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Review Article

A REVIEW ON: COMMELINA BENGHALESIS AN EFFECTIVE MANAGEMENT OF DIABETICS

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ABSTRACT:
A chronic metabolic disease called diabetes mellitus is characterized by persistently high blood sugar levels brought on by either decreased insulin action or secretion, or both. Particularly, the rising incidence of type 2 diabetes has spurred a great deal of study into complementary and alternative medicine. A wild herb that has long been employed in a variety of folk medicines, Commelina benghalensis (dayflower) has drawn interest among medicinal plants due to its possible antidiabetic effects. Packed with phytochemicals, including phenolic compounds, alkaloids, flavonoids, tannins, and saponins, C. benghalensis has a variety of pharmacological benefits, such as anti-inflammatory, hypoglycemic, and antioxidant properties. It has been shown in experiments to protect pancreatic β-cells in diabetes animals, increase insulin sensitivity, and regulate blood glucose levels. The purpose of this review is to gather the most recent information on Commelina benghalensis's phytoconstituents, antidiabetic action mechanisms, pharmacological investigations, dose forms, and therapeutic efficacy. The safety profile, standardisation issues, and potential for clinical translation in the future are also highlighted. C. benghalensis may be a viable natural alternative for managing diabetes, either on its alone or in conjunction with current treatments, according to its traditional use and promising pharmacological profile.

Keywords: Commelina Benghalensis, Diabetes mellitus, Herbal antidiabetic, hypoglycemic plant, Phytomedicine

INTRODUCTION

One of the biggest health issues facing the world today is diabetes mellitus, which is typified by persistently high blood sugar levels brought on by either insufficient insulin synthesis or poor insulin action. There are two main forms of the disease: type 1, in which the body is unable to manufacture insulin, and type 2, in which insulin resistance develops.1 The World Health Organization estimates that 537 million persons worldwide have diabetes in 2021, and that number is expected to increase dramatically over the next several decades. Despite their widespread usage, traditional medications including metformin, sulfonylureas, and insulin treatments have long-term adverse effects that include weight gain, gastrointestinal problems, and hypoglycemia. For safer and more sustainable management, this has sparked an increase in interest in complementary and alternative medicine, especially herbal medicines.2

The Bengal dayflower, or Commelina benghalensis L., is a wild creeping herb that grows extensively in tropical Asia and Africa. C. benghalensis has long been used to treat infections, inflammation, and metabolic diseases in Ayurvedic and traditional medicine. According to recent pharmacological research, the plant has bioactive phytoconstituents that may have antidiabetic effects.3

The complex Phytochemistry of C. benghalensis, which includes flavonoids, alkaloids, glycosides, tannins, and saponins, is what gives it its medicinal potential. These compounds are known to have biological actions like scavenging free radicals, inhibiting enzymes like α-glucosidase, and promoting the regeneration of pancreatic β-cells.4

The botanical profile, traditional use, pharmacological data, antidiabetic action mechanisms, and future research directions for C. benghalensis in relation to diabetes care are all included in this review.5

Pathophysiology of Diabetics:

The hallmark of diabetes mellitus, a complicated metabolic disease, is persistent hyperglycemia brought on by deficiencies in either insulin action or secretion, or both. The two main forms of diabetes have different pathophysiological mechanisms:

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1.Type 1 Diabetes Mellitus (T1DM): This autoimmune disease occurs when the body's immune system targets and kills the pancreatic β-cells that produce insulin. An utter lack of insulin results from this damage. In addition to environmental triggers such viral infections or nutritional variables, the disease has a significant hereditary component.

