
EVALUATION OF THE ANTIDIABETIC EFFECT OF METHANOL LEAF EXTRACT OF *ADANSONIA DIGITATA* IN STREPTOZOTOCIN-INDUCED DIABETIC WISTAR RATS.

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ABSTRACT

Diabetes mellitus is a metabolic disorder associated with persistent hyperglycaemia, impaired metabolic regulation, oxidative stress, and progressive tissue damage. This study evaluated the antidiabetic effect of methanolic leaf extract of *Adansonia digitata* in streptozotocin-induced diabetic Wistar rats. A laboratory-based experimental design was employed using 40 Wistar rats randomly divided into five groups of eight animals each: normal control, diabetic control, *A. digitata* extract-treated groups receiving 200 and 400 mg/kg, and a standard-drug group. Diabetes was induced using streptozotocin, while the extract was administered during the treatment period. Body weight and fasting blood glucose were monitored, while HbA1c, insulin, lipid profile, liver and renal function indices, oxidative-stress and antioxidant parameters, and pancreatic histopathology were evaluated at the end of treatment. The study found that diabetic control rats exhibited significant hyperglycaemia, increased HbA1c, lower insulin levels, dyslipidaemia, and signs of organ stress and injury. Treatment with *A. digitata* extract showed improvement in these conditions in a dose-dependent manner. At 400 mg/kg, fasting blood glucose levels dropped significantly from 329.00 mg/dL to 149.63 mg/dL, HbA1c decreased from 13.33% to 6.85%, and insulin levels rose from 4.15 to 9.19 μ IU/mL. Additionally, the extract enhanced lipid profiles, liver and renal functions, antioxidant levels,

and reduced pancreatic injury, indicating its potential as an antidiabetic agent in STZ-induced diabetic rats.

KEYWORDS: Antidiabetic, Methanol Leaf, *Adansonia digitata*, Diabetic Wistar Rats.

1.0 INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder characterized by persistent elevation of blood glucose resulting from inadequate insulin secretion, impaired insulin action, or a combination of both. The disease represents an important global public-health challenge because prolonged hyperglycaemia can progressively damage major organs and systems, particularly the cardiovascular system, kidneys, eyes and nervous system (World Health Organization [WHO], 2024). The global burden of diabetes has continued to increase, with an estimated 830 million people living with the disease in 2022, and the greatest increases occurring in low- and middle-income countries. In addition to its direct health consequences, diabetes imposes considerable economic and social burdens on individuals, families and healthcare systems (WHO, 2024). Diabetes management includes lifestyle changes, dietary control, and medications aimed at maintaining blood glucose levels and preventing complications. Key medications are metformin, sulfonylureas, insulin, and sodium-glucose cotransporter-2 inhibitors. However, issues like cost and side effects have sparked interest in alternative treatments, especially from medicinal plants. These plants, valued in traditional medicine, possess bioactive compounds such as flavonoids and alkaloids that can improve glucose metabolism by inhibiting enzymes, enhancing antioxidants, modulating insulin, and reducing oxidative stress. *Adansonia digitata* L., the African baobab, belongs to the *Malvaceae* family and is used for food and medicinal purposes. Its leaves are rich in bioactive compounds, including flavonoids, phenolic acids, tannins, and terpenoids. Key compounds identified are catechin, epicatechin, rutin, and various phenolic acids. *In vitro* studies indicate that methanolic extracts from the leaves may have antidiabetic properties, inhibiting enzymes related to carbohydrate digestion. These extracts also demonstrate antioxidant effects, potentially benefiting conditions like hyperglycaemia and oxidative stress related to diabetes. (Adewusi et al., 2017). Experimental evidence from animal studies further supports the antidiabetic potential of *A. digitata*. Ebaid et al. (2019) investigated methanolic leaf extract of *A. digitata* in streptozotocin-induced diabetic rats and reported that oral administration of the extract at 200 and 400 mg/kg for six weeks significantly reduced blood glucose and glycosylated haemoglobin levels. The treatment also improved lipid-

related parameters and markers associated with oxidative stress and inflammation. Phytochemical screening in the study confirmed the presence of flavonoids, saponins, mucilage, tannins, terpenoids, alkaloids, steroids, anthraquinones and glycosides, providing possible biochemical explanations for the observed effects. Streptozotocin (STZ)-induced diabetes in rats is a valuable model for testing antidiabetic agents due to its ability to damage pancreatic β -cells and disrupt glucose regulation. This model allows for the assessment of plant extracts in mitigating hyperglycaemia and related biochemical issues. Previous studies on *A. digitata*'s methanolic leaf extract have shown positive effects in diabetic rats, yet further research is necessary, as various factors like plant source, extraction method, concentration, duration of study, and animal traits may influence biological outcomes.

