BAY LEAVE (SYZYGIUM POLYANTHUM) AS AN ANTIDIABETIC AGENT

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THE POTENTIAL OF BAY LEAVE (*SYZYGIUM POLYANTHUM*) AS AN ANTI-DIABETIC AGENT

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Abstract

Non-communicable disease prevalence continues to increase in Indonesia. One of the top 10 causes of death is non-communicable disease, and diabetes mellitus is on the list. Genetics, advanced age, obesity, stress, hypertension, smoking, and physical inactivity are risk factors that might result in diabetes mellitus. Despite advancements in mainstream anti-diabetic treatment, traditional medical practices continue to exist in several nations. *Syzygium polyanthum* is the herb that diabetic patients most frequently utilize in the traditional therapy of their illness, according to research on diabetic patients at the Health Community Center in Sering, Medan, Indonesia. The research team was interested in figuring out whether bay leaves showed any potential as an anti-diabetic agent based on the previous description. In this study, secondary literature from research publications is used in a literature review with a descriptive method. Several studies have suggested that bay leaves could potentially be used for the prevention and treatment of diabetes mellitus.

Keywords: Potential, *Syzygium polyanthum,* Bay Leaf, Diabetes Mellitus, Non-Communicable Disease

Abstrak

Di Indonesia, insiden penyakit tidak menular semakin meningkat setiap harinya. Penyakit tidak menular merupakan salah satu dari sepuluh penyakit terbanyak penyebab kematian, yang dimana diabetes melitus termasuk dalam penyakit tersebut. Faktor risiko yang dapat menyebabkan diabetes melitus ialah genetik, usia, obesitas, stress, hipertensi, merokok dan aktivitas fisik. Dibeberapa negara, masih mengunakan metode pengobatan tradisional meskipun terdapat kemajuan dalam pengobatan antidiabetik konvensional. Penelitian pada pasien diabetes di Health Community Center Sering, Medan, Indonesia menunjukan bahwa *Syzygium polyanthum* merupakan ramuan yang paling umum digunakan oleh pasien dalam pengelolaan tradisional diabetes. Berdasarkan uraian diatas, maka peneliti ingin mengetahui potensi daun salam sebagai anti diabetes melitus. Penelitian ini menggunakan kajian kepustakaan dengan pendekatan deskriptif berdasarkan pustaka sekunder dari artikel-artikel penelitian. Dari beberapa penelitian menunjukan adanya potensi penggunaan daun salam dalam pencegahan dan pengobatan diabetes melitus

Kata Kunci: Potensi, *Syzygium polyanthum,* Daun Salam, Diabetes Melitus, Penyakit Tidak Menular

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1. INTRODUCTION

The prevalence of non-communicable diseases continues to rise in both industrialized and developing nations, including Indonesia. This phenomenon is seen in a growing number of non-communicable diseases both domestically and internationally. One of the top 10 causes of death is a non-communicable disease, and diabetes mellitus makes up one of these diseases.[1] Numerous factors, including genetics, advanced age, obesity, stress, hypertension, smoking, and physical inactivity, might contribute to the development of diabetes mellitus. The most frequent cause of diabetes mellitus is unhealthy eating habits, such as low fiber intake and high fat, protein, sugar, and salt consumption. Additionally, Indonesians tend to consistently eat rice, which is high in glucose.[2]

Diabetes mellitus is a malfunction of the endocrine system characterized by symptoms of elevated blood sugar levels brought on by a lack of insulin secretion, insulin action, or both.[3] In general, this disease consists of two types, namely type 1 DM and type 2 DM, but in cases that are often found, type 2 DM accounts for as much as 90–95% of all cases of this disease. [4]

Many people still rely (to a greater or lesser extent) on conventional antidiabetic medications in various countries, despite developments in natural antidiabetic remedies, especially medicinal plants thought to have antidiabetic characteristics. To standardize and/or source natural medicine with a relative therapeutic benefit, these combined circumstances have sparked and maintained research interest in anti-diabetic medicinal plants.

