.
4. **Ocimum sanctum: (holy basil):** It is commonly known as Tulsi. The aqueous extract of leaves of *Ocimum sanctum* showed the significant reduction in blood sugar level in both normal and alloxan induced diabetic rats.<sup>(21)</sup> 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 diabetic rats. Oral administration of plant extract (200 mg/kg) for 30 days led to decrease in the plasma glucose level by approximately 9.06 and 26.4% on 15 and 30 days of the experiment respectively.<sup>(22)</sup> Renal glycogen content increased 10 fold while skeletal muscle and hepatic glycogen levels decreased by 68 and 75% respectively in diabetic rats as compared to control.<sup>(23)</sup>

5. **Momordica charantia: (bitter gourd)** The plant is commonly known as Bitter guard and has many varieties *Momordica charantia* is commonly used as an antidiabetic and antihyperglycemic agent in India as well as other Asian countries. Polypeptide p, isolated from fruit, seeds and tissues of *M. charantia* showed significant hypoglycemic effect when administered subcutaneously to langurs and humans.<sup>(24)</sup> Ethanolic extracts of *M. charantia* (200 mg/kg) showed an antihyperglycemic and also hypoglycemic effect in normal and STZ diabetic rats. This may be because of inhibition of glucose-6-phosphatase besides fructose-1, 6-biphosphatase in the liver and stimulation of hepatic glucose-6-phosphate dehydrogenase activities.<sup>(25)</sup> Dosage: 2-3 fresh unripe fruits are taken at any time per day for three months.
6. **Azadirachta indica: (Neem)** Hydroalcoholic extracts of this plant showed anti-hyperglycemic activity in streptozotocin treated rats and this effect is because of increase in glucose uptake and glycogen deposition in isolated rat hemidiaphragm. Apart from having anti-diabetic activity, this plant also has anti-bacterial, antimalarial, antifertility, hepatoprotective and antioxidant effects.<sup>(26)</sup>

### Conclusion

There has been a rich history associated with usage of herbs and spices in India since 300 BC. Various studies have shown use of spices and herb for prophylaxis and treatment of diseases in rural as well as in urban areas as they are abundantly available and gives highly efficacious therapeutic results. As per the present study we came to know that above mentioned herbs and spices are used traditionally in rural area of Chhattisgarh and have shown excellent result in diabetes. So we can conclude that the mentioned herbs and spices can be used for treatment and prophylaxis of diabetes and the plants have wide possibility for research.

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