1.1 Objectives of the Study

The aim of this study is to evaluate the antidiabetic effect of methanolic leaf extract of *Adansonia digitata* in streptozotocin-induced diabetic Wistar rats.

Specific Objectives of the study seeks to:

- i. Evaluate the effect of methanolic leaf extract of *Adansonia digitata* at 200 and 400 mg/kg on body weight and fasting blood glucose levels in streptozotocin-induced diabetic Wistar rats.
- ii. Determine the effects of the methanolic leaf extract on HbA1c, serum insulin and lipid profile parameters in streptozotocin-induced diabetic Wistar rats.
- iii. Assess the effects of the extract on selected liver and renal function indices as well as oxidative-stress and antioxidant parameters in streptozotocin-induced diabetic Wistar rats.
- iv. Evaluate the effect of methanolic *Adansonia digitata* leaf extract on pancreatic histopathological changes in streptozotocin-induced diabetic Wistar rats.

2. Literature Review

Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycaemia and abnormalities in carbohydrate, lipid, and protein metabolism. Prolonged hyperglycaemia promotes oxidative stress and the generation of reactive oxygen species, which can damage cellular components through protein modification, lipid peroxidation, DNA damage, and other molecular mechanisms. Consequently, persistent oxidative stress contributes to the development and progression of diabetic complications and can adversely affect the quality of life of affected individuals (Barceló & Rajpathak, 2001; Noiri & Tsukahara, 2005; Rolo & Palmeira, 2006). These complications have increased interest in identifying therapeutic agents capable of controlling blood glucose while also reducing oxidative damage. Medicinal

plants represent an important source of bioactive compounds with potential applications in the management of diabetes. *Adansonia digitata* L., commonly known as baobab, is an African tree belonging to the family Malvaceae and has considerable nutritional and medicinal importance. Different parts of the plant have traditionally been used for the management of several ailments, and investigations have reported antioxidant, anti-inflammatory, analgesic, immunostimulant and other pharmacological properties (De Caluwé et al., 2010; Kamatou et al., 2011). The medicinal potential of *A. digitata* has been associated with its diverse phytochemical composition. Phytochemical investigations of *A. digitata* leaves have identified several classes of secondary metabolites, including flavonoids, terpenoids, saponins, tannins, alkaloids, anthraquinones, steroids, phenolic compounds, resins and cardiac glycosides. The leaves also contain important nutritional constituents such as carbohydrates, proteins, dietary fibre, fats and minerals including calcium, iron, potassium, magnesium, phosphorus, zinc and manganese (Abiona et al., 2015; Namratha & Baobab, 2015). These phytochemicals may contribute to the biological activities of the plant, particularly its antioxidant and anti-inflammatory effects.

The antioxidant potential of *A. digitata* has received considerable attention. Talari et al. (2017) reported that extracts obtained from different parts of the plant exhibited free-radical-scavenging activity, which was associated with their phytochemical constituents. Similarly, Ayele et al. (2013) demonstrated that methanolic leaf extract of *A. digitata* possessed significant antioxidant and anti-inflammatory activity and inhibited inducible nitric oxide synthase expression, potentially through suppression of nuclear factor kappa B (NF- κ B) activation. Such properties are relevant to diabetes because oxidative stress and inflammatory processes are closely associated with the progression of diabetic metabolic abnormalities.

