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Effect of Bay Leaf Extract *(Syzygium polyanthum)* on Blood Glucose, Malondialdehyde, and Insulin Levels in Animal Models of Diabetes: A Systematic Review

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Abstract
Diabetes mellitus (DM) is a chronic metabolic disorder characterized by hyperglycemia resulting from impaired insulin secretion or action. Long-term antidiabetic therapy may cause adverse effects, highlighting the need for safer alternative treatments. Syzygium polyanthum (bay leaf) contains various bioactive compounds with antidiabetic and antioxidant activities. This study aimed to evaluate the effects of Syzygium polyanthum leaf extract on blood glucose, malondialdehyde (MDA) and insulin levels in diabetic rat models through a systematic review. This review was conducted in accordance with the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) guidelines. Literature searches were performed in PubMed, Scopus, ScienceDirect, and Google Scholar. Included studies were experimental in vivo studies using diabetic rat models that assessed the effects of Syzygium polyanthum extract on blood glucose, insulin, and/or MDA levels. Risk of bias was evaluated using the CAMARADES tool. The results showed that administration of Syzygium polyanthum extract at doses of 250–500 mg/kg body weight consistently reduced blood glucose levels, accompanied by increased insulin levels and decreased MDA levels. These findings indicate that Syzygium polyanthum leaf extract has potential antidiabetic and antioxidant effects in animal models of diabetes

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1. INTRODUCTION

Diabetes mellitus is a global health problem with a significantly increasing prevalence and contributing to high morbidity and mortality. Suboptimal glycemic control can trigger various microvascular and macrovascular complications. Although pharmacological therapies have been developed, long-term use is often associated with certain side effects, thus encouraging the development of complementary therapies based on natural ingredients.

Bay leaf *(Syzygium polyanthum)* is a plant traditionally used in Indonesia as a cooking spice and herbal medicine. Several experimental studies have shown that bay leaf extract has antihyperglycemic and antioxidant activities that could potentially support diabetes management. However, this scientific evidence is still scattered and has not been systematically summarized. Therefore, this systematic review aims to summarize and evaluate scientific evidence regarding the effects of bay leaf extract on blood glucose, MDA, and insulin levels in animal models of diabetes.

2. RESEARCH METHODS

This study is a systematic review that aims to analyze the effect of administering bay leaf extract. *(Syzygium polyanthum)* on blood glucose, malondialdehyde (MDA), and insulin levels in diabetic rat models. The systematic review was conducted based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and has been registered with PROSPERO.

Literature searches were conducted systematically through four electronic databases, namely PubMed, Scopus, ScienceDirect, and Google Scholar, using a combination of related keywords. *Syzygium polyanthum*, diabetes, blood glucose, MDA, insulin, and oxidative stress using Boolean operators. Included articles are in vivo experimental studies on streptozotocin- or alloxan-induced diabetic rats, published in Scopus- or SINTA-accredited journals between 2015 and 2025.

The data used were secondary data from selected articles and managed using Microsoft Excel 2016 and Review Manager version 5.4. Data management was carried out through editing, processing, and cleaning processes. Data analysis used mean difference (MD) estimation with a 95% confidence interval and a significant p-value. Methodological quality and risk of bias of the studies were assessed using the CAMARADES instrument, which is specifically designed for experimental animal studies.

