

Effectiveness of Soursop Leaf Extract in Reducing Glucose Levels in Diabetes Mellitus Patients: Literature Study

Elisa Issusilaningtyas¹, Nikmah Noor Rochmah², Seffiani Dwi Azmi³, Nurul Fadhila⁴

Univ Al-Irsyad Cilacap^{1,2}, Universitas Jambi³, Universitas Sriwijaya⁴

e-mail: * elisa12211@gmail.com

ABSTRAK

Alternative treatment for lowering sugar levels can be done through the use of herbal plants such as soursop leaves. This study aims to evaluate the effectiveness of soursop leaf extract (*Annona muricata* L.) in reducing blood glucose levels in Diabetes Mellitus (DM) patients. This research uses a literature study method, with data taken from scientific articles or journals within the last five years. Data was collected using the Google Scholar search engine with the keywords "diabetes mellitus," "soursop leaf extract," and "reducing sugar levels". Research shows that soursop leaf extract (*Annona muricata* L.) contains flavonoids, tannins, alkaloids, and saponins which are effective in lowering blood glucose levels through various mechanisms, including inhibiting sugar absorption, increasing glucose tolerance, stimulating insulin release, and regulating carbohydrate metabolism enzymes. The results of clinical and in silico trials support the effectiveness of this extract, making it a potential herbal treatment alternative amidst the current high costs of diabetes care. This research encourages the use of soursop leaves as a promising therapy and recommends further research to optimize its benefits.

Kata kunci: Blood Glucose Levels; Diabetes Mellitus; Extraction; Soursop Leaves

INTRODUCTION

Diabetes Mellitus (DM) is a chronic metabolic disease characterized by high blood sugar levels (hyperglycemia) due to impaired insulin secretion, insulin action, or both (Ayu et al., 2019). Diabetes Mellitus is one of the main health problems in the world with an increasing prevalence. According to the International Diabetes Federation (IDF), in 2021, approximately 537 million adults were living with diabetes, and this figure is projected to increase to 643 million in 2030 and 783 million in 2045. This increase reflects the major challenges in treating and managing diabetes, especially in developing countries like Indonesia. In Indonesia, Diabetes Mellitus is one of the main causes of morbidity and mortality. Data from the Ministry of Health of the Republic of Indonesia shows that the prevalence of Diabetes Mellitus in adults will reach 10.7% in 2021.

The high number of Diabetes Mellitus sufferers in Indonesia creates a significant economic burden, both for individuals and the national health system. In addition, Diabetes Mellitus is often accompanied by serious complications such as cardiovascular disease, nephropathy, retinopathy and neuropathy which can worsen sufferers' quality of life and increase health care costs (Muslim et al., 2023).

In an effort to manage and control blood sugar levels, various therapeutic approaches have been developed, including the use of drugs such as metformin, sulfonylurea and insulin (Maulidya & Oktianti, 2021). Although these medications are effective in lowering blood sugar levels, they are often accompanied by undesirable side effects such as hypoglycemia (Shorr et al., 1997), digestive disorders (Bailey & Turner, 1996), and increased risk of cardiovascular disease (Riddle et al., 2003). Apart from that, high medical costs are also an obstacle for many Diabetes Mellitus sufferers, especially in developing countries. Based on this, there is an urgent need to find alternative treatments that are safer, more effective and affordable. One alternative treatment that is attracting attention is the use of traditional medicinal plants. The use of medicinal plants in the treatment of various diseases has been known for a long time in various cultures, including Indonesia, which is rich in biodiversity.

Soursop leaves (*Annona muricata*) are a traditional medicinal plant that has long been used in the treatment of various health conditions. Soursop leaves contain various bioactive compounds such as acetogenin, alkaloids, flavonoids and tannins which have pharmacological activities, including antidiabetic effects (Zeng et al., 1996; Yang et al., 2008; Gavamukulya, 2014; Coria et al., 2018). Several in vitro and in vivo studies show that soursop leaf extract has the potential to reduce blood sugar levels and increase insulin sensitivity. The mechanism of action of soursop leaf extract in reducing blood sugar levels includes increasing

insulin secretion, inhibiting glucose absorption in the intestine, and increasing glucose use by body cells (Dewi et al., 2022).

This study aims to evaluate the effectiveness of soursop leaf extract in reducing blood sugar levels in Diabetes Mellitus patients through analysis of existing literature. By reviewing the various studies that have been carried out, it is hoped that a more comprehensive understanding can be obtained regarding the potential and mechanism of action of soursop leaf extract in the management of Diabetes Mellitus. This literature study also aims to identify the strengths and limitations of existing research, as well as provide recommendations for future research. Furthermore, it is hoped that this research will provide useful information for health practitioners and researchers in the field of pharmacology, as well as for Diabetes Mellitus sufferers who are looking for alternative treatments that are more natural and have minimal side effects. Thus, it is hoped that this research can contribute to efforts to control Diabetes Mellitus more effectively and holistically, as well as support the development of better alternative therapies in the future.

