



ISSN: 2319-9490

RESEARCH ARTICLE

ANTIDIABETIC EFFECT ON SOME MEDICINAL PLANTS

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Received 17th November, 2020; Accepted 10th December, 2020; Published 30th January, 2021

ABSTRACT

Many plants have been used for the treatment of diabetes mellitus in Indian system of medicine and in other ancient systems of the world. Out of these only a few have been evaluated as per modern system of medicine. Medicinal herbs as potential source of therapeutic aids have attained a significant role in health system all over the world for both humans and animals. Ayurveda and other Indian literature mention the use of plants in treatment of various human diseases. Many studies have confirmed the benefits of medicinal plants with hypoglycemic effects in the management of diabetes mellitus. The effects of these plants may delay the development of diabetic complications and correct the metabolic abnormalities. WHO has pointed out this prevention of diabetes and its complications is not only a major challenge for the future, but essential if health for all is to attain.

Key words: Diabetes, Aloe vera, Bilberry extract, Bitter melon, Cinnamon, Fenugreek, Ginger, Okra.

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Citation: Pidaran Murugan. 2021. "Antidiabetic effect on some medicinal plants" *International Journal of Current Research in Life Sciences*, 10, (xx), xxx-xxx

INTRODUCTION

Human beings have depended on nature for their simple requirements as being the sources for medicines, shelters, food stuffs, fragrances, clothing, flavours, fertilizers and means of transportation throughout the ages. For the large proportions of world's population medicinal plants continue to show a dominant role in the healthcare system and this is mainly true in developing countries, where herbal medicine has continuous history of long use. The development and recognition of medicinal and financial aids of these plants are on rise in both industrialized and developing nations (WHO, 1998). The use of plants for treating diseases is as old as the human species. Popular observations on the use and efficacy of medicinal plants significantly contribute to the disclosure of their therapeutic properties, so that they are frequently prescribed, even if their chemical constituents are not always completely known. All over the globe, especially in South American countries, the use of medicinal plants has significantly supported primary health care (Maciel *et al.*, 2002). From 250 to 500 thousand plant species are estimated to exist on the planet, and only between 1 and 10% are used as food by humans and other animals (Cowan 1998). Brazil has the world's highest biodiversity, accounting for over 20% of the total number of known species. This country presents the most diverse flora, with more than 55 thousand described species, which corresponds to 22% of the global total.

Such biodiversity is followed by a wide acceptance of the medicinal plant use (Carvalho *et al.*, 2007). Most of the Brazilian population (80%) consumes only 37% of the commercially available drugs and depend almost exclusively on medicines of natural origin. Thus, phytotherapies entered the market promising a shorter and cheaper production, since basic requirements to use medicinal plants do not involve strict quality control regarding safety and efficacy compared to the other types of drugs (Funari and Ferro, 2005). During the past decade, traditional systems of medicine have become a topic of global importance. Current estimates suggest that, in many developing countries, a large proportion of the population relies heavily on traditional practitioners and medicinal plants to meet primary health care needs. Although modern medicine may be available in these countries, herbal medicines (phytomedicines) have often maintained popularity for historical and cultural reasons. Medicinal plants frequently used as raw materials for extraction of active ingredients which used in the synthesis of different drugs. Like in case of laxatives, blood thinners, antibiotics and anti-malarial medications, contain ingredients from plants. Moreover the active ingredients of Taxol, vincristine, and morphine isolated from foxglove, periwinkle, yew, and opium poppy, respective. Medicine, in several developing countries, using local traditions and beliefs, is still the mainstay of health care. As defined by WHO, health is a state of complete physical, mental, and social wellbeing and not merely the absence of disease or infirmity. Medicinal plants can make an important contribution to the WHO goal to ensure, by the year 2000, that all peoples, worldwide, will lead a sustainable socio-economic productive life (UNESCO, 1998).