In a research survey on ethnobotanical studies on diabetic patients at the Health Community Center in Sering, Medan, Indonesia, it was found that *Syzygium polyanthum* was the herb most used by patients in the traditional management of diabetes (data shown below). This finding sparked our interest in studying the anti-diabetic properties of *S. polyanthum* with the aim of pharmacologically validating traditional claims.[5]

The treatment for type 1 diabetes is insulin injections. However, this treatment can cause side effects such as lipodystrophy, immunopathology, and hypoglycemia, with symptoms accompanied by autonomic hyperactivity such as parasympathetic (nausea and hunger) and sympathetic (tachycardia, palpitations, sweating, and trembling).[6,7]

Oral anti-diabetic medications of the biguanide class, such as metformin, are administered as part of the treatment for type 2 diabetes mellitus. Side effects of this medication include headaches, diarrhea, abdominal discomfort, and anorexia. Patients who also have kidney and liver illness should avoid taking this medication.[6]

Treatment for DM sufferers requires a fairly high cost; therefore, many DM sufferers try to control their glucose levels on their own, one of them by using traditional medicine.[8] Natural components, such as herbal plants, may be used in this treatment. When compared to the usage of synthetic medications, several studies have proven that the use of herbal medicinal plants is generally harmless. Additionally, this herbal medicine is inexpensive and exhibits fewer negative effects. Traditional medicine is well-known and utilized all around the world. Due to simple and affordable access to drugs, this is also accepted and trusted by the community on a cultural level. At an international conference on traditional medicine held in Southeast Asian nations in February 2013, the excellent caliber, safety, and efficacy of traditional medicines were also demonstrated.[9] In Burma (Myanmar), Indo-China, Thailand, Malaysia, and Indonesia, bay leaf (*Syzygium polyanthum* (Wight) Walp) is a common plant. This plant can be planted all around the house; however, it typically grows naturally in forests and mountains. Bay leaves are useful as a medication in addition to enhancing flavor. According to ethnobotany, bay leaves can treat diabetes, diarrhea, ulcers, high blood pressure, and itching.[10] Surveys in 2010–2011 in Medan, North Sumatra, showed that bay leaves were most widely used for the treatment of diabetes mellitus.[5] The researchers were interested in finding out whether bay leaves had any promise as an anti-diabetic substance based on the description.

2. METHOD

The research method used is a literature review with a descriptive approach based on secondary literature from research articles. Literature searches were explored through Pubmed, Science Direct, Clinical Key, and Google Scholar with related keywords such as bay leaf, diabetes mellitus, and *Syzygium polyanthum*.

3. DISCUSSION

3.1 *Syzygium polyanthum*

In Indonesia, *Syzygium polyanthum*, also known as *Eugenia polyantha*, is sometimes referred to as bay leaf and is known by the names "ubar serai," "manting," and "meselengan."[5,11] In Southeast Asia, woods, mountainous regions, plantation areas, and rural communities all have a lot of leaf growth. The plant has spherical stems, straight roots, and leaves with petioles that are 5–15 cm long and 3–8 cm wide and have pointy bases and points. It can grow to a height of 25 meters. On the top and bottom, bay leaves are a dark or light green color. Bay leaves divide using cuttings or grafts.[12] Due to the fact that bay leaves can be used as a spice or medication, a lot of people in Indonesia grow them. Bay leaves are reported to contain antioxidants like vitamin A, vitamin C, and vitamin E, as well as flavonoids, essential oils, sesquiterpenes, terpenoids, phenols, steroids, citral, lactones, saponins, carbohydrates, and selenium. Bay leaves, which include flavonoids, terpenoids, and coumarins, have been used as an antidiabetic, according to research by Patel et al. (2012).[13]

3.2 Diabetes Mellitus

Diabetes mellitus is a chronic and complex disease characterized by hyperglycemia caused by pancreatic β cells producing little insulin, resulting in the body not being able to efficiently regulate insulin production.[14,15] The Health Organization has categorized diabetes mellitus as the 7th leading cause in America. The United States estimates that 422 million adults suffered from diabetes in 2014. This is four times higher than the cases recorded in 1980. [14] Doctors believe that carbohydrates and fats can also cause diabetes mellitus. The digestive process in the pancreas uses amylase and glucosidase enzymes. Inhibition of starch digestive enzymes or glucose transporters can reduce the release and absorption of glucose in the small intestine. This decrease can help manage diabetes mellitus. [16]

