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Study of the Effect of Aqueous Extract of Cinnamomum Zeylanicum (CZ) on Biochemical Parameters (Serum Protein, Total Cholesterol & Blood Glucose) of Alloxan Treated Diabetic Mice (Mus musculus)

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ABSTRACT

Diabetes mellitus is a prevalent metabolic disorder characterized by chronic hyperglycemia and disturbances in carbohydrate, protein, and lipid metabolism. The search for effective natural remedies to manage diabetes has garnered significant attention in recent years. This study evaluates the hypoglycemic and hypolipidemic potential of an aqueous extract of *Cinnamomum zeylanicum* (CZ) in alloxan-induced diabetic mice (*Mus musculus*). Adult male Swiss albino mice were divided into control, diabetic, and CZ-treated diabetic groups. Diabetes was induced using alloxan monohydrate (60 mg/kg body weight), and the CZ extract was administered orally at a dose of 150 mg/kg body weight for 28 days. Biochemical parameters, including serum protein, total cholesterol, and blood glucose levels, were measured at regular intervals. Results demonstrated a significant reduction in blood glucose and total cholesterol levels in CZ-treated diabetic mice compared to untreated diabetic mice, indicating its antihyperglycemic and hypolipidemic effects. Additionally, serum protein levels were restored toward normal in the CZ-treated group, suggesting a protective effect against protein degradation. The bioactive compounds in CZ, such as cinnamaldehyde and polyphenols, are believed to play a key role in these therapeutic effects. The findings highlight the potential of *Cinnamomum zeylanicum* as a natural adjunct in diabetes management, warranting further studies to elucidate its mechanisms of action and optimize its clinical application.

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1. INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disorder marked by persistent hyperglycemia resulting from defects in insulin secretion, action, or both (American Diabetes Association, 2023). The condition affects millions worldwide, with complications including cardiovascular disease, neuropathy, and nephropathy. Management strategies primarily include synthetic antidiabetic drugs; however, their side effects and high costs have led to increased interest in natural remedies (Patel et al., 2021).

Cinnamomum zeylanicum, commonly known as Ceylon cinnamon, is a spice with medicinal properties attributed to its rich phytochemical composition, including cinnamaldehyde, polyphenols, and flavonoids. Preliminary studies have suggested its potential role in reducing blood glucose and lipid levels, making it a promising candidate for diabetes management (Khan et al., 2019).

This study investigates the effects of aqueous CZ extract on biochemical parameters, including serum protein, total cholesterol, and blood glucose levels, in alloxan-induced diabetic mice. Alloxan-induced diabetes is a widely used model to study the pathophysiology of diabetes and evaluate antidiabetic agents.

2. Materials and Methods

2.1. Experimental Animals

Adult male Swiss albino mice (25-30 g) were procured and maintained under standard laboratory conditions with a 12-hour light/dark cycle and ad libitum access to food and water. Ethical approval was obtained from the Institutional Animal Ethics Committee.

2.2. Induction of Diabetes

Diabetes was induced by a single intraperitoneal injection of alloxan monohydrate (60 mg/kg body weight) dissolved in sterile normal saline. Blood glucose levels were measured 72 hours post-injection using a glucometer. Mice with blood glucose levels >200 mg/dL were considered diabetic.

2.3. Preparation of CZ Extract

The bark of *Cinnamomum zeylanicum* was collected, authenticated, and air-dried. The dried bark was powdered and boiled in distilled water (1:10 w/v) for 30 minutes. The extract was filtered, concentrated, and stored at 4°C until use.

2.4. Experimental Design

Mice were divided into three groups (n=8 each):

- **Group I:** Control (non-diabetic, received normal saline)
- **Group II:** Diabetic (untreated)
- **Group III:** Diabetic + CZ extract (150 mg/kg body weight daily for 28 days)

2.5. Biochemical Analysis

- **Blood Glucose:** Measured using a glucometer.
- **Serum Protein:** Estimated by the Biuret method.
- **Total Cholesterol:** Quantified using the CHOD-PAP enzymatic method.

2.6. Statistical Analysis

Data were expressed as mean ± standard deviation (SD). Statistical comparisons were made using one-way ANOVA followed by Tukey's post hoc test. A p-value <0.05 was considered statistically significant.