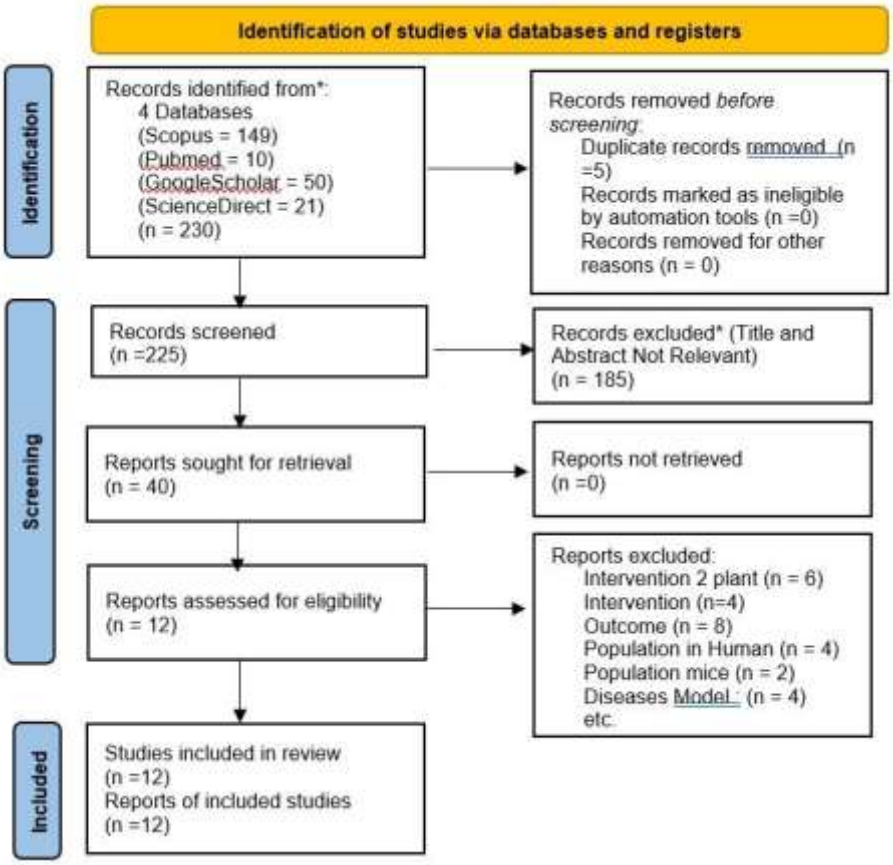

Figure 1. Study Selection Flowchart Based on PRISMA 2020

Table 1. Assessment of the quality of included studies

No.	Studies	Quality Assessment of Studies (CAMARADES)										Total
		1	2	3	4	5	6	7	8	9	10	
1.	(Revelation)*et al.*., 2019)	1	1	1	0	0	1	1	0	1	1	7
2.	*(*Widyawati*et al.*., 2015a)	1	1	1	0	0	0	1	0	1	1	6
3	(Widyawati*et al.*., 2022)	1	1	1	0	0	1	1	0	1	1	7
4	(Paris *et al.,* 2019)	1	1	1	0	0	0	1	0	1	0	5
5	(Wahjuni and Wita, 2017)	1	1	1	0	0	0	1	0	1	0	5
6	(Prambudi*et al.*., 2022)	1	1	1	0	0	1	1	0	1	0	6
7	(Harefa et *al.*, 2025)	1	1	1	0	0	0	1	0	1	0	5
8	(Meldawati*et al.*., 2025)	1	1	1	0	0	1	1	0	1	1	7
9	(Zanaria)*et al.*., 2017)	1	1	1	0	0	1	1	0	1	0	6
10	(Nasution, 2022)	1	1	1	0	0	0	1	0	1	0	5
11	(Hayati and Hidayat, 2020)	1	1	1	0	0	1	1	0	1	0	6
12	*(Hadiyanti et al*., 2023)	1	1	1	0	0	0	1	0	1	0	5

3. RESEARCH RESULTS AND DISCUSSION

3.1.Research result

A systematic literature search was conducted using the PICO framework through four electronic databases: PubMed, ScienceDirect, Scopus, and Google Scholar. The initial search yielded 230 articles. After identification, five duplicate articles were identified, leaving 225 articles for screening.

During the title and abstract screening stage, 185 articles were excluded because they did not meet the PICO inclusion criteria. Next, 40 articles were assessed through full-text review. From this process, 12 articles met all inclusion criteria and were further analyzed in this systematic review.

The study selection process followed the PRISMA 2020 guidelines, which include identification, screening, eligibility, and inclusion. A PRISMA flow diagram depicting the study search and selection process from the four databases is presented.

3.2.Discussion

The results of a study of 12 pre-clinical studies showed that bay leaf extract*(Syzygium polyanthum)* consistently lowers blood glucose levels in diabetic rat models using various induction methods. This antihyperglycemic effect is generally comparable to standard antidiabetic drugs and is most effective at doses of 200–500 mg/kgBW with a minimum duration of two weeks.

In addition to improved glycemic control, several studies have also reported increased insulin levels and insulin sensitivity, indicating improved pancreatic β-cell function and increased glucose uptake by peripheral tissues. This mechanism is thought to be related to the content of flavonoid*, tannin, saponin*, and polyphenols, which have antioxidant and cytoprotective activities.

Bay leaf extract has also been shown to reduce malondialdehyde (MDA) levels and other oxidative stress markers. This reduction occurs both directly through antioxidant activity and indirectly through reduced hyperglycemia, which suppresses free radical formation. Thus, bay leaves have potential as a phytotherapeutic agent with both antihyperglycemic and antioxidant properties, potentially supporting the prevention of diabetes mellitus complications.

This study has limitations due to the heterogeneity of study designs, animal models, types of extracts, and quantitative data reported, so that a meta-analytic quantitative analysis could not be performed.

4. CONCLUSION

Bay leaf extract *(Syzygium polyanthum)* demonstrated potential in lowering blood glucose levels, increasing insulin levels, and reducing MDA levels in animal models of diabetes. Further research with more rigorous and standardized designs is needed to support its further development as a complementary therapy.

5. ACKNOWLEDGEMENT

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