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Use of medicinal plants in the diabetes treatment

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ABSTRACT

Medicinal plants have been used by the population since the beginning as a tool to prevent and fight diseases. In addition, to strengthening local culture and offering cheaper labor, this practice is an alternative to conventional therapies. The use of these plants in metabolic disorders has been studied worldwide. It has shown promising results in reducing glycemic levels and profiles related to diabetes, such as LDL lipid profile, total cholesterol, triglycerides, and glycated hemoglobin (HbA1c). These results can be potential sources for pharmacological treatments, through the production of medicines, as well as the implementation of these plants in the diet, dispensing with the use of commercialized drugs.

Keywords: Phytotherapy, diabetes, dyslipidemia

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Introduction

The use of medicinal plants by the population has been described since ancient times as a tool for the prevention and treatment of diseases. Whereas in popular belief, they cause little or no adverse effects[1]. Although in modern medicine there is considerable progress in the drug industry and its correlates, these traditional practices in developing countries reach 80%. The use of medicinal plants strengthens local culture and traditional knowledge, enriching a production chain and is an alternative option to conventional therapy[2].

Dyslipidemia has a strong relationship with diabetes because the more fat in the body, the level of glucose and lipids in the blood increases more. According to Agência Nacional de Vigilância Sanitária (ANVISA), dyslipidemia is defined as a disorder that changes serum levels of lipids. The change in this lipid profile may include elevated cholesterol, triglycerides, high density lipoprotein (HDL), and low-density lipoprotein (LDL). This can lead to the development of cardiovascular diseases that cause mortality in thousands of people worldwide[3,4].

Diabetes is a metabolic disorder caused by hyperglycemia resulting from a malfunction of the pancreas when it does not produce enough insulin. Furthermore, when the body cannot effectively use the insulin produced. This chronic disease of global importance is responsible for an important cause of morbidity and mortality. Also, it has a high impact on health expenses, because when poorly controlled, it brings complications to patients, who need to spend more time in direct care of hospitals[5]

The incidence of diabetes in Brazil has reached a rate of 61.8% in the last 10 years. global estimates indicate that the number of people living with diabetes could reach 592 million in 2035[6,7]. Several traditional or complementary therapies have been described in the literature to deal with this disorder. Among them, the use of medicinal plants has grown as a promising alternative.

Medicinal plants and diabetes

Among the great diversity of plants with a potential to combat dyslipidemia and diabetes, table 1 covers 10 species with these properties. Among other therapeutic activities, these species have significant efficacy in clinical trials regarding the potential to reduce profiles of glycemic markers. In sequence, a more detailed description of how each species acts in the fight against diabetes.

Table 1. Species with potential to diabetes management.

Species	Study direction	Reference
Trigonella foenum-graecum	Diabetes Mellitus	10
Momordica charantia	Pre-diabetics and diabetics	14
Cinnamomum verum	Type II diabetes	17
Moringa oleifera	Diabetes Mellitus	24
Crocus sativus L.	Type II diabetes	29
Bauhinia forficata L.	Type II diabetes	31
Scoparia dulcis	Type II diabetes	35
Melissa officinalis L.	Type II diabetes	39
Zingiber officinale	Type II diabetes	41
Salvia hispanica L.	Type II diabetes	43

Trigonella foenum-graecum

Known as “feno grego”, this species belonging to the Fabaceae family and has been used as a condiment and as a medicinal plant. Studies have demonstrated its antioxidant, gastroprotective, hepatoprotective, antidiabetic and neuroprotective activities[8,9].

Geberemeskel, Debebe and Nguse (2019) used an aqueous solution of 25g / L of T. feonum-graecum seed powder in diabetic patients for 30 days. This study showed a significant reduction, compared to the control group, of 13.6% of total cholesterol, 23.53% of triglycerides, 23.4% of LDL, and an increase in HDL of 21.7%. Thus, the authors suggest that T. feonum-graecum seed powder has a potential antidislipidemic effect. Although it is not known exactly how its mechanism occurs, studies suggest that the seed may increase the excretion of bile. This causes the formation of large micelles, compromising the synthesis of triglycerides[10,11].

Momordica charantia

Popularly called “melão amargo” or “mamãozinho”, this species belongs to the Cucurbitaceae family and has antiviral, antimicrobial and antimutagenic activity. Its action against diabetes mellitus has been described by indigenous populations in Asia, East Africa, India, America and the Caribbean[12,13].

According to Krawinkel et al. (2018), supplementation with the powder of the fruits of M. charantia showed a significant reduction in fasting blood glucose, by bringing the glycemic levels of pre-diabetics to the normal level. Therefore, it is expected that the plant will be even more effective in patients who already have diabetes installed. The mechanisms by which this reduction in blood glucose occurs are still poorly known[14].

Cinnamomum verum

Often referred to by its synonym, Cinnamomum zeylanicum Blume, and popularly known as “canela”, this plant belonging to the Lauraceae family. It has shown antimicrobial, anti-inflammatory, antifungal properties and helps in reducing the risk of colon câncer[15,16].

In a work carried out by Zare et al., (2018), they proved that 1g / day of C. verum compared to the placebo group, demonstrated a significant reduction in anthropometric indices including mass index, total body fat and visceral fat. As well as, the glycemic index, fasting plasma glucose, glycated hemoglobin, and lipid profile balance. The mechanisms may be related to inhibition of glycogen synthase kinase-3 and increased expression of the UCP317 gene[17,18,19].

Moringa oleifera

Among the 13 species described for the Moringaceae family, M. oleifera has been the most used and studied and in traditional Ayurveda medicine (Ancient science created in India). It has been used in the prevention and treatment of diseases, including diabetes[20,21,22]. Because they have an incredible number of properties, for example, antioxidant, anti-inflammatory, immunomodulatory and anticancer, the species has been nicknamed “Arvore milagrosa” and “presente natural”[23].

Leone et al. (2018), concluded that the addition of 20g of the powder of M. oleifera leaves in a meal, reduces the postprandial response to glucose, which was maintained for about 3h. The inhibition of α-amylase, an enzyme important for the digestion of carbohydrates, in in vitro tests, has also been related to the decrease in glycemic level. Therefore, the continuous use of powder from these leaves can improve the management of glycemia in diabetic individuals[24].

Crocus sativus L.

Known as “açafrão” or “açafrão do outono”, this species belonging to the Iridaceae family and has been used as a natural product since ancient times. Persians, Egyptians and Europeans used it as an aphrodisiac, to decrease low back pain and against poisoning[25,26,27]. studies have brought its therapeutic efficacy in several parts of the gastrointestinal system, in addition to antioxidant effects, anticancer, antigenotoxic, anti-inflammatory, among others[28].

The work of Aleali et al. (2019) concluded that consumption for three months of encapsulated

hydroalcoholic extract of C. sativus significantly reduced fasting blood glucose, glycated hemoglobin (HbA1c), total cholesterol and LDL in patients with type II diabetes. One of the suggested mechanisms is that the extract causes inhibition of intestinal glucose absorption. Therefore, the results show that the consumption of saffron can improve hyperglycemia and that further studies are needed to show the mechanisms of action of its positive effects[29].

Bauhinia forficata

Naturally native to the Atlantic Forest and commonly known as “pata de vaca” or “unha de vaca”, B. forficate belongs to the Caesapinoideae subfamily and the Fabaceae family. This species has been used popularly for the treatment of several pathologies, especially diabetes, pain and inflammatory processes[30].

The study by Mariángel et al. (2019), showed that tea from the dry leaves of B. forficate, twice daily for a period of three months, significantly reduced triglycerides, total cholesterol, and glycated hemoglobin (HbA1c). The mechanisms proposed for this reduction imply hepatic lipid metabolic stimulation, in which it reduces plasma lipid levels. The authors also compared their research with other studies. through experimental models, treatment with B. forficate interferes with hepatic glucose, glycogenesis, and lactate production. In addition, it diminishes blood glucose and is anti-diabetic in rats[31,32].

In addition, another species of Bauhinia, Bauhinia monandra Kurz, presents hypoglycemic and hypotensive activity. It was also evidenced that when hydrocoolic extract of B. monandra developed insulin-like effect, that is, it may be able to interact or modulate the specific binding capacity of insulin, competing by the same receptor. The morphological and morphometric results of the hydroalcoholic extract allowed us to infer that B. monandra Kurz possibly caused recovery of B cells[44]

Scoparia dulcis

S. dulcis belongs to the Plantaginaceae family and is commonly known as “erva de alcaçuz”, “erva bode”or “vassoura doce”. Studies have related S. dulcis with analgesic, anti-inflammatory, antidiuretic, and antimicrobial potential[33,34].

The clinical trial conducted by Senadheera, Ekanayake and Wanigatunge (2015), with porridge from the extract of the leaf of S. dulcis, demonstrated a significant reduction in fasting blood glucose and a reduction in the levels of glycated hemoglobin (HbA1c). In addition, there was no increase in creatinine, urea, and C-reactive protein (CRP). The author also approaches, through the analysis of other studies, that the consumption of S. dulcis extract can reduce oxidative stress in pancreatic cells. Also, it significantly reduces the concentrations of triglycerides, LDL, and total carbohydrates. However, it is worth mentioning that this last analysis was observed in studies with rats, which can also support its use[35,36].

Melissa officinalis L.

Better known as “erva cidreira”, “citronela” or “melissa”, M. officinalis belongs to the Lamiaceae family. Some studies have shown its antibacterial, antimicrobial, antioxidant, sedative activity, among others[37,38].

The pioneering study by Asadi et al. (2018), determined the clinical effect and tolerability of 700mg /day for three months of M. officinalis in type II diabetic individuals. They observed a significant decrease in fasting blood sugar, glycated hemoglobin (HbA1c) and systolic blood pressure compared to the control group. In addition, there is a reduction the inflammatory marker CRP[39].

Zingiber officinale

Known as “gengibre” Z. officinale is one of the common functional foods used worldwide as condiments for various foods and drinks. For ginger, some medicinal uses have been described, for example, antispasmodic, digestive and vasodilatory action, expectorant, bronchodilator, topical stimulant, analgesic, antiflatulent, aphrodisiac and aperitive[40].

In the study by Shidfar et al. (2015), ginger supplementation was done with 3g / day for three

months. When compared to the control group, the results showed a decrease in insulin-resistant glucose, hs-CRP, lipid peroxidation, and increased levels of paraoxonase-1 (PON-1). These data were compared with other animal studies using hydroalcoholic and alcoholic extracts of ginger. Some of the possible mechanisms are related to the inhibition of glycogen phosphorylase, which is responsible for breaking down glycogen in the liver. One of the possible effects is also related to the antioxidant potential of ginger[41].

Salvia hispanica L.

"Salba-chia" or "chia", a plant belonging to the Lamiaceae family, is a seed with a good source of protein, phenolic compounds, and essential fatty acids. In addition, it has a high amount of fiber[42].

Vuksan et al. (2016), determined the benefits of consuming 30g / day of ground tea from S. hispanic for six months. In this study, there was a significant reduction in body weight and android and gynoid fat. There were also no major adverse events, only mild and transient discomforts. The author suggests that therapies that promote weight loss, as in the case of the study, may reduce the risk factors associated with type II diabetes, thus helping its control[42,43].

Conclusion

Besides presenting an economical labor, plants have shown over the years, an enormous potential to treat countless diseases, among them, diabetes. Given the rates of diabetics in the country, the search for alternative therapeutic treatments is essential. Also, to encouraging the search for new plant species with bioactive potentials and proof of their pharmacological properties.

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