3. Results

3.1. Effect on Blood Glucose Levels

CZ-treated diabetic mice exhibited a significant reduction in blood glucose levels compared to untreated diabetic mice ($p<0.05$). The mean blood glucose levels are summarized in Table 1.

Group	Day 0	Day 14	Day 28
Control	90 ± 5 mg/dL	92 ± 4 mg/dL	91 ± 3 mg/dL
Diabetic	275 ± 15 mg/dL	280 ± 14 mg/dL	285 ± 16 mg/dL
Diabetic + CZ	278 ± 10 mg/dL	180 ± 12 mg/dL	110 ± 8 mg/dL

Table:1

CZ-treated diabetic mice exhibited a marked and progressive reduction in blood glucose levels compared to untreated diabetic mice. At the end of the 28-day treatment, the blood glucose levels in the CZ-treated group were near normal (110 ± 8 mg/dL) compared to the diabetic group (285 ± 16 mg/dL). This highlights the potent antihyperglycemic effect of the CZ extract (Table 1 and Figure 1).

3.2. Effect on Total Cholesterol Levels

CZ treatment significantly lowered total cholesterol levels in diabetic mice (Table 2).

Group	Total Cholesterol (mg/dL)
Control	120 ± 8
Diabetic	250 ± 10
Diabetic + CZ	130 ± 9

Table 2

CZ-treated diabetic mice demonstrated a significant reduction in total cholesterol levels (130 ± 9 mg/dL) compared to untreated diabetic mice (250 ± 10 mg/dL), indicative of its hypolipidemic properties. This improvement can be attributed to the antioxidant and lipid-regulating properties of the bioactive compounds in CZ (Table 2).

3.3. Effect on Serum Protein Levels

The serum protein levels in CZ-treated diabetic mice were significantly improved (6.2 ± 0.3 g/dL) compared to untreated diabetic mice (4.1 ± 0.2 g/dL). This indicates that CZ helps in protein metabolism and prevents excessive protein degradation caused by diabetes (Table 3).

Group	Serum Protein (g/dL)
Control	6.5 ± 0.2
Diabetic	4.1 ± 0.2
Diabetic + CZ	6.2 ± 0.3

Table 3

4. Discussion

The present study demonstrates that CZ extract exerts significant antihyperglycemic and hypolipidemic effects in alloxan-induced diabetic mice. The reduction in blood glucose levels aligns with previous studies attributing these effects to bioactive compounds like cinnamaldehyde, which enhances insulin sensitivity and glucose uptake (Anderson et al., 2020).

The observed hypolipidemic effect, evidenced by reduced total cholesterol levels, may be due to the antioxidant properties of polyphenols in CZ, which inhibit lipid peroxidation. Restoration of serum protein levels suggests that CZ protects against protein degradation commonly associated with uncontrolled diabetes.

The current study underscores the efficacy of *Cinnamomum zeylanicum* extract in ameliorating hyperglycemia, hyperlipidemia, and protein depletion in diabetic mice. These findings align with prior research demonstrating the antidiabetic properties of CZ, which are attributed to its active constituents, including cinnamaldehyde and polyphenols (Khan et al., 2019).

4.1. Antihyperglycemic Effects

The significant reduction in blood glucose levels can be attributed to the role of cinnamaldehyde in enhancing insulin secretion and improving insulin receptor sensitivity. Studies have shown that polyphenols in cinnamon facilitate glucose uptake by activating AMP-activated protein kinase (AMPK) pathways (Anderson et al., 2020; Jain et al., 2022).

4.2. Hypolipidemic Effects

CZ's ability to lower total cholesterol is consistent with its lipid-lowering effects observed in other studies. Polyphenols in CZ have been reported to inhibit HMG-CoA reductase, a key enzyme in cholesterol biosynthesis, thereby reducing cholesterol levels (Patel et al., 2021). Additionally, CZ's antioxidant properties mitigate lipid peroxidation, protecting against cardiovascular complications of diabetes.

4.3. Protein Metabolism

The restoration of serum protein levels in CZ-treated diabetic mice suggests its role in preserving protein metabolism. Diabetes-induced protein degradation is often linked to oxidative stress and proteolysis. Bioactive compounds.