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Diabetes is a serious metabolic disorder and plenty of medical plants are used in traditional medicines to treat diabetes. These plants have no side effects and many existing medicines are derived from the plants. The purpose of this systematic review is to study diabetes and to summarize the available treatments for this disease, focusing especially on herbal medicine. Diabetes is a chronic disorder in the metabolism of proteins, fats, and carbohydrates. It is described as an increase in blood glucose after any type of meal. Diabetes results from either insulin deficiency or malfunction (Modak *et al.*, 2007). According to statistics, 2.8% of the world's population suffer from this disease and it is expected to increase to more than 5.4% by 2025. Diabetes requires early diagnosis, treatment, and lifestyle changes. Diabetes is a disease that affects many people in the 21st century and is known as the fifth leading cause to death. In the absence of proper treatment, cardiac, vascular, neurological, and renal damage and neuropathy may occur. Treatment includes diet, exercise, and medication (Yu Zengyang *et al.*, 2015). Currently, the main and effective treatment for diabetes is the use of insulin and hypoglycemic drugs, but these compounds also have many adverse side effects (Das *et al.*, 2009). Medicinal plants have a long history of usage and today, they are being extensively used for various diseases (Salahi, 2012; Rao *et al.*, 2010). There are several reasons for increasing the use of medicinal plants. Many plants from different parts of the world have been investigated for antidiabetic effects.

In addition, the side effects of medicines and their interactions with each other in vitro must be considered by medical staff. Today, many treatments that involve the use of medicinal plants are recommended (Kazi, 2014). Most plants contain carotenoids, flavonoids, terpenoids, alkaloids, glycosides and can often have anti-diabetic effects (Afrisham *et al.*, 2015). The anti-hyperglycemic effects that results from treatment with plants are often due to their ability to improve the performance of pancreatic tissue, which is done by increasing insulin secretions or reducing the intestinal absorption of glucose. The number of people with diabetes today has been growing and causing increasing concerns in medical community and the public. The main purpose of this article is to introduce a number of effective medicinal plants used for treating diabetes and other mechanisms of plant compounds used to reduce glucose levels and increase insulin secretion.

Aloe vera: Aloe vera is a product of the prickly but succulent aloe vera plant, which has been used in herbal medicine for thousands of years due to its healing, rejuvenating and soothing properties. Native to the Caribbea, South Africa and Latin American, the plant's leaves contain a clear gel that is widely used in: Creams, Lotions, Shampoos, Ointments. A bitter liquid known as aloe latex, that can be derived from the skin of the leaves, is used in juice drinks, tablets, capsules and dental care items such as toothpaste and mouthwash. Aloe vera has various medicinal properties like anti-inflammatory, antibacterial, antiviral, and antitumor which accelerates wound healing and helps in treating various lesions in oral cavity (Ahlawat and Khatkar, 2011). Benefits associated with Aloe vera have been attributed to the polysaccharides contained in the gel of the leaves. Preliminary research suggests that intake of aloe vera juice can help improve blood glucose levels and may therefore be useful in treating people with diabetes. Decreased blood lipids (fats) in patients with abnormally high levels of these molecules in the blood (e.g. some people with type 2 diabetes) and/or acute hepatitis (liver disease).

Decreased swelling and faster healing of wound injuries. Leg wounds and ulcers are common complications of diabetes, and they typically take longer time to heal than in healthy non-diabetic individuals (Grindlay and Reynolds, 1986; Gupta and Malhotra, 2012).

Bilberry extract: Bilberry is a plant. The dried, ripe fruit and leaves are used to make medicine. Bilberry is used by mouth to treat poor circulation that can cause the legs to swell. Some people take bilberry for diabetes, high blood pressure, gout, urinary tract infections (UTIs), and many other conditions. But there is no good scientific research to support these other uses. Bilberry is also sometimes used by mouth to treat eye conditions such as disorders of the retina, cataracts, nearsightedness, and glaucoma. There is some evidence that bilberry may help retinal disorders, but there is no good scientific evidence that bilberry is effective for treating other eye conditions. In fact, bilberry was once commonly used for improving night vision. During World War II, British pilots in the Royal Air Force ate bilberry jam to improve their night vision, but later research showed it probably didn't help. Bilberry is sometimes applied directly to the inside of the mouth for mild mouth and throat soreness (Wilhelmina *et al.*, 2020). Bilberry contains chemicals called tannins that can help improve diarrhea, as well as mouth and throat irritation, by reducing swelling (inflammation). There is some evidence that the chemicals found in bilberry leaves can help lower blood sugar and cholesterol levels. Some researchers think that chemicals called flavonoids in bilberry leaf might also improve circulation in people with diabetes. Circulation problems can harm the retina of the eye (Ozawa *et al.*, 2015).

