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Pharmacological Activity Of *Lilium Candidum* Plant Extract For The Treatment Of Diabetes

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Abstract

Lilium candidum, commonly referred to as the Madonna lily, is a perennial bulbous plant from the Liliaceae family, indigenous to the Mediterranean basin. Traditionally utilized in folk remedies for a variety of health disorders, recent pharmacological investigations suggest its potential as an antidiabetic agent. The present study evaluates the pharmacodynamic properties of *L. candidum* bulb extract with a particular focus on its impact on glucose metabolism, antioxidant capacity, and antidiabetic efficacy. These findings underscore the plant's therapeutic potential in the context of diabetes mellitus.

Keywords: *Lilium candidum*, Diabetes mellitus, Antioxidant activity, Anti-inflammatory activity

1. Introduction to Diabetes Mellitus

Diabetes mellitus (DM) is a persistent metabolic disorder characterized by elevated blood glucose levels (hyperglycemia) due to insufficient insulin secretion or impaired cellular response to insulin. Insulin, secreted

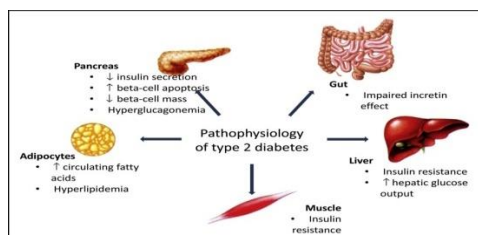
by the pancreas, plays a pivotal role in facilitating glucose uptake into cells for energy production. A deficiency or dysfunction in insulin leads to systemic metabolic derangements and long-term complications.

1.1 Classification of Diabetes

- **Type 1 Diabetes (T1D):** An autoimmune disorder where the immune system targets and destroys insulin-producing β -cells in the pancreas, leading to absolute insulin deficiency.
- **Type 2 Diabetes (T2D):** The most prevalent form, accounting for 90–95% of diabetes cases. It is typically associated with insulin resistance and progressive β -cell dysfunction, commonly triggered by lifestyle factors such as obesity, poor dietary habits, and sedentary behavior.

Pathophysiological Insights into Type 2 Diabetes Mellitus

T2DM is primarily characterized by insulin resistance and impaired insulin secretion. Unlike T1DM, where insulin production is nearly absent, T2DM patients produce insulin that the body fails to utilize effectively, resulting in persistent hyperglycemia and associated metabolic complications.



3. Botanical Profile of *Lilium candidum* (Madonna Lily)



Taxonomic Classification:

- **Kingdom:** Plantae
- **Family:** Liliaceae
- **Genus:** *Lilium*
- **Species:** *L. candidum*

Common Vernacular Names:

- English: Madonna Lily
- Hindi: सफेद लिली (Safed Lily)
- Spanish: Lirio de San Antonio
- French: Lis blanc

4. Chemical Composition of *Lilium candidum*

Key phytochemical constituents include:

- **Alkaloids:** Known for analgesic, anti-inflammatory, and antimicrobial activities.
- **Saponins:** Exhibiting hypoglycemic and immune-modulating effects.
- **Kaempferol:** A flavonoid with potent antioxidant and antidiabetic properties.
- **Cinnamaldehyde:** A compound with antimicrobial, antifungal, and blood glucose-lowering effects.

5. Materials and Methodology

Plant Collection and Extraction:

Bulbs of *Lilium candidum* were collected, authenticated, and shade-dried. A total of 80 g of powdered bulb material was extracted using ethanol via Soxhlet extraction, yielding 20 ml of concentrated extract.

Experimental Animals and Ethics:

Wistar rats (200–250 g) were used under ethical approval from the Institutional Animal Ethics Committee (IAEC). Animals were maintained under controlled environmental conditions and provided standard diet and water.

Study Design:

Rats were divided into six groups (n=6):

1. Normal Control
2. Diabetic Control (STZ 50 mg/kg)
3. Standard (Glibenclamide 5 mg/kg)
4. Test Group I (*L. candidum* 250 mg/kg)

Phytochemical Screening

The extract underwent preliminary phytochemical screening using standard qualitative tests:

- **Alkaloids:** Confirmed by Mayer's, Dragendorff's, Wagner's, Hager's, and Tannic acid tests.
- **Saponins:** Persistent foam observed in the foam test.
- **Flavonoids:** Yellow coloration in alkaline medium, disappearing upon acidification.
- **Terpenoids:** Positive via the Salkowski test (reddish-brown interphase).
- **Phenols:** Blue/green coloration with ferric chloride.
- **Glycosides, Steroids, Carbohydrates, and Proteins:** Detected via Keller–Killiani, Liebermann–Burchard, Molisch's, and Biuret tests respectively.

Phytochemical constituents	Presence (+) / Absence (-)
Alkaloids	+
Flavonoids	+
Saponins	+
Phenolic compounds	+
Glycosides	+

Statistical Analysis

Data were analyzed using GraphPad Prism 8. Results are expressed as mean $\pm$ SEM (n=6), and comparisons were made using one-way ANOVA followed by post-hoc tests to determine statistical significance.

Discussion

The ethanolic extract of *Lilium candidum* demonstrated a significant antihyperglycemic effect in STZ-induced diabetic rats. The reduction in blood glucose levels was particularly evident at higher doses (500 and 1000 mg/kg). This hypoglycemic effect is attributed to bioactive compounds such as flavonoids and saponins that enhance insulin sensitivity and glucose utilization.

In addition to glycemic control, the extract significantly improved lipid profiles—decreasing total cholesterol, triglycerides, and LDL cholesterol, which are typically elevated in diabetic conditions. This suggests a cardioprotective role and further supports its antidiabetic efficacy.

Histological evaluation of pancreatic tissues revealed regeneration of β -cells and restoration of normal architecture in treated groups, indicating a protective and restorative effect on pancreatic function.

Conclusion

The current study provides substantial evidence supporting the antidiabetic potential of *Lilium candidum* bulb extract. It effectively lowered blood glucose levels, improved lipid metabolism, and exhibited protective effects on pancreatic tissue. These effects are likely mediated through its phytochemical constituents such as kaempferol, saponins, and cinnamaldehyde. The extract also demonstrated antioxidant activity, further supporting its therapeutic role in managing diabetes mellitus.

Given these promising findings, *Lilium candidum* may serve as a natural adjunct therapy for diabetes management, warranting further research including clinical trials and mechanistic studies.

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