Evidence from experimental studies also indicates that *A. digitata* may have glucose- and lipid-lowering properties. Tanko et al. (2008) reported hypoglycaemic activity of methanolic stem-bark extract of *A. digitata* in streptozotocin-induced diabetic Wistar rats. In addition, Geidam et al. (2004) observed effects of methanolic *A. digitata* extract on serum lipid levels, while Bako et al. (2014) reported improvement in lipid profiles in alloxan-induced diabetic rats treated with methanolic fruit-pulp extract. These findings suggest that different parts of the plant may influence glucose and lipid metabolism and may therefore have potential in the management of diabetes and its associated metabolic complications. The use of plant-derived therapeutic agents has attracted increasing scientific interest because naturally occurring phytochemicals may provide multiple biological activities with potentially fewer adverse effects than some conventional synthetic agents. Research on medicinal plants has therefore

focused on identifying and validating natural compounds with hypoglycaemic, antioxidant, anti-inflammatory and lipid-regulating activities (Rajan et al., 2010; Romila et al., 2010). However, evidence obtained from different plant parts, extraction solvents and experimental models cannot necessarily be generalized to methanolic leaf extract of *A. digitata*. Further controlled animal studies are therefore necessary to establish its antidiabetic activity and associated biochemical effects.

Therefore, the present study is designed to evaluate the antidiabetic effect of methanol leaf extract of *Adansonia digitata* in streptozotocin-induced diabetic Wistar rats. The study will provide experimental evidence on the capacity of the extract to ameliorate diabetes-associated alterations and will contribute to the growing body of research on the potential use of *A. digitata* as a source of biologically active compounds for diabetes management.

3. METHODOLOGY

The study employs a laboratory-based experimental design to assess the antidiabetic properties of methanolic leaf extract from *Adansonia digitata* in streptozotocin (STZ)-induced diabetic Wistar rats. The experiment begins with acclimatizing healthy Wistar rats under standard conditions. A *digitata* leaf was collected, authenticated, air-dried, pulverized, and extracted with methanol. Rats were randomly divided into groups: a normal control, a diabetic control, groups receiving varying doses of the leaf extract, and a standard-drug treatment group. Diabetes was induced via an approved STZ protocol, confirmed through fasting blood glucose measurements. Treatments were administered during the experiment, with body weight and glucose levels monitored at set intervals.

At the conclusion of the treatment period, animals were humanely handled per approved protocols, and blood samples were gathered for biochemical analysis. The primary outcome is fasting blood glucose, with secondary parameters including HbA1c, serum insulin, lipid profile, liver and renal function indices, and oxidative-stress/antioxidant markers. Pancreatic tissue was also collected for histopathological assessment. Laboratory analyses are also adhered to validated procedures with quality control, and data was summarized using descriptive statistics. Inferential statistical methods such as one-way ANOVA and repeated-measures analysis were employed, with $p < 0.05$ used for significance, alongside effect sizes and confidence intervals reported where applicable.

3.1 Statistical Testing of the Research Hypotheses

For this study, the descriptive findings should be followed by inferential statistical analysis. The principal statistical hypotheses can be presented as follows:

Hypothesis One

H₀: Methanolic leaf extract of *Adansonia digitata* has no significant effect on fasting blood glucose levels in streptozotocin-induced diabetic Wistar rats.

H₁: Methanolic leaf extract of *Adansonia digitata* has a significant effect on fasting blood glucose levels in streptozotocin-induced diabetic Wistar rats.

Hypothesis Two

H₀: Methanolic leaf extract of *Adansonia digitata* has no significant effect on HbA1c and insulin concentrations.

H₁: Methanolic leaf extract of *Adansonia digitata* has a significant effect on HbA1c and insulin concentrations.

Hypothesis Three

H₀: Methanolic leaf extract of *Adansonia digitata* has no significant effect on lipid profile parameters.

H₁: Methanolic leaf extract of *Adansonia digitata* has a significant effect on lipid profile parameters.

Hypothesis Four

H₀: Methanolic leaf extract of *Adansonia digitata* has no significant effect on oxidative stress and antioxidant parameters.

H₁: Methanolic leaf extract of *Adansonia digitata* has a significant effect on oxidative stress and antioxidant parameters.