2.Type 2 Diabetes Mellitus (T2DM): Relative insulin insufficiency and insulin resistance are the main characteristics of T2DM. Important pathophysiological elements consist of:

- **Insulin Resistance**: Impaired glucose absorption due to decreased sensitivity of muscle and adipose tissues to insulin.
- B-cell dysfunction is the progressive loss of pancreatic β-cells' ability to secrete insulin.
- **Increased Hepatic Glucose Output:** In spite of elevated blood sugar, the liver still produces glucose.
- **Adipokine imbalance and inflammation:** Insulin resistance and low-grade inflammation are exacerbated by dysfunctional adipose tissue.
- Diabetes complications include microvascular conditions like retinopathy, nephropathy, and neuropathy as well as macrovascular conditions like coronary artery disease and stroke6-10.

COMMELINA BENGHALESIS:

Commelina benghalensis, commonly known as Benghal dayflower, is a fast-growing herb widely distributed in tropical and subtropical regions. It is traditionally used in Ayurveda and folk medicine for various ailments, including diabetes11.

Phytochemical Constituents:

Commelina benghalensis, a traditionally used medicinal herb, has garnered attention for its potential antidiabetic properties. This therapeutic potential is largely attributed to its rich and diverse phytochemical profile. Several studies have confirmed the presence of the following bioactive constituents:

Flavonoids:

Notably quercetin and Kaempferol, both of which exhibit potent antioxidant, anti-inflammatory, and antidiabetic activities. Quercetin, in particular, enhances insulin secretion, improves glucose uptake, and reduces oxidative stress in pancreatic β-cells.

Alkaloids:

These nitrogen-containing compounds possess anti hyperglycemic properties by influencing glucose metabolism and potentially mimicking insulin action.

Phenolic Compounds:

These compounds are known for their strong antioxidant potential. They scavenge free radicals and reduce oxidative stress, which plays a significant role in the pathogenesis of diabetes.

Saponins:

Saponins are amphipathic glycosides that help reduce blood glucose levels by modulating carbohydrate digestion and absorption in the intestine. They may also enhance insulin sensitivity.

Tannins:

Tannins have been associated with anti hyperglycemic activity through their ability to inhibit key enzymes such as α-amylase and α-glucosidase involved in carbohydrate metabolism.

These constituents collectively contribute to the antidiabetic potential of Commelina benghalensis, making it
These compounds possess antioxidant, anti-inflammatory, and hypoglycemic properties, making
C. benghalensis a potential candidate for diabetes management12-15.

Structure of phytoconstituents:

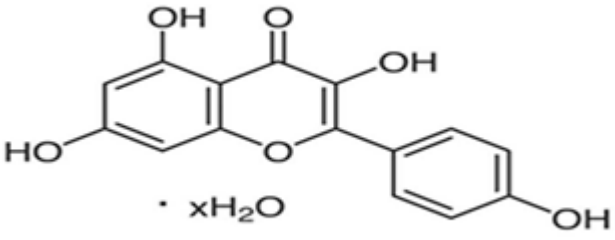

Figure.1 Structure of Kaempferol

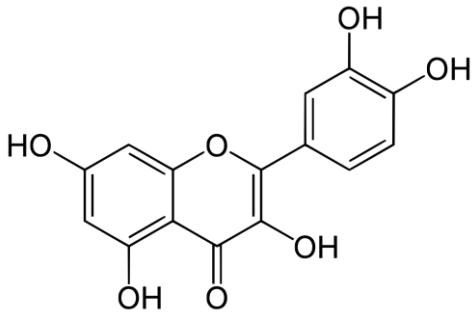

Figure.2 Structure of Quercetin

Morphology Commelina benghalensis:

Figure.3 Commelina benghalensis

Table.1: Morphology of Commelina benghalensis

Plant Part	Description
Root	Fibrous, shallow, adventitious roots.
Stem	Creeping, branched, succulent, purplish-green, rooting at nodes.
Leaves	Simple, alternate, ovate to lanceolate, 4–8 cm long, with parallel venation.
Flowers	Zygomorphic, bisexual, blue in color, pedicellate with 3 petals and 3 sepals.
Fruits	Capsule with 2 locules, seeds are trigonous with brown coloration.
Seeds	1–3 per locule, brown, smooth with hard coat.

