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doi: <https://doi.org/10.36568/gelinkes.v24i1.392>Journal Homepage: <https://gelinkes.poltekkesdepkes-sby.ac.id/>The Potential Use of Avocado Leavers (*Persea americana*) as an Antidiabetic AgentKadek Abdi Saputra¹, Ni Nyoman Wahyu Udayani^{2*}, I Putu Tangkas Suwantara³¹ Bachelor of Pharmacy, Faculty of Pharmacy, Universitas Mahasaraswati Denpasar, Bali, Indonesia² Department of Pharmacology and Clinical Pharmacy, Faculty of Pharmacy, Universitas Mahasaraswati Denpasar, Bali, Indonesia³ Department of Social Pharmacy, Faculty of Pharmacy, Universitas Mahasaraswati Denpasar, Bali, Indonesia*Correspondence: udayani.wahyu@unmas.ac.id

Diabetes mellitus represents a chronic metabolic disorder that occurs when glycemic concentrations exceed normal levels. The use of natural ingredients such as avocado leaves (*Persea americana*) is an option due to the abundance of bioactive compounds that have antidiabetic potential. This article was written to present information and understanding related to the pharmacological activity of avocado leaves as an antidiabetic. It was compiled using a comparative review method based on data-driven literature searches. Based on the results of studies that have been conducted, it is known that avocado leaves have potential as an antidiabetic agent. In vivo studies show that avocado leaf extract can significantly lower blood sugar levels and regenerate the pancreas. In vitro studies reinforce the in vivo findings by showing high antioxidant activity (91.03%) and high α -amylase enzyme inhibition (88.95%), which is almost equivalent to acarbose. In addition, preliminary clinical studies show an improvement in glycemic levels in type 2 DM in humans that received avocado leaf decoction. Overall, avocado foliage extract shows great promising effects as an antidiabetic agent through various mechanisms, such as antioxidant activity, inhibition of glucose absorption enzymes, and regeneration of organs such as the pancreas and kidneys.

Keywords: Avocado leaves, *Persea americana*, Antidiabetic, Bioactive compounds, Phytotherapy

INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disorder and a public health problem (Faradiba et al., 2023). Elevated blood glucose levels above normal, which are generally a sign of diabetes, can be caused by the pancreas being unable to produce insulin or the body's inability to utilize insulin optimally due to a disorder in the body's glucose receptors that bind glucose in the blood, so that glucose cannot be metabolized properly, ultimately leading to diabetes mellitus (Istriningsih & Kurnianingtyas Solikhati, 2021; Rindy Cantika Istyawati et al., 2023). Diabetes mellitus can be identified through several laboratory indicators, namely approximately ± 200 mg/dl without taking into account previous meal times, ± 126 mg/dl after fasting, or an increase in glucose two hours after eating, indicating a value of ± 200 mg/dl. Common symptoms include excessive hunger and thirst, frequent urination with increased volume, and a significant decrease in body weight (Riset Kesehatan Dasar (Riskesdas), 2018).

Diabetes mellitus has seen an increase in prevalence globally in recent years. Based on a report released by the International Diabetes Federation (IDF), the number of people with diabetes mellitus in 2024 is estimated to be

589 million, a figure that is projected to increase to 853 million in 2050. In addition, the IDF also predicts an increase in the number of adults aged 20-79 with diabetes from 20.4 million to 28.6 million by 2050 (International Diabetes Federation, 2025). The World Health Organization (WHO) reported in 2016 that 96 million people in Southeast Asia suffer from diabetes, making it the region with the second highest number of diabetes sufferers (World Health Organization, 2016). In Indonesia, a 2018 national survey showed an increase in diabetes based on medical diagnosis in people aged >15 years to 2.0% in 2018 (Riset Kesehatan Dasar (Riskesdas), 2018).

Although it cannot be completely cured, diabetes mellitus can be controlled through proper management so that blood glucose levels remain within normal limits (Elvira & Nathalia, 2021). In people with diabetes mellitus, management is carried out pharmacologically and non-pharmacologically. Pharmacologically, therapy is carried out with antihyperglycemic drugs or insulin. Non-pharmacological therapy involves dietary adjustments, increased physical activity, and the consumption of herbal remedies. However, the use of pharmacological drugs often causes side effects such as peripheral edema (Dewi et al., 2022). These side effects have led to an increase in

the use of alternative herbal therapies derived from plants such as avocados as an alternative means of controlling blood glucose levels.