Bitter melon: Bitter melon also known as bitter melon, karela, balsam pear, or bitter gourd, is a popular plant used for the treating of diabetes-related conditions amongst the indigenous populations of Asia, South America, India, the Caribbean and East Africa (Cousens, 2008; Cefalu *et al.*, 2008). Its fruit has a distinguishing bitter taste, which is more pronounced as it ripens, hence the name bitter melon or bitter gourd. The fruit and seeds are used to make medicine. People use bitter melon for diabetes, obesity, stomach and intestinal problems, and many other conditions, but there is no good scientific evidence to support these uses. Bitter melon is linked to lowering the body's blood sugar. This is because the bitter melon has properties that act like insulin, which helps bring glucose into the cells for energy. The consumption of bitter melon can help your cells utilize glucose and move it to your liver, muscles, and fat. The melon may also be able to help your body retain nutrients by blocking their conversion to glucose that ends up in your blood stream. Bitter melon isn't an approved treatment or medication for prediabetes or diabetes despite the evidence that it can manage blood sugar. Several studies have examined bitter melon and diabetes. Most recommend conducting more research before using any form of the melon for diabetes management.

Cinnamon: Cinnamon is a spice obtained from the inner bark of several tree species from the genus *Cinnamomum*. Cinnamon is used mainly as an aromatic condiment and flavouring additive in a wide variety of cuisines, sweet and savoury dishes, breakfast cereals, snackfoods, tea and traditional foods. Cinnamon can kill bacteria, viruses and even drug-resistant fungi. It can disrupt a particularly nasty type of bacterial colony called a biofilm that coats the surface of medical devices and wreaks havoc with hospital-acquired

infections (Anderson *et al.*, 2004). Antioxidants protect your body from oxidative damage caused by free radicals. Cinnamon has been linked to a reduced risk of heart disease, the world's most common cause of premature death. In people with type 2 diabetes (Sanga, 2011), 1 gram or about half a teaspoon of cinnamon per day has been shown to have beneficial effects on blood markers. It reduces levels of total cholesterol, "bad" LDL cholesterol and triglycerides, while "good" HDL cholesterol remains stable. More recently, a big review study concluded that a cinnamon dose of just 120 mg per day can have these effects. In this study, cinnamon also increased "good" HDL cholesterol levels (Yeh *et al.*, 2013; Nonaka *et al.*, 1983). In animal studies, cinnamon has been shown to reduce blood pressure. Cinnamon may improve some key risk factors for heart disease, including cholesterol, triglycerides and blood pressure.

Fenugreek: Fenugreek is a clover-like herb native to the Mediterranean region, southern Europe, and western Asia. Its seeds, which smell and taste like maple syrup, have been used in cooking and as medicine. Fenugreek is used as an ingredient in spice blends and a flavoring agent in foods, beverages, and tobacco. Hepatotoxicity. Despite being widely used, fenugreek has not been implicated in cases of clinically apparent liver injury and, in prospective studies, has had no effect on serum enzyme levels. In vitro studies have demonstrated hepatoprotective activity of fenugreek extracts in several animal models (Kumar *et al.*, 2015). Fenugreek seeds may be helpful for people with diabetes. The seeds contain fiber and other chemicals that may slow digestion and the body's absorption of carbohydrates and sugar. The seeds may also help improve how the body uses sugar and increases the amount of insulin released. Fenugreek seeds (*trigonellafoenumgraecum*) are high in soluble fiber, which helps lower blood sugar by slowing down digestion and absorption of carbohydrates. This suggests they may be effective in treating people with diabetes. Several clinical trials showed that fenugreek seeds can improve most metabolic symptoms associated with both type 1 and type 2 diabetes in humans by lowering blood glucose levels and improving glucose tolerance (Hannan *et al.*, 2007). Fenugreek seeds are a rich source of vitamins, minerals and antioxidants, which help protect the body's cells from damage caused by unstable molecules known as free radicals. For centuries they have been (and are still) used by nursing mothers to help stimulate the production of breast milk during pregnancy and following childbirth. Due to their powerful antiviral properties, they are also commonly used as an herbal remedy for colds and sore throats. In addition, researchers believe fenugreek seeds may be effective in the treatment of arthritis, high cholesterol, skin problems (wounds, rashes and boils), bronchitis, abscesses, hair loss, constipation, upset stomach, kidney ailments, heart bur, male impotence and other types of sexual dysfunction (Roberts, 2011).