Taxonomical Classification:

Table.2: Taxonomical classification

Category	Details
Kingdom	Plantae
Sub-Kingdom	Tracheobionta (Vascular plants)
Super division	Spermatophyta (Seed plants)
Division	Magnoliophyta (Flowering plants)
Class	Liliopsida (Monocotyledons)
Order	Commelinales
Family	Commelinaceae
Genus	Commelina
Species	Commelina benghalensis L.

Plant profile of Commelina benghalensis:

- Commelina benghalensis L., commonly known as Tropical Spiderwort, Benghal Dayflower, or Wandering Jew, is an herbaceous plant belonging to the family Commelinaceae.
- Referred to as Kanchara in Hindi and Sanskrit, and Kanchari in Marathi, it is a fast-spreading annual or perennial herb found predominantly in moist and disturbed areas such as roadsides, agricultural fields, and tropical to subtropical regions.

- The plant is widely distributed across Africa, India, China, Southeast Asia, and South America. It grows as a prostrate or ascending branched herb that roots at the nodes, exhibiting a fibrous and adventitious root system that may form tubers.
- Its stem is weak, creeping or ascending, succulent in texture, and purplish-green in color, with nodes capable of producing roots, aiding in its rapid propagation and adaptability in various habitats.

Mechanism of Action in Diabetes Management:

Table.4: Mechanism of action in Diabetes management

Mechanism	Explanation
α-glucosidase inhibition	Inhibits the enzyme responsible for carbohydrate digestion, Leading to reduced glucose absorption.
Insulin mimetic effect	Enhances glucose uptake in cells by mimicking insulin Activity.
β-cell protection	Protects pancreatic β-cells from oxidative damage.
Antioxidant activity	Neutralizes free radicals, reducing oxidative stress in diabetic Conditions.
Inhibition of hepatic gluconeogenesis	Suppresses glucose production by the liver.
Increased peripheral glucose utilization	Enhanced uptake and use of glucose by peripheral tissues such as muscle and fat.

Pharmacological Activities:

Table.5: Pharmacological Activities

Pharmacological Activity	Observed Effect
Antidiabetic	Significant reduction in blood glucose levels in diabetic rats
Antioxidant	Scavenging of DPPH and superoxide radicals
Anti-inflammatory	Reduction of inflammation in carrageenan-induced rat paw edema
Antibacterial	Effective against *E. coli*, *S. aureus*, *P. aeruginosa*
Hepatoprotective	Protection against liver toxicity and damage

Reported Pharmacological Evaluation Tests Table:

Table.6: Reported Pharmacological evaluation test table

Test Name	Model Used	Result
Oral Glucose Tolerance Test (OGTT)	Normal and diabetic rats	Improved glucose tolerance
Alloxan-Induced Diabetes Model	Rats administered with alloxan (150 mg/kg)	Significant reduction in fasting blood sugar levels
DPPH Free Radical Scavenging Assay	In vitro	Strong antioxidant potential observed
Acute Toxicity Test	OECD guidelines	No mortality observed up to 2000 mg/kg
Liver Enzyme Markers (ALT, AST, ALP)	Diabetic rats	Enzyme levels restored toward normal indicating Hepatoprotective effects
Histopathological Studies of Pancreas	Microscopy	Restoration of islets of Langerhans in treated diabetic rats

Conventional Treatment Overview:

Controlling blood glucose levels and avoiding complications are the goals of traditional diabetic therapies. Among the primary categories are:

1. Biguanides, such as metformin, are oral hypoglycemic agents (OHAs) that decrease hepatic glucose synthesis and increase insulin sensitivity. Insulin secretion is stimulated by sulfonylureas, such as Glibenclamide. Thiazolidinediones: Increase peripheral tissues' sensitivity to insulin (e.g., pioglitazone). Sitagliptin and other DPP-4 inhibitors prolong the effects of incretin hormones. SGLT2 Inhibitors: Encourage the excretion of glucose through urine (e.g., canagliflozin).

