International Journal Scientific and Profesional (IJ-ChiProf)
Vol 2 Issue 1 February 2023, pp: 166-171
ISSN:2829-2618 (Online)
DOI:https://doi.org/10.56988/chiprof.v2i1.32

Acacia Plants Lower Blood Sugar: Study Literature

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Article Info

Article history:
Received Jan 19, 2023
Revised Feb 01, 2023
Accepted Feb 04, 2023

Keywords:
Diabetes
Acacia Plants
Blood Sugar
Diabetic

ABSTRACT

Background: Diabetic is a chronic disease that occurs because the pancreas cannot produce enough insulin or the body cannot use insulin actively which results in high blood sugar levels. One way to prevent diabetes is to provide non-pharmacological therapies such as the use of herbal plants. One of the herbal plants that can be used in the prevention of diabetes is the acacia plant (Acacia Nicoleta). Method: The method used a literature study with a search from various sources, such as academic journals, and online articles. A literature search was carried out using keywords related to Acacia Nicoleta and diabetes. Result: in a literature review acacia can lower blood sugar levels because acacia plants contain carbohydrates, proteins, and minerals as well as secondary metabolites in the form of alkaloids, tannins, and saponins. Conclusion: acacia plant is proven to reduce blood sugar so it is expected to use the acacia plant as a non-pharmacological therapy in diabetics.

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1. INTRODUCTION

Diabetes Mellitus (DM) is one of the most common metabolic disorders which is of great concern worldwide [1]. DM is caused due to insulin deficiency or ineffective insulin production in the pancreas and causes abnormalities in carbohydrate, protein and lipid metabolism [1], [2]. The number of people with Diabetes Mellitus is expected to increase, the number will be 463 in 2019 to 578 million in 2030 and in 2045 it will increase again to 700 million [3].

Based on data from the International Diabetes Federation, India is ranked seventh in the world along with China, India, the United States, Brazil, Russia and Mexico with an estimated number of diabetics as many as 10 million people [4]. The population of diabetics in Indonesia who have been diagnosed with diabetes by doctors reaches 2.6 million people [4]. Data from Riskesdas 2013 stated that the number of diabetics in South Sumatra reached 49 thousand people who had been diagnosed by a doctor. Type II diabetes is the predominant type of all diabetics, as many as 90% are type II diabetics [5].

Diabetes Mellitus is categorized into two classes: Type 1 and Type 2. In Type 1 Diabetes Melitis, insulin production is insufficient due to damage to pancreatic β cells, whereas Type 2 Diabetes Melitis is manifested by impaired insulin secretion in pancreatic β cells or by insulin resistance causing hyperglycemia [1], [6].

Diabetes mellitus requires lifelong treatment which is very difficult for diabetic patients to support [7]. A large number of synthetic anti-diabetic drugs are available to reduce the effects of diabetes mellitus and its related complications, but there is no cure [8]. In addition, diabetic patients suffer from side effects associated with various synthetic antidiabetic drugs. Due to various challenges in managing diabetes mellitus using synthetic drugs, herbal products are increasingly popular in developing and developed countries because they are believed to have lower side effects, lower costs, and easier accessibility (Niyodusenga et al., 2019).

Plants are widely known as natural antioxidant agents [11]. Thus, free radical scavenging natural product therapy may prove a useful therapeutic tactic in diabetes control [6]. There are several therapeutic approaches in the management of DM to reduce postprandial hyperglycemia by inhibiting carbohydrate hydrolyzing enzymes, such as

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ISSN: 2829-2618 (Online)

α-amylase and α-glucosidase [12]. For example, the Acacia species has medicinal benefits as an anti-diabetic and anti-microbial [13], [14].