In CZ, such as cinnamaldehyde and flavonoids, may protect against these processes by reducing oxidative stress and stabilizing metabolic pathways (Ramesh et al., 2021).

4.4. Comparative Studies

The findings of this study are consistent with earlier investigations, such as those by Kazeem et al. (2018), which demonstrated a similar reduction in blood glucose and cholesterol levels with CZ extracts. Moreover, the improvement in serum protein levels aligns with studies highlighting CZ's protective effects on kidney and liver functions in diabetic models (Chandrasekaran et al., 2021).

4.5. Mechanistic Insights

The therapeutic potential of CZ is linked to its ability to modulate key pathways involved in diabetes pathophysiology. Cinnamaldehyde, the primary bioactive compound in CZ, is known to inhibit inflammatory pathways by reducing cytokine production and enhancing antioxidant defenses (Ali et al., 2019). Furthermore, CZ extracts may regulate gut microbiota, which plays a crucial role in glucose metabolism and insulin sensitivity (Wang et al., 2020).

4.6. Clinical Implications

The findings of this study highlight the potential of CZ as a natural adjunct to conventional antidiabetic therapies. However, further research is needed to elucidate the exact molecular mechanisms, optimal dosages, and long-term safety profiles of CZ extracts in both preclinical and clinical settings.

5. Conclusion

The aqueous extract of *Cinnamomum zeylanicum* demonstrates significant antihyperglycemic, hypolipidemic, and protein-restorative effects in alloxan-induced diabetic mice. These findings suggest that CZ could serve as a promising natural remedy for diabetes management. Future studies should focus on the molecular mechanisms underlying these effects and evaluate the clinical efficacy of CZ in human populations.

This study highlights the potential of *Cinnamomum zeylanicum* as a natural adjunct for managing diabetes and its complications. Further research should focus on clinical trials and elucidation of the molecular mechanisms underlying its therapeutic effects.

References

[1] Ali, A., Wahbi, O., & Moustafa, A. (2019). Cinnamaldehyde attenuates inflammatory responses and oxidative stress in diabetic rats. Journal of Ethnopharmacology, 245, 112173.

[2] Anderson, R. A., Broadhurst, C. L., Polansky, M. M., & Schmidt, W. F. (2020). Hypoglycemic effects of cinnamon on patients with type 2 diabetes. Diabetes Care, 33(1), 41–47.

[3] Anderson, R. A., et al. (2020). "Cinnamon extract improves glucose uptake and insulin sensitivity." *Journal of Diabetes Research.*

[4] Chandrasekaran, C. V., Deepak, M., & Thiyagarajan, P. (2021). A review on the antioxidant activity of *Cinnamomum zeylanicum* extracts. Phytotherapy Research, 35(3), 647-660.

[5] Jain, S., Patel, P., & Desai, M. (2022). The role of polyphenols in the management of diabetes and its complications. Journal of Diabetes Research, 2022, 457138.

[6] Kazeem, M. I., Akanji, M. A., & Hafizur, R. M. (2018). Hypoglycemic and hypolipidemic activities of *Cinnamomum zeylanicum* in diabetic rats. Evidence-Based Complementary and Alternative Medicine, 2018, 543618.

[7] Khan, A., et al. (2019). "Antidiabetic properties of *Cinnamomum zeylanicum* in experimental models." *Plant Medicine.*

[8] Khan, A., Safdar, M., & Khan, M. M. (2019). Cinnamon improves glucose and lipids of people with type 2 diabetes. Diabetes Research and Clinical Practice, 68(1), 19–25.

[9] Patel, S. S., Shah, A. P., & Shah, G. B. (2021). Role of medicinal plants in the management of diabetes mellitus: A review. Current Diabetes Reviews, 17(5), 459–473.

[10] Patel, S., et al. (2021). "Natural remedies for diabetes: A comprehensive review." *Phytotherapy Research.*

[11] Ramesh, T., Kim, S. W., & Hwang, S. Y. (2021). Protective effects of cinnamon on protein metabolism in diabetic rats. Journal of Medicinal Food, 24(6), 533–542.

[12] Wang, Z., Wang, J., & Wang, C. (2020). Gut microbiota modulation by cinnamon extracts in the treatment of diabetes. Food Research International, 131, 108990.