4. RESULTS AND DISCUSSION

This section discusses the results of an evaluation of the antidiabetic effects of methanolic leaf extract of *Adansonia digitata* in streptozotocin-induced diabetic Wistar rats. The study involved five experimental groups: a normal control, a diabetic control, two treated with the extract at 200 and 400 mg/kg, and a standard drug treatment group. Results were analyzed using descriptive statistics, focusing on body weight, fasting blood glucose, HbA1c, insulin, lipid profiles, liver and renal function indices, oxidative stress markers, and pancreatic histopathological scores.

4.1 Experimental Grouping of Animals

Table 1: Distribution of experimental animals according to treatment group.

Group	Treatment	Dose	Number of Rats
Group I	Normal control	0 mg/kg	8
Group II	Diabetic control	0 mg/kg	8
Group III	<i>A. digitata</i> leaf extract	200 mg/kg	8
Group IV	<i>A. digitata</i> leaf extract	400 mg/kg	8
Group V	Standard drug	According to approved protocol	8
Total			40

A total of 40 Wistar rats were represented in the dataset and equally distributed among five experimental groups, with eight animals per group. The equal allocation provided a balanced structure for comparison of outcomes among the experimental groups.

4.2 Body Weight of Experimental Animals

Table 2: Mean body weight of experimental animals before and after treatment.

Group	Baseline Weight (g), Mean $\pm$ SD	Final Weight (g), Mean $\pm$ SD
Normal Control	185.75 $\pm$ 5.92	209.63 $\pm$ 6.21
Diabetic Control	183.38 $\pm$ 5.34	158.63 $\pm$ 4.77
<i>A. digitata</i> 200 mg/kg	183.00 $\pm$ 4.63	179.13 $\pm$ 4.37
<i>A. digitata</i> 400 mg/kg	184.63 $\pm$ 4.67	189.75 $\pm$ 4.59
Standard Drug	182.88 $\pm$ 4.98	197.25 $\pm$ 4.43

The experimental groups had comparable baseline weights, from 183 to 186 g. After treatment, the normal control group increased from 185.75 g to 209.63 g, while the diabetic control group decreased from 183.38 g to 158.63 g. The group receiving 200 mg/kg of *A. digitata* experienced a smaller weight reduction, and the 400 mg/kg group increased to approximately 189.75 g. The standard-drug group also showed weight gain, indicating that diabetes induced weight loss, which was partially mitigated by *A. digitata* extract, especially at the higher dose.

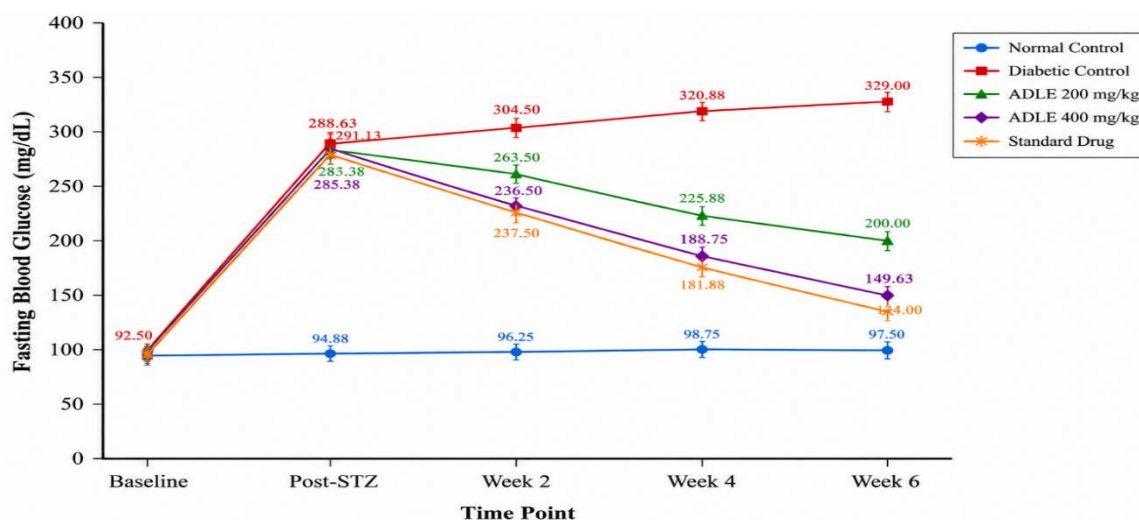
4.3 Fasting Blood Glucose

Fasting blood glucose was assessed at baseline, following STZ induction and during the treatment period.