Avocado (*Persea americana*) is a plant with various pharmacological activities. Avocado has been widely used in the health sector to treat multiple health conditions (Faradiba et al., 2023). The part of the avocado that has therapeutic potential and is known to lower blood glucose levels is its leaves. According to various studies, avocado leaves are a source of pharmacologically active compounds, including saponin, flavonoids, tannins, and steroids, which contribute to antidiabetic activity (Isah et al., 2024; Rahman et al., 2018, 2021). Seeing the pharmacological activity of avocado leaves as an antidiabetic therapeutic agent, this review article reviews the results of previous studies to provide broader insights into its possible use in diabetes mellitus management.

METHOD

This review was conducted following prisma guidelines. Literature searches were conducted by accessing databases such as Pubmed, Scienedirect, Google scholar, NCBI. The search strategy combine Medical Subject Heading (MeSH) terms and free-text keyword using Boolean operators: ("*Persea americana*" OR "*avocado leaves*") AND ("*antidiabetic*" OR "*diabetes melitus*") AND ("*phytochemical*" OR "*bioactive compounds*").

The inclusion criteria used were keyword relevance, clearly indexed article status, and discussion of the pharmacological activity of avocado leaves as an antidiabetic. The articles obtained were then selected based on inclusion and exclusion criteria. The inclusion criteria included: (1) articles published within the last 10 years (2015-2025), (2) discussing the role of avocado leaves as an antidiabetic agent, (3) available in full text, and (4) articles from nationally and internationally indexed journals. Meanwhile, the exclusion criteria included: (1) articles published more than 10 years ago, (2) irrelevant to the topic of avocado leaves as an antidiabetic agent, (3) only discussing other parts of the avocado plant besides the leaves, (4) articles not available in full text, and (5) unindexed journals. Articles that did not discuss avocado leaves as an antidiabetic agent or were not available in full text were excluded from the review.

The initial literature search yielded 343 articles (PubMed:9, ScienceDirect: 6, Google Scholar:328). After removing 7 duplicates, 336 records were screened, with 313 excluded based on title/abstract review. 23 full-text

articles were assessed for eligibility, and 13 were excluded due to insufficient focus antidiabetic activity (n=3), review nature (n=4), or methodological limitations (n=3). 10 articles that met the criteria and were analyzed further.

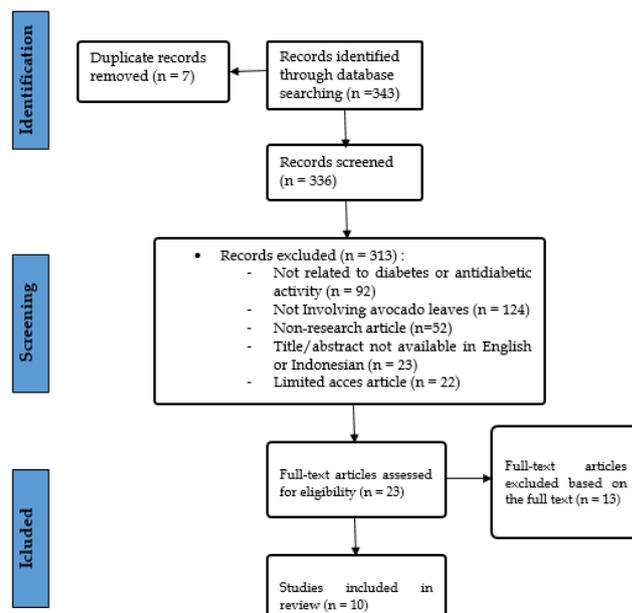


Figure 1. The flow chart of the identification and selection process

RESULT AND DISCUSSION

Characteristics of Included Studies

Based on the literature selection process, the included studies that shown in Table 1. primarily investigated the antidiabetic activity of avocado leaves (*Persea americana*) using clinical approaches. Most studies have been conducted using in both laboratory studies and clinical trials models to test the effectiveness of avocado leaves (*Persea americana*) as an antidiabetic agent. In vitro studies were conducted by researching and evaluating the potential inhibition of α -glucosidase and α -amylase enzymes and the antioxidant activity of avocado leaves (Abd Elkader et al., 2022). Meanwhile, in vivo studies were conducted by using diabetic animal models, which were generally induced with alloxan or streptozotocin (STZ), to assess and evaluate the potential of avocado leaves on blood glucose levels (Rahman et al., 2020).