3.2.1 Diabetes Mellitus Classification

The classification of diabetes mellitus is divided into three general types, namely:

1. Type I diabetes mellitus

Pancreatic cells are destroyed in type I diabetes, which results in complete insulin deficiency. Type I diabetes, sometimes referred to as insulin-dependent diabetes, is brought on by an autoimmune reaction in which the immune system assaults the pancreatic β- cells that produce insulin during puberty or infancy. Type 1 diabetes mellitus has a few potential causes, including viral infections that can have an impact on the development of DM or environmental variables. the primary signs and symptoms of diabetes mellitus, such as excessive thirst and urination, constant hunger, loss of weight, changes in eyesight, and exhaustion. Patients with type I diabetes need to take insulin every day to keep their blood sugar levels regular; if they don't, it could be fatal.[17]

2. Type II diabetes mellitus

Type II diabetes, sometimes referred to as non-insulin-dependent diabetes or adult-onset diabetes, is thought to be caused by persistent problems with insulin secretion against a background of insulin resistance brought on by the body's inefficient utilization of insulin. The most prevalent DM is type II diabetes. In this type, the body can still generate insulin, but it becomes so resistant that it loses its effectiveness, leading to insufficient insulin levels. Although the precise origin of type II diabetes has not been determined, being overweight and a lack of physical activity have been demonstrated to be two major risk factors. Ethnicity, family history of DM, gestational diabetes history, and advanced age are further influencing factors. The heart, nerves, eyes, kidneys, and other bodily organs are just a few of the places in which type II diabetes mellitus can cause difficulties.[14,18]

3. Gestational Diabetes mellitus (GDM)

One kind of DM that develops during the second or third trimester of pregnancy is gestational diabetes mellitus. GDM is a transient condition that develops during pregnancy and poses the risk of type II diabetes. Gestational diabetes was defined as a somewhat raised blood glucose level, while diabetes mellitus during pregnancy was defined as a significantly elevated blood glucose level. The 24th week of pregnancy is when GDM typically manifests. To regulate blood glucose levels, doctors occasionally prescribe insulin or oral medicines. Although gestational diabetes typically goes away after delivery, previously diagnosed women are more likely to have the condition again during a second

pregnancy and to acquire type II diabetes in later life. Babies whose moms have GDM are also more likely to go on to acquire type II diabetes in adolescence or early adulthood.[14,]

3.2.2 Diabetes Mellitus Diagnosis

Table 1. Criteria for The Diagnosis of Prediabetes dan Diabetes.[19]

	Nomal	Prediabetes	Diabetes
A1C	≤ 5.6%	5.7-6.4 %	≥6.5 %
FPG	≤ 99 mg/dL	100-125 mg/dL (5.6-6.9 mmol/L)	≥ 126 mg/dL (7.0 mmol/L)
OGTT	≤ 139 mg/dL	140-199 mg/dL (7.8-11.0 mmol/L)	≥ 200 mg/dL (11.1 mmol/L)
RPG	RPG	-	≥ 200 mg/dL (11.1 mmol/L)

* If there is no overt hyperglycemia, the results should be confirmed by repeat testing.
** Diagnostic only in patients with symptomatic hyperglycemia or hyperglycemic crisis. RPG, plasma glucose

3.2.3 Management of Diabetes Melitus

According to PERKENI in 2015, the management of diabetes mellitus is divided into 2, namely as follows:

a. Non Pharmalogical
   1. Education
   2. Medical Nutrition Therapy
   3. Physical Exercise (Sports)

b. Pharmacological
   1. Oral Antihypoglycemic Drugs
   2. Injectable Antihypoglycemic Drugs[3]

3.3 The Potential of Bay Leaves As Antidiabetic Agent

In a preliminary study, it was discovered that *S. polyanthum* was the herb most frequently utilized as a traditional treatment for diabetes mellitus among outpatient diabetes patients who visited the Sering Health Community Center in Medan, Indonesia (57.1%). *S. polyanthum* leaf extract has been demonstrated to dramatically lower blood glucose levels in diabetic rats caused by alloxan and streptozotocin. Lelono has demonstrated that treatment of alloxan-induced diabetic mice for 21 days daily with an aqueous extract of *S. polyanthum* leaves at doses of 100, 200, and 300 mg/kg dramatically reduced blood glucose levels. In fact, when given with an aqueous extract of *S. polyanthum* leaves at 200 mg/kg to alloxan-induced diabetic rats, the commencement of the antidiabetic effect could be noticed as early as 7 days of treatment.[5]