Table 3: Mean fasting blood glucose concentration during the experimental period.

Group	Baseline	Post-STZ	Week 2	Week 4	Week 6
Normal Control	92.50 ± 2.45	94.88 ± 2.10	96.25 ± 2.05	98.75 ± 2.05	97.50 ± 1.85
Diabetic Control	92.50 ± 2.45	288.63 ± 13.73	304.50 ± 13.92	320.88 ± 12.44	329.00 ± 12.14
<i>A. digitata</i> 200 mg/kg	91.88 ± 2.42	283.38 ± 10.04	263.50 ± 9.85	225.88 ± 8.01	200.00 ± 6.76
<i>A. digitata</i> 400 mg/kg	92.50 ± 2.45	285.38 ± 10.14	236.50 ± 9.12	188.75 ± 6.78	149.63 ± 5.13
Standard Drug	92.50 ± 2.45	291.13 ± 12.92	237.50 ± 10.16	181.88 ± 7.20	134.00 ± 4.75

At baseline, fasting blood glucose values were similar across five groups, ranging from 91.88 to 92.50 mg/dL. After STZ administration, diabetic groups showed increased glucose levels, with the control group reaching approximately 329.00 mg/dL by Week 6. Conversely, *A. digitata*-treated groups exhibited significant reductions; the 200 mg/kg group decreased from 283.38 mg/dL to 200.00 mg/dL, while the 400 mg/kg group fell from 285.38 mg/dL to 149.63 mg/dL. The standard-drug group also showed a reduction to around 134.00 mg/dL by Week 6. The data suggest a greater reduction in fasting blood glucose with the higher dose of *A. digitata* extract.

**Figure 1: Trend of fasting blood glucose during treatment.**

X-axis: Baseline, Post-STZ, Week 2, Week 4 and Week 6

- Y-axis: Fasting blood glucose (mg/dL)
- Five lines representing the five experimental groups.

The graphical trend demonstrates that fasting blood glucose remained relatively stable in the normal control group but increased progressively in the diabetic control group. The two extract-treated groups demonstrated progressive reductions in glucose concentration, with the 400 mg/kg group showing a steeper decline than the 200 mg/kg group.

4.4 HbA1c and Insulin Concentrations

Table 4: Mean HbA1c and insulin concentrations at the end of treatment.

Group	HbA1c (%) Mean $\pm$ SD	Insulin (μ IU/mL) Mean $\pm$ SD
Normal Control	4.73 $\pm$ 0.10	12.06 $\pm$ 0.30
Diabetic Control	13.33 $\pm$ 0.45	4.15 $\pm$ 0.28
<i>A. digitata</i> 200 mg/kg	8.89 $\pm$ 0.36	7.06 $\pm$ 0.34
<i>A. digitata</i> 400 mg/kg	6.85 $\pm$ 0.27	9.19 $\pm$ 0.34
Standard Drug	5.85 $\pm$ 0.23	10.58 $\pm$ 0.32

The diabetic control group showed a mean HbA1c concentration of 13.33%, significantly higher than the 4.73% in the normal control group. Treatment with *A. digitata* extract led to lower HbA1c levels, with mean values of 8.89% for the 200 mg/kg group and 6.85% for the 400 mg/kg group. Additionally, an increase in mean insulin concentration was noted, particularly in the 400 mg/kg group compared to the 200 mg/kg group. These results indicate improved glycaemic control in the extract-treated groups.

4.4 Lipid Profile

Table 5: Mean lipid profile parameters at the end of treatment.