Ginger: Ginger is a flowering plant that originated in Southeast Asia. It's among the healthiest (and most delicious) spices on the planet. It belongs to the Zingiberaceae family, and it's closely related to turmeric, cardamom, and galangal. The rhizome (underground part of the stem) is the part commonly used as a spice. It's often called ginger root or, simply, ginger. Ginger can be used fresh, dried, powdered, or as an oil or juice. It's a very common ingredient in recipes. It's sometimes added to processed foods and cosmetics. Ginger has a very long history of use in various forms of traditional and

alternative medicine. It's been used to aid digestion, reduce nausea, and help fight the flu and common cold, to name a few of its purposes. The unique fragrance and flavor of ginger come from its natural oils, the most important of which is gingerol. Gingerol is the main bioactive compound in ginger (Murugan and Pari, 2006). It's responsible for much of ginger's medicinal properties. Gingerol has powerful anti-inflammatory and antioxidant effects, according to research. For instance, it may help reduce oxidative stress, which is the result of having an excess amount of free radicals in the body (Murugan and Pari, 2006). Ginger is high in gingerol, a substance with powerful anti-inflammatory and antioxidant properties. Ginger can be an effective addition to your diabetes treatment if you use it in moderation. Eating up to 4 grams per day may help lower your blood sugar levels and regulate insulin production. Be sure to talk with your doctor before adding this to your treatment regimen. It's also worth noting that ginger has a very low glycemic index (GI) Low GI foods break down slowly to form glucose and therefore do not trigger a spike in blood sugar levels as high GI foods do (Murugan and Pari, 2007). Since ginger may fight germs, illness, inflammation, and cancer-causing molecules, taking a little bit every day can support your overall health. Ginger is a natural root, so drinking it will also give you added nutrients (Murugan and Pari, 2007).

Okra: Okra is a nutritious food with many health benefits. It's rich in magnesium, folate, fiber, antioxidants, and vitamin C, K1, and A. Okra may benefit pregnant women, heart health, and blood sugar control. It may even have anticancer properties. Drinking "okra water" is a popular new method of using okra. Some have even suggested that drinking it helps lessen diabetes symptoms (Saifullahand Rabbani, 2009). The drink is made by putting okra pods in water and soaking them overnight. Some of the valuable nutrients in the skin and seed pods will be absorbed into the water. People with an elevated blood glucose level should definitely include okra in their daily diets. As okra is rich in fiber, it helps in improving insulin sensitivity and also aids in controlling and maintaining blood sugar levels in the body (Andras *et al.*, 2005). The fiber in okra helps reduce the absorption rate of glucose which reduces blood glucose levels. Okra is useful for preventing kidney disease; patients who ate okra daily had reduced signs of kidney damage. Okra is known to have high levels of vitamin A, vitamin C, and many other antioxidants, making it a helpful alternative option for reducing wrinkles, helping with acne and acne scars, and reducing skin irritations. Diabetes Management: Besides being rich with antioxidants, bhindi, also known as okra, is an excellent source of both soluble and insoluble fibre, that takes its on time to breakdown and digest, making for an excellent pick for diabetes. Okra water can be a great option for blood sugar management (Ndunguru and Rajabu, 2004).

Conclusion

Treatment of diabetes without any side effects is still a challenge to the medical system. There is an increasing demand by patients to use the natural products with antidiabetic activity, because insulin and oral hypoglycemic drugs are having undesirable side effects. The plants used in the study can be tried as an antidiabetic agent.

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