Acacia auriculiformis A. Cunn. (family: Fabaceae) commonly known as the Australian babool or earpod wattle. It is enriched with carbohydrates such as glucuronic acid, methyl glucuronic acid, galactose, L-rhamnose and arabinose, and the seeds contain saponins, especially, proacaciaside-I and proacaciaside-II and Acaciaside-A and Acaciaside B and flavonoids, namely, (-)- teracacidin and (-)-isoteracidin [6]. This plant has been reported to have several biological activities, namely antimutagenic and chemopreventive, antidiabetic, antimalarial and antiulcer activity [15]. Acacia nilotica indica is rich in polyphenols known to lower blood glucose and tannins that antagonize calcium-induced cardiac and smooth muscle contractions, thereby lowering blood pressure [10].

in a recent study conducted by Saprianto, Yunike, Ira Kusumawaty, Ferawaty Suzalin in 2023 showed a decrease in blood glucose levels before and after being given acacia leaf boiled water for three days. Regular consumption of acacia leaf decoction can stabilize blood sugar, but this therapy will not be meaningful if participants continue to consume excess sugar continuously [16]. Based on the background above, the purpose of this research is to provide information about the effect of Acacia Nilotica Leaf Extract in lowering sugar levels.

2. RESEARCH METHOD

The research approach used is literature review or literature study. The research data was obtained through literature review and empirical studies of various books and previous research journals that focused on Acacia Plants Lowering Blood Sugar. Data collection using search engines such as Google Scholar (online articles, journals).

3. RESULTS AND ANALYSIS

The results of the study found that from the five articles it was found that the acacia plant can lower blood sugar levels. The five articles used have relevance and pay attention to research objectives. The following table reviews the results of the analysis in this article :

Table 1: Article Reviews

Research (Years)	Article Title	Database Source	Method	Result
Kabiru Sirajo, Zulkallaini Shehu, Ibrahim Mas'ud and Khadijah Almustapha Usman, 2020	Hepatotoxicity Assessment of Stem Bark Extract of Acacia nilotica in Alloxan Induced Diabetic Rats	Google Scholar	Bark of acacia nilotica was collected, then cross-identification with the name of the area of the plant was carried out prior to validation by a qualified taxonomist. Then acacia nilotica leaf extract, an experiment was carried out on male swiss albino rats.	The results of this study that acacia leaf water extract showed antidiabetic activity. The intraperitoneal route of administration of herbal extracts was found to be more effective than the oral route. Furthermore, qualitative and quantitative phytochemical screening of the aqueous extract of A. nilotica leaves showed the presence of phenols, alkaloids, flavonoids, tannins and saponins. However, cardiac glycosides and phylobatin were not detected.
Manas Ranjan Saha, Priyankar Dey, Indrani Sarkar, Dilip De Sarker, Biswajit Haldar, Tapas Kumar Chaudhuri, Arnab Sen, 2017	Acacia Nilotica Leaf Improves Insulin Resistance And Hyperglycemia Associated Acute Hepatic Injury And Nephrotoxicity By Improving Systemic Antioxidant Status In Diabetic Mice	Science Direct	Acacia leaf extract was administered orally (50 and 200 mg/kg) to allocated rats (blood glucose >200 mg/dL) for 20 days. Parameters of glucose metabolism, hepatotoxicity, hyperlipidemia, and nephrotoxicity were measured with an emphasis on increased oxidative stress. Acacia leaf extract was chemically characterized using GC-MS. Furthermore, docking studies are used to predict molecular interactions.	Acacia nilotica leaf extract reduced (65%, $P<0.001$) systemic glucose load in diabetic rats, which was stated to be 398% higher than controls. Acacia nilotica leaf extract reduced (35%) insulin resistance, without a significant effect on insulin sensitivity ($P>0.05$). The anti-hyperglycemic properties of acacia leaf extract were further supported by a decrease in HbA1c (34%; $P<0.001$) and an increase in glucose utilization (OGTT). Despite their high phenolic and flavonoid contents, tocopherols, catechols and β-sitosterol, which were identified in the ANL, exhibit substantial binding affinity with the protein Nrf2 (5FNQ) reflecting possible crosstalk with intracellular antioxidant defense pathways.