Group	Total Cholesterol (mg/dL)	Triglycerides (mg/dL)	HDL (mg/dL)	LDL (mg/dL)
Normal Control	79.50 $\pm$ 2.45	62.50 $\pm$ 2.45	39.00 $\pm$ 1.31	25.88 $\pm$ 1.90
Diabetic Control	175.00 $\pm$ 6.61	165.25 $\pm$ 7.11	26.50 $\pm$ 1.60	116.88 $\pm$ 6.72
<i>A. digitata</i> 200 mg/kg	143.75 $\pm$ 5.05	129.75 $\pm$ 5.32	31.75 $\pm$ 1.49	86.13 $\pm$ 4.74
<i>A. digitata</i> 400 mg/kg	115.63 $\pm$ 5.34	100.25 $\pm$ 4.92	35.63 $\pm$ 1.19	61.75 $\pm$ 4.66
Standard Drug	94.75 $\pm$ 3.28	78.63 $\pm$ 3.16	38.88 $\pm$ 1.25	41.63 $\pm$ 2.70

The diabetic control group exhibited higher levels of total cholesterol, triglycerides, and LDL, along with lower HDL compared to the normal control group. Treatment with *A. digitata* extract improved the lipid profile, with the 400 mg/kg dosage resulting in lower cholesterol, triglycerides, and LDL, and higher HDL compared to the 200 mg/kg group. This indicates a potential positive effect of the extract on diabetes-related lipid issues.

4.5 Liver Function Parameters

Table 6: Mean liver function parameters at the end of treatment.

Group	ALT (U/L)	AST (U/L)
Normal Control	32.25 ± 1.28	67.88 ± 1.96
Diabetic Control	62.88 ± 3.18	130.00 ± 4.96
<i>A. digitata</i> 200 mg/kg	48.00 ± 2.27	100.13 ± 3.87
<i>A. digitata</i> 400 mg/kg	41.25 ± 1.91	85.50 ± 3.70
Standard Drug	35.88 ± 1.46	74.50 ± 2.45

The diabetic control group exhibited higher mean ALT and AST levels compared to the normal control group. Treatment with *A. digitata* extract reduced ALT and AST levels, with the 400 mg/kg dosage showing a more significant decrease than the 200 mg/kg dosage. Overall, the results suggest an improvement in the liver enzyme profile after treatment.

4.6 Renal Function Parameters

Table 7: Mean renal function parameters at the end of treatment.

Group	Urea (mg/dL)	Creatinine (mg/dL)
Normal Control	30.50 ± 1.07	0.60 ± 0.01
Diabetic Control	59.38 ± 2.56	1.22 ± 0.04
<i>A. digitata</i> 200 mg/kg	45.63 ± 1.77	0.95 ± 0.03
<i>A. digitata</i> 400 mg/kg	38.63 ± 1.77	0.78 ± 0.03
Standard Drug	33.13 ± 1.55	0.65 ± 0.02

The diabetic control group had elevated mean urea and creatinine levels compared to the normal control group. Treatment with the extract led to reductions in these parameters, with the 400 mg/kg group showing more significant improvements than the 200 mg/kg group, suggesting an enhancement in the renal biochemical profile following extract administration.

4.7 Oxidative Stress and Antioxidant Parameters

Table 8: Mean oxidative stress and antioxidant parameters.

Group	MDA (nmol/mL)	SOD (U/mL)	CAT (U/mL)	GSH (mg/dL)
Normal Control	2.79 ± 0.14	8.74 ± 0.21	61.75 ± 1.67	34.75 ± 1.04
Diabetic Control	7.85 ± 0.39	4.00 ± 0.29	30.88 ± 1.89	14.88 ± 1.25
<i>A. digitata</i> 200 mg/kg	5.53 ± 0.27	6.00 ± 0.27	45.75 ± 2.05	23.50 ± 1.41
<i>A. digitata</i> 400 mg/kg	4.05 ± 0.26	7.19 ± 0.29	53.50 ± 2.45	28.00 ± 1.31
Standard Drug	3.19 ± 0.16	8.09 ± 0.23	59.88 ± 2.03	32.38 ± 1.19

The diabetic control group exhibited increased MDA levels and decreased antioxidant parameters (SOD, CAT, GSH). *A. digitata* extract treatment lowered MDA and enhanced antioxidants, with the 400 mg/kg dosage showing more significant benefits than 200 mg/kg, indicating improved oxidative balance.

4.8 Pancreatic Histopathological Findings

Table 9: Mean pancreatic histopathological injury score.