Table 1.

No	Title	Selected Literature Result		Key Antidiabetic Findings	Reference
		Model	Dose range		
1	"The Avocado (<i>Persea americana</i> Mill.) Leaf Extract on Streptozotocin-induced Pancreatic Cell Regeneration of White Rats (<i>Rattus norvegicus</i>)"	STZ-induced diabetic rats (in vivo)	100-200 mg/kg BW aqueous extract of avocado leaf	Improvement in pancreatic histology regeneration effects and reduced pancreatic damaged score in line with increased doses	(Rahman et al., 2021)

No	Title	Model	Dose range	Key Antidiabetic Findings	Reference
2	"Effects Of Avocado Leaf Ethanol Extract (<i>Persea americana</i> Mill.) Against Blood Sugar Levels, Interleukin 6 (IL-6), Fgf And Wound Area In White Rats Wistar Strain (<i>Rattus novergius</i> Sp.) Diabetic Ulcer Model"	Diabetic wistar rats (in vivo)	100-150 mg/kg BW leaf ethanol extract	Dose dependent decrease in blood glucose levels. Additional improvement in maintaining body weight and accelerating the wound healing process	(Retta et al., 2025)
3	"The Effectiveness Of 70% Methanolic Extract Of Avocado Leaf (<i>Persea americana</i> Mill) In Decreasing Blood Sugar Levels In Male Rats (<i>Rattus Norvegicus</i>) Wistar Strain Induced Alloxan"	Alloxan induced diabetic rats (in vivo)	100-200 mg/kg BW of 70% methanolic extract of avocado leaf	Significant reduction in blood glucose levels with a clear dose-dependent effect	(Sintowati et al., 2017)
4	"Phytogenic Compounds From Avocado (<i>Persea Americana</i> L.) Extracts; Antioxidant Activity, Amylase Inhibitory Activity, Therapeutic Potential Of Type 2 Diabetes"	In vitro (experimental)	Evaluating antioxidant activity through the DPPH test and the ability to inhibit the α -amilase enzyme	Strong antioxidant activity and significant inhibition of α -glucosidase and α -amylase, supporting post prandial glucose-lowering potential	(Abd Elkader et al., 2022)
5	"Comparative Antidiabetic Activity of Aqueous, Ethanol, and Methanol Leaf Extracts of <i>Persea americana</i> and Their Effectiveness in Type 2 Diabetic Rats"	Diabetic wistar rats (in vivo)	100 mg/kg BW of aqueous, ethanol, and methanol leaf extracts	Methanolic extract showed the greatest reduction in blood glucose levels compared to aqueous and ethanol extract, indicating solvent-dependent antidiabetic activity	(Kouamé et al., 2019)
6	"The Dosage of the Avocado Leaf Extract (<i>Persea americana</i> Mill.) on Regeneration of Diabetic White Rats (<i>Rattus norvegicus</i>) Renal Cell"	STZ-induced diabetic rats (in vivo)	100-200 mg/kg BW avocado leaf extract	Improvement in renal cell histology regeneration effects and reduced renal cell damaged score in line with increased doses	(Rahman et al., 2020)
7	"Effect of Avocado Leaf Extract on the Decrease of Fasting Blood Glucose Level White Rats"	STZ-induced diabetic rats (in vivo)	100-200 mg.kg BW avocado leaf extract	Avocado leaf extract at a dose of 150 mg/kgBW was found to be most effective in significantly reducing fasting blood glucose levels	(Rahman et al., 2019)
8	"Single Antidiabetic Activity and Combination of Avocado Leaves and Curcuma Rhizome In Vivo"	STZ-induced diabetic rats (in vivo)	175 mg/kg BW avocado leaf extract	Contributed to a significant decrease in blood glucose levels on the 14th day.	(Kurniawati et al., 2024)
9	"The Effectiveness Of Avocado Leaf Decoction On Reducing Blood Sugar Levels In Patients With Type 2 Diabetes"	Quasi experimental	Avocado leaf decoction made from 4-5 fresh leaves boiled in 200 ml of water	Show an improvement on Fasting Plasma Glucose (FPG)	
10	"Acute toxicity and hypoglycaemic activity of the leaf extracts of <i>Persea americana</i> Mill. (<i>Lauraceae</i>) in Wistar rats"	STZ-induced diabetic rats (in vivo)	15-60 mg/kg BW of avocado leaf extracts	Significant reduction in blood glucose levels with a clear dose-dependent effect	(Mamadou et al., 2016)