2. Insulin Therapy: Crucial for both advanced Type 2 and Type 1 diabetes. It aids in keeping blood sugar levels within the desired range.

Limitations: Side effects include as weight gain, gastrointestinal problems, and hypoglycemia. Extended use may result in decreased efficacy. Problems with accessibility and high expense, especially in environments with limited resources. These restrictions lead people to look for less expensive, safer substitutes, such as plant-based treatments16-20.

Preclinical and Clinical Evidence:

Preclinical Research: Several animal studies have assessed C. benghalensis's potential as an antidiabetic.

Following the injection of C. benghalensis extracts, rodent models of diabetes caused by streptozotocin (STZ) demonstrated notable decreases in fasting blood glucose.

There have been reports of improvements in lipid profiles, insulin sensitivity, and glucose tolerance.

The Hepatoprotective and antioxidant properties of the extracts suggested wider metabolic advantages.

Proposed Mechanisms: Imitating the action of insulin or increasing insulin secretion. Reduction of postprandial hyperglycemia through inhibition of α-glucosidase enzymes.

Decrease in inflammation and oxidative stress. Clinical Evidence: Although few, clinical trials show promise. In a small-scale human research, there were no significant adverse effects and a moderate drop in blood glucose.

To confirm long-term use, dosage, safety, and efficacy, more randomized controlled studies (RCTs) are needed21-25.

Future Scope of Study:

The potential of Commelina benghalensis as an effective antidiabetic agent opens several promising avenues for future research. Phytochemical standardization remains a primary focus, involving the isolation, characterization, and development of standardized extracts or formulations of its bioactive compounds. Mechanistic studies such as molecular docking, pathway analysis, and gene expression profiling could elucidate the specific targets and metabolic pathways modulated by its constituents. In the field of formulation development, innovative delivery systems like herbal capsules, teas, and especially Nano-formulations could significantly enhance its bioavailability and therapeutic efficacy. Rigorous toxicological evaluations including acute, sub-acute, and chronic toxicity studies are essential to ensure its long-term safety. Furthermore, conducting large-scale clinical trials across diverse populations would help validate its safety and efficacy in humans. Lastly, comparative studies against conventional antidiabetic drugs like metformin could establish therapeutic equivalence or even reveal superior benefits, strengthening its position as a viable alternative in diabetes management.

Summary:

Commelina benghalensis, commonly known as Benghal dayflower, is a wild edible plant traditionally used in various parts of Asia and Africa for medicinal purposes. Recent research has highlighted its promising potential in the management of diabetes mellitus, particularly Type 2 diabetes, owing to its rich phytochemical profile including flavonoids, alkaloids, saponins, and phenolic compounds. These bioactive constituents are known to exhibit hypoglycemic, antioxidant, and anti-inflammatory activities, which play a vital role in reducing blood glucose levels and protecting pancreatic β-cells from oxidative damage.

Several in vivo studies on animal models have demonstrated a significant reduction in fasting blood glucose, improved insulin sensitivity, and decreased lipid peroxidation upon administration of C. benghalensis extracts. These findings suggest its ability to modulate carbohydrate metabolism and enhance insulin secretion. Additionally, its antioxidant potential helps combat complications associated with chronic hyperglycemia.

The plant's cost-effectiveness, safety, and availability make it a compelling candidate for further exploration as a complementary therapy in diabetic management. However, comprehensive clinical trials and standardization of dosage are necessary to validate its efficacy in humans. Overall, Commelina benghalensis holds great promise as a natural antidiabetic agent with minimal side effects.

Conclusion:

With its rising prevalence and related problems, diabetes mellitus continues to pose a serious threat to global health. Despite the effectiveness of conventional treatments, its drawbacks underscore the necessity for alternative strategies. Because of its bioactive components and diverse modes of action, Commelina benghalensis, a traditionally used medicinal plant, has demonstrated significant promise in the treatment of diabetes. It’s hypoglycemic and antioxidant