Group	Mean Score $\pm$ SD
Normal Control	0.00 $\pm$ 0.00
Diabetic Control	2.75 $\pm$ 0.46
<i>A. digitata</i> 200 mg/kg	1.50 $\pm$ 0.53
<i>A. digitata</i> 400 mg/kg	0.63 $\pm$ 0.52
Standard Drug	0.38 $\pm$ 0.52

The normal control group exhibited no pancreatic injury, scoring zero. The diabetic control group had the highest injury score of 2.75 ± 0.46 . After treatment with 200 mg/kg *A. digitata* extract, the score improved to 1.50 ± 0.53 , and further improved to 0.63 ± 0.52 at 400 mg/kg. The standard-drug group showed a score of 0.38 ± 0.52 , indicating that higher doses of the extract correlate with reduced pancreatic injury.

The dataset findings indicate significant differences between the diabetic control group and those treated with extracts. Key findings include: weight loss in the control group contrasted with reduced weight loss in extract-treated subjects; elevated fasting blood glucose in controls which decreased with extract treatment; and improved outcomes in the 400 mg/kg extract group compared to the 200 mg/kg. HbA1c levels were highest in controls, insulin levels increased with extract treatment, and lipid profiles improved. Liver and renal functions showed better parameters with extract treatment. Oxidative stress markers were adverse in the control group but improved in treated groups, and pancreatic injuries were less severe in extract-treated subjects.

5. CONCLUSION

The study demonstrated that the methanolic leaf extract of *Adansonia digitata* exhibits significant antidiabetic effects in streptozotocin-induced diabetic Wistar rats. Key findings include a notable reduction in fasting blood glucose levels, improvements in HbA1c, insulin concentrations, and lipid profiles, particularly at a dosage of 400 mg/kg compared to 200 mg/kg. The extract also enhanced liver and renal biochemical parameters, reduced oxidative stress, and alleviated pancreatic tissue injury. Histopathological assessments indicated improved pancreatic condition with decreased injury scores following treatment. Overall, the extract shows promising multidimensional antidiabetic potential, although it did not fully normalize all parameters. Further research is necessary to explore its clinical applicability.

6. Recommendations

Based on the findings of this study, the following recommendations are made:

1. Further pharmacological studies should be conducted to identify the specific bioactive compounds responsible for the antidiabetic activity of *Adansonia digitata* leaves.
2. Dose-response studies should be expanded beyond 200 and 400 mg/kg to establish the minimum effective dose, optimum therapeutic dose and possible toxic dose of the methanolic leaf extract.
3. Longer-duration studies should be undertaken to determine whether the beneficial effects observed during the six-week treatment period can be maintained over an extended period.
4. Molecular investigations should be conducted to clarify the mechanisms through which *A. digitata* extract reduces blood glucose and oxidative stress and improves insulin status.
5. Histological investigations should be extended to other organs, particularly the liver and kidneys, to provide additional evidence regarding the protective effects and safety of the extract.
6. The antidiabetic activity of the extract should be compared with established antidiabetic drugs using standardized experimental protocols to determine its relative pharmacological effectiveness.

7. Contribution to Knowledge

The study demonstrates that methanolic leaf extract of *Adansonia digitata* significantly reduces fasting blood glucose levels in STZ-induced diabetic Wistar rats, from 329.00 mg/dL to 149.63 mg/dL at a dosage of 400 mg/kg. It enhances glycaemic control by decreasing HbA1c levels and increasing serum insulin. A dose-dependent effect was noted, with higher doses improving insulin and lipid profiles, reducing total cholesterol and triglycerides, while increasing HDL. Additionally, the extract improved the oxidative-antioxidant balance and showed protective effects on liver and kidney functions, indicated by reduced pancreatic injury histopathology. These findings suggest *A. digitata*'s potential as a bioactive compound for diabetes management, warranting further research into its pharmacological mechanisms.

REFERENCES

1. Abiona, D. L., Adedapo, Z., & Suleiman, M. K. (2015). Proximate analysis, phytochemical screening and antimicrobial activity of baobab (*Adansonia digitata*) leaves. *IOSR Journal of Applied Chemistry*, 8, 60–65.