According to research done by Zanaria in 2017, it was discovered that giving rats a low dose ethanol extract of bay leaves (*Eugenia polyantha*) for 14 days (62.5 mg/kgbb) was able to lower fasting blood glucose in male Wistar rats. This indicates that the higher the dose, the faster the fasting blood glucose falls. However, there was no difference in the mean when compared to the positive control, the medication pioglitazone, given the ethanol extract of bay leaves at doses of 62.5 mg/kg, 125 mg/kg, and 250 mg/kg, indicating that there is no mean difference and that the extract's capacity to lower fasting blood glucose levels has the same efficacy as pioglitazone.[20]

One of the most significant findings for this plant is that bay leaves only have a selective antidiabetic effect in diabetic

rats. *S. polyanthum* leaf extract acts as an anti-diabetic agent in a number of ways. These include blocking alpha-glucosidase, reducing gastrointestinal glucose uptake, and boosting muscular glucose uptake. An essential enzyme called alpha-glucosidase converts big polysaccharides into glucose or sucrose. The digestion process will take longer to complete if this enzyme is inhibited since carbs take longer to digest. This will slow down how quickly the body absorbs glucose. In comparison to the methanol and water extracts, Lelono demonstrated that the aqueous methanol extract of *S. polyanthum* leaves demonstrated the best suppression of alpha-glucosidase activity. In fact, more recent studies have shown that the methanol extract of *S. polyanthum* leaves can greatly boost glucose uptake in abdominal muscle tissue in vitro while significantly decreasing intestinal glucose uptake.[21]

Based on Aljamal's research in 2010, it was stated that when type 1 diabetes patients were given 3 g doses of bay leaves for 4 weeks, there was a change in blood sugar, total cholesterol, LDL, and triglyceride levels accompanied by an increase in HDL, where the change in the blood sugar component was a significant change ($P<0.05$). This was continued in 2011, when type 2 diabetes patients were given 2 g doses of bay leaves for 4 weeks, and there were the same changes as in previous studies where the change in the blood sugar component was a significant change ($P<0.05$). This study shows that the content of flavonoid compounds in bay leaves has been shown to affect insulin sensitivity, glucose uptake, and antioxidant status.

Bay leaves have relatively high levels of flavonoids, saponins, and quinones. Bay leaf aqueous extract at a concentration of 50 µg/ml has antidiabetic activity (41.4% inhibition of a-glucosidase) and antioxidant activity (49.4% of DPPH).[22]

Flavonoids, which are polyphenolic chemicals with antioxidant characteristics, can produce a particular scent. It is thought that flavonoids can lower blood glucose levels. By removing excess free radicals, disrupting free radical reaction chains, binding metal ions (chelating), and blocking the polyol pathway by inhibiting the enzyme aldose reductase, flavonoids can stop the progression or complications of diabetes mellitus. The alpha-glucosidase enzyme is similarly inhibited by flavonoids due to hydroxylation bonds and β-ring replacement. Like acarbose, a medication used to treat diabetes mellitus, this inhibitor works by delaying the hydrolysis of carbohydrates, disaccharides, and glucose absorption and by preventing the conversion of sucrose into glucose and fructose.[23,24]

In a study conducted by Parisa et al. (2019) at Sriwijaya University, Indonesia, a bay leaf extract (*Syzygium polyanthum*) was found at a dose of 50 mg, 100mg, dan 200mg are proven to lower blood glucose. In this study, it was found that bay leaf extract at a dose of 50 mg/KgBW has effectiveness in reducing blood glucose level up to 8% before intervention, and high dose of 200mg/KgBW can reduce blood glucose levels by up to 22% in 14 days.[25]

4. CONCLUSION

From some of the research above, it can be concluded that bay leaves has been shown to have potential in the prevention and treatment of diabetes mellitus.

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