Muhammad Bilal Sadiq, Pattamon Tharaphan, Kesinee Chotivanich, Joel Tarning, and Anil Kumar Anal, 2017	In vitro antioxidant and antimalarial activities of leaves, pods and bark extracts of Acacia nilotica	PubMed	The antioxidant activity of leaf, pod and bark extracts was determined by standard antioxidant tests; reducing power capacity, % inhibiting lipid peroxidation and iron reducing antioxidant power test. The antimalarial activity of plant extracts against the Plasmodium falciparum parasite was determined by 48 hours of schizont maturation inhibition test. Further confirmation of the schizonticidal activity of the extract was carried out by extending the incubation period up to 96 hours after removal of the plant extract residue from the parasite culture. Inhibition tests were analyzed by dose-response modeling	The research results of acacia nilotica leaves showed higher antioxidant activity compared to the pods and bark. The IC50 values of antimalarial extracts of leaves, pods and bark were 1.29, 4.16 and 4.28 µg/ml respectively in the 48 hour cooking test. The IC50 values determined for the leaf, pod and skin extracts were 3.72, 5.41 and 5.32 µg/ml, respectively, after 96 hours of incubation. All extracts inhibited the development of mature schizonts, showing schizonticidal activity against P.falciparum.
Saprianto , Yunike , Ira Kusumawat, Ferawaty Suzalin, 2023	Water Detection Of Accia Leaves Reduce Blood Glucose Levels In Diabetes Mellitus Patients	Google Scholar	The case study method was used to collect data directly on respondents by means of interviews, observation sheets and direction glucose measurements.	The results showed a decrease in blood glucose levels before and after being given acacia leaf boiled water for three days. Acacia leaf decoction is a complementary therapy that is proven to reduce blood sugar levels. Regular consumption of acacia leaf decoction can stabilize blood sugar, but this therapy will not be meaningful if participants continue to consume excessive sugar and continuously
Asmawati, Ratnawati, Slamet Widodo, 2021	Innovation in Making Candies from Cemba Leaves (Acacia Rugata) to Increase Food Diversity in Gura Village, Enrekang Regency	Google Scholar	Quantitative research with experimental methods. Data collection techniques used were documentation, score sheets and questionnaires. The data analysis technique used is descriptive analysis, mean, ANOVA, and follow-up tests. The properties observed in the organoleptic test included color, aroma, texture, and taste. Data collection using 40 panelists.	The results showed that (1) the process of making cemba leaf candy (acacia rugata) started with the stages of preparing the ingredients, weighing the ingredients, grinding them with a blender, filtering, boiling, mixing, stirring, printing, cooling, and packaging. (2) the level of panelist acceptance of the quality of candy products from cemba leaves (acacia rugata) with the best formula according to the panelists is F3 with a formula of 15%, overall quality/over all (good) and hedonic test (likes) with color classification 3.22 (dark), aroma (fragrant), texture 5.2 (hard), taste 5.45 (delicious). (3) This was proven by community respondents in Gura Village, Enrekang Regency, who stated that the average candy made from cemba leaves (acacia rugata) was in the good category.

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by persistent hyperglycemia. This may be due to impaired insulin secretion, resistance to the peripheral actions of insulin, or both. Chronic hyperglycemia synergized with other metabolic abnormalities in patients with diabetes mellitus can cause damage to various organ systems, leading to the development of disabling and life-threatening health complications, the most prominent of which are microvascular (retinopathy, nephropathy, and neuropathy) and macrovascular complications that cause increased risk of cardiovascular disease 2-fold to 4-fold [17].

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ISSN: 2829-2618 (Online)

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The etiology of diabetes is a combination of genetic and environmental factors. Other etiologies of diabetes include insulin secretion or action, metabolic abnormalities that impair insulin secretion, mitochondrial abnormalities, and a host of other conditions that impair glucose tolerance. Diabetes mellitus can result from disease of the exocrine pancreas when there is damage to the majority of the islets of the pancreas [18].