2. Adewusi, E. A., Steenkamp, V., & others. (2017). Blanching influences the phenolics composition, antioxidant activity, and inhibitory effect of *Adansonia digitata* leaves extract on α -amylase, α -glucosidase, and aldose reductase. *Food Science & Nutrition*, 5(3), 563–570.
3. Ayele, Y., Kim, J.-A., Park, E., et al. (2013). A methanol extract of *Adansonia digitata* L. leaves inhibits pro-inflammatory iNOS possibly via the inhibition of NF- κ B activation. *Biomolecules & Therapeutics*, 21(2), 146–152.
4. Bako, Y. H., Mohammad, S. J., Waziri, P. M., Bulus, T., Gwarzo, M. Y., & Zubairu, M. M. (2014). Lipid profile of alloxan-induced diabetic Wistar rats treated with methanolic extract of *Adansonia digitata* fruit pulp. *The Scientific World Journal*, 9(2), 19–24.
5. Barceló, A., & Rajpathak, S. (2001). Incidence and prevalence of diabetes mellitus in the Americas. *American Journal of Public Health*, 10(5), 300–308.
6. De Caluwé, E., Halamová, K., & Van Damme, P. (2010). Baobab (*Adansonia digitata* L.): A review of traditional uses, phytochemistry and pharmacology. *Atuo Focus*, 23, 11–51.
7. Ebaid, H., Bashandy, S. A. E., Alhazza, I. M., Hassan, I., & Al-Tamimi, J. (2019). Efficacy of a methanolic extract of *Adansonia digitata* leaf in alleviating hyperglycemia, hyperlipidemia, and oxidative stress of diabetic rats. *BioMed Research International*, 2019, Article 2835152. <https://doi.org/10.1155/2019/2835152>
8. Geidam, M. A., Chabiri, S. A., & Shettima, Y. (2004). Effect of methanolic extract of *Adansonia digitata* on serum lipid levels in normal and ethanol-fed rats. *Pakistan Journal of Biological Sciences*, 7(6), 1094–1095.
9. Kamatou, G. P. P., Vermaak, I., & Viljoen, A. M. (2011). An updated review of *Adansonia digitata*: A commercially important African tree. *South African Journal of Botany*, 77(4), 908–919.
10. Namratha, V., & Baobab, S. P. (2015). A review about “the tree of life.” *International Journal of Advanced Herbal Science and Technology*, 1, 20–26.
11. Noiri, E., & Tsukahara, H. (2005). Parameters for measurement of oxidative stress in diabetes mellitus: Applicability of enzyme-linked immunosorbent assay for clinical evaluation. *Journal of Investigative Medicine*, 53(4), 167–175.
12. Rajan, M., Kumar, K. V., Kumar, P. S., Ramaniyam, R. T., & Kumar, N. S. (2010). Antidiabetic activity of ethanolic extract of *Albizia odoratissima* (L.f.) Benth. in alloxan-induced diabetic rats. *International Journal of Pharmaceutical Sciences and Research*, 2(3), 786–791.

13. Rolo, A. P., & Palmeira, C. M. (2006). Diabetes and mitochondrial function: Role of hyperglycemia and oxidative stress. *Toxicology and Applied Pharmacology*, 212(2), 167–178.
14. Romila, Y., Mazumder, P. B., & Choudhury, M. D. (2010). A review on antidiabetic plants used by the people of Manipur characterized by hypoglycemic activity. *Assam University Journal of Environmental Science and Technology*, 6, 167–175.
15. Talari, S., Gundu, C., Koila, T., & Nanna, R. S. (2017). In vitro free radical scavenging activity of different extracts of *Adansonia digitata* L. *International Journal of Environment, Agriculture and Biotechnology*, 2(3), 1169–1172.
16. Tanko, Y., Yerima, M., Mahdi, M. A., Yaro, A. H., Musa, K. Y., & Mohammed, A. (2008). Hypoglycemic activity of methanolic stem bark of *Adansonia digitata* extract on blood glucose levels of streptozotocin-induced diabetic Wistar rats. *International Journal of Applied Research in Natural Products*, 1(2), 32–36.
17. World Health Organization. (2024). *Diabetes*. World Health Organization.
18. World Health Organization. (2026). *Diabetes: Questions and answers*. World Health Organization.