METHOD

The type of research applied in this research is literature study. This research method is a research process using library data collection methods, reading and taking notes and processing research materials (Zed, 2008). Data was taken from various literature sources such as scientific articles or journals within the last 5 years. Data collection was carried out through the Google Scholar search engine with the keywords diabetes mellitus, soursop leaf extraction, and reducing sugar levels.

DISCUSSION

Diabetes mellitus(DM) is a disease whose prevalence continues to increase throughout the world, both in developed and developing countries. As a result, DM is now considered a global health problem. The World Health Organization

(WHO) estimates that more than 346 million people worldwide suffer from DM (Azis et al., 2020). Currently, the cost of treating diabetes mellitus is still relatively high, so several alternative treatments using herbal plants such as soursop leaf extraction are needed. The results of research conducted by Fadel & Emma (2020) show that soursop leaves contain flavonoids, alkaloids, saponins and tannins both in powder and leaf form. The flavonoid and tannin content can reduce regional sugar levels (Sovia, Ratwita, Wijayanti, & Novianty, 2017). According to Yazid & Suryani (2017) the tannin content in soursop leaves is a flavonoid content that regenerates cells in the pancreas. The pancreas is one of the body's organs that plays a role in producing the hormone insulin which controls blood sugar levels (Darfiani & Honesty, 2020).

The mechanism of action of soursop leaves includes inhibiting sugar absorption in the intestine, increasing glucose tolerance, stimulating insulin release, and regulating enzymes that play a role in carbohydrate metabolism. (Oyededeji, Taiwo, Ajayi, & Oziegbe, 2015). Research conducted by Syamson & Abdul (2021) using quantitative methods shows that there is a relationship between the use of soursop leaves (*Annona Muricata*) and a decrease in blood sugar levels, with a significant value of 0.007 ($\alpha < 0.05$). The results of the paired t test analysis show that the use of soursop leaves is effective in reducing blood sugar levels.

Based on an *in silico* study using molecular docking modeling, it also shows that there are four criteria to obtain 5 active compounds which are predicted to have high affinity for the enzymes α -Glucosidase and α -Amylase. These five compounds are in sequence from the highest to Rutin, Quercetin 3-O-neohesperidoside, Kaempferol 3-O routineoside, Coclaurine and Roseoside (Sugiharto et al., 2021). Similar findings were also obtained by Fathul (2023) who showed that of 26 active compounds, 23 met Lipinski's criteria. Pharmacokinetic predictions showed that 23 active compounds were well absorbed in the intestine, and 4 of them were able to penetrate the blood-brain barrier (BBB).

Seven active compounds are well distributed and bound in free form. Fifteen active compounds have low potential to interact with other drugs. One active compound showed the best excretion ability. A total of 17 active compounds did not show hepatotoxic properties. In silico predictions show that the active compounds have high affinity for SUR-1, and there are 5 active compounds that show affinity for SGLT-2.

The results of research conducted by Fadlilah et al., (2020) which was carried out using a quasi-experiment with a pre and posttest control group showed bivariate test results for the intervention group ($p = 0.005$). Bivariate test results for control group and intervention group ($p = 0.019$). This shows that there is a difference in pretest and posttest blood sugar in the intervention group, so the results show that there is an influence of soursop leaves on blood sugar levels. Similar findings were also found by Astutu et al., (2021). This research was a quasi-experimental design before and after with a control group. Respondents were divided into 2 groups, namely the intervention group and the control group, each totaling 18 people. There was a decrease in the average blood sugar level before and after the intervention of giving soursop leaf decoction by 67 mg/dl. The results of the analysis obtained a p value = 0.003, which means that the reduction in blood sugar levels was statistically significant. There is a significant effect of the intervention of giving soursop leaf decoction to patients with type II diabetes mellitus to reduce blood sugar levels.

Soursop leaf herbal therapy also reduced blood glucose levels after administration with a mean of 267.7 with a standard deviation of 101.14. Research shows that the application of soursop leaf extract (*Annona muricata* L.) has a significant effect on blood glucose levels. Preliminary data shows that the blood glucose level in the research subjects was 432.10 mg/dl. After one week of therapy using soursop leaf extract, the average blood glucose level decreased to 267.7 mg/dl. The results of the Paired t-test produced a p value of 0.000, indicating a significant reduction in blood glucose levels associated with the use

of soursop leaf extract. This shows its potential as a treatment for lowering glucose levels in diabetes mellitus patients.

CONCLUSION

Conclusions from various studies show that soursop leaf extract (*Annona muricata* L.) has significant potential as a herbal treatment for lowering blood glucose levels in diabetes mellitus patients. The active ingredients in soursop leaves such as flavonoids and tannins play a role in inhibiting sugar absorption, increasing glucose tolerance, and stimulating insulin release. The results of clinical and in silico trials support the effectiveness of soursop leaves in significantly reducing blood sugar levels, making it a promising treatment alternative amidst the current high costs of treating diabetes.

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