Bioactive Compounds in Avocado Leaves

Various studies on the use of natural ingredients as antidiabetic agents continue to develop, one of which is research related to the use of avocados, mainly the leaves, as antidiabetic agents. In studies, phytochemical analyses consistently report that avocado leaves contains bioactive compounds such as flavonoids, fenol, tannins, saponins, and steroids that have been found in avocado leaves (Isah et al., 2024; Rahman et al., 2018, 2021). Among these compounds, flavonoid such as quercetin, catechin, and epicatechin are most frequently reported and are known to possess antihyperglycemic and antioxidant properties (Rosa et al., 2025). Several studies indicate that the flavonoid content of avocado leaves is higher than that found in the fruit pulp.

In addition to flavonoids, phenolic compounds and saponin have been identified as contributors to the biological activity of avocado leaf extract. These bioactive compounds have the pharmacological activity to lowered glucose concentrations levels through mechanisms that increase inhibition of the enzymes α -glucosidase and α -amylase, antioxidant activity, and improve the fasting glycemic levels (Aqmal, 2025; Rahman et al., 2020; Tran et al., 2020).

Mechanism of Antidiabetic Action

One of the primary mechanisms underlying the antidiabetic activity of avocado leaves involve inhibition of carbohydrate-digesting enzymes, particularly α -glucosidase and α -amylase enzymes, which are key enzymes involved in carbohydrate digestion (Tran et al., 2020). In vitro studies demonstrate that avocado leaves extract are capable suppressing these enzymes, thereby delaying glucose release and absorption in the intestine and contributing to improved postprandial glycemic control (Azzahra et al., 2023).

This mechanism is comparable to that of conventional antidiabetic drugs such as acarbose, although the inhibitory potency of plant extracts is generally lower. Bioactive compounds that contains in avocado leaves also has an antidiabetic mechanism by antioxidant activity. Oxidative stress plays a central role in the pathogenesis of diabetes melitus by impairing insulin signaling and promoting β -cell dysfunction. The flavonoid and phenolic compounds present in avocado leaves exhibit strong antioxidant properties through free radical scavenging and enhancement of endogeneous antioxidant defense systems (Abd Elkader et al., 2022).

Several in vivo studies reports reduction in oxidative stress markers and improvements in pancreatic histopathology following administration of avocado leaves extract confirmed by research by (Rahman et al., 2020, 2021). Flavonoids, which have the ability to repair and protect cell structures and have anti-inflammatory activity, thereby repairing and regenerating pancreatic tissue (Panche et al., 2016). Flavonoids also have the ability to regenerate damaged kidneys, as they possess diuretic activity by increasing urinalysis and electrolyte secretion through enhancing glomerular filtration rate (GFR) (Siangcham et al., 2022). Increased glomerular filtration

helps remove waste and toxic substances from the body, thereby reducing kidney damage (Rahman et al., 2020).

The antidiabetic activity of avocado leaves has also been proven through preliminary clinical studies on type 2 DM patients who used avocado leaf decoction as a practical intervention. Research conducted by (Aqmal, 2025) showed an improvement in fasting glycemic levels in most respondents after received of avocado leaf decoction. Despite these promising findings, the overall strength of preclinical evidence is limited by small sample sizes, short intervention periods, and methodological heterogeneity. Consequently, while the consistency of antidiabetic activity supports biological relevance, the findings should be interpreted cautiously.

CONCLUSIONS

Based on the results of in vitro, in vivo, and preliminary clinical studies, avocado leaves (*Persea americana*) show great potential as an antidiabetic agent. The pharmacological activity of avocado leaves as an antidiabetic agent is demonstrated through various mechanisms such as lowering blood glucose, regenerating pancreatic cells, antioxidant activity, and inhibiting the enzyme α -amylase. This activity is mainly influenced by pharmacologically active substances such as fenol, flavonoids, tannins, saponin, and alkaloids.

Although preclinical data suggest antidiabetic potential, clinical evidence supporting the use of avocado leaves in human remains limited making it difficult to establish therapeutic dosing, long term safety, and clinical efficiency. Therefore, avocado leaves should currently be regarded as a potential adjunctive therapy, rather than a primary antidiabetic treatment.

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