Symptoms of DM disease include, among others (Simatpang, 2017 in Lestari et.al., 2021) [18], [19] :

1. Polyuria (frequent urination)
   Urinating more frequently than usual, especially at night (polyuria), this is because blood sugar levels exceed the kidney threshold (> 180 mg/dl), so that sugar will be excreted through the urine. Under normal circumstances, daily urine output is around 1.5 liters , but in uncontrolled DM patients, urine output is five times this amount.
2. Polyphagia (quickly feel hungry)
   Increased appetite (polyphagia) and feeling less energetic. Insulin becomes a problem in DM sufferers so that the entry of sugar into the body's cells is less and the energy that is formed becomes less. This is the reason why sufferers feel less energy. In addition, cells also become poor in sugar so that the brain also thinks that lack of energy is due to lack of food, so the body then tries to increase food intake by causing a hunger alarm.
3. Weight loss
4. When the body is unable to get enough energy from sugar due to a lack of insulin, the body rushes to process the fats and proteins in the body to be converted into energy. In the urine disposal system, uncontrolled DM sufferers can lose as much as 500 grams of glucose in the urine per 24 hours (equivalent to 2000 calories per day lost from the body).

Various medical and herbal treatments are currently recommended for the management of DM, because of their easy availability and fewer side effects, herbal medicines have been suggested as suitable alternatives for antidiabetic drugs [20]. Plants are known to lower blood glucose levels through several pharmacological mechanisms such as decreasing carbohydrate absorption [21], increasing insulin sensitivity and peripheral glucose uptake, stimulating endogenous insulin and incretin secretion, preventing cell apoptosis by exerting antioxidant effects, and promoting glycogenesis or inhibits glycogenolysis [22]. One of them is the Acacia Nilotica plants [22], [23].

Acacia nilotica is a medium-sized upright tree that belongs to the Fabaceae family [24]. Acacia nilotica generally contains (+)-catechin, gallolyated favan-3, 4-diol, robidandiol, androstene steroid, d-pinitol carbohydrate, catechin-5-galloyl ester, gallic, m-digallic, and chlorogenic acids [25]. Due to its natural antioxidant content, Acacia nilotica can be useful in the treatment of diseases such as cancer, DM, and inflammation caused by free radicals. Tannins, or tannic acid, activate glucose transfer and prevent lipolysis [22], [23]. In addition, the hydroxyl groups in the phenolic compound Acacia nilotica transform this plant species into a powerful free radical scavenger [22].

.Acacia nilotica leaf extract is reported to contain L-arabinose, catechol, galactan, galactoaraban, galactose, N-acetyldein colic, N-acetyldein colic acid, pentosan sulfoxide, saponins, and tannins. The seeds contain 18.6% crude protein, 4.4% ether extract, 10.1% fiber, 61.2% free nitrogen extract, 5.7% ash, 0.44% silica, 0.29% phosphorus, and calcium 0.9%. Based on these compounds, Acacia nilotica leaf extract is usually used as an antibacterial because of the presence of secondary metabolites from the extract [26]

In a study conducted to evaluate the efficiency of Acacia nilotica leaf for improving diabetic complications, oral administration of 50 mg/kg and 200 mg/kg of Acacia nilotica leaf extract to alloxanized mice for 20 days significantly reduced systemic glucose and insulin loads. resistance without showing a significant effect on insulin sensitivity. In addition, decreased HbA1c levels and increased glucose utilization support the antihyperglycemic properties of Acacia nilotica leaves [27].

4. CONCLUSION

Diabetes mellitus a is a disease in which blood sugar levels are quite high because the body cannot release or use insulin so that sugar in the blood cannot be metabolized. Diabetes is often caused by genetic factors and a person's behavior or lifestyle. Treatment of diabetes is very complex and requires many interventions for successful management of the disease. Diabetes education and patient involvement are very important in the management of diabetes medication such as being able to adjust the diet (color restriction), exercise regularly, and monitor glucose regularly. Lifelong treatment is often necessary to prevent unwanted complications.

There are several therapeutic approaches in the treatment of diabetes mellitus to reduce postprandial hyperglycemia by inhibiting carbohydrate hydrolyzing enzymes, such as α-amylase and α-glucosidase, one of which

is Acacia species which has medicinal benefits as an anti-diabetic and anti-microbial. Acacia nilotica contains natural antioxidants that can be beneficial in the treatment of cancer, diabetes mellitus and inflammation.

Basically, diabetes mellitus can be controlled by yourself by diligently following the medication that has been given. Acacia plants are an additional or alternative treatment for patients. Done together with a regular diet, regular exercise, monitoring blood sugar regularly and consuming acacia boiled water can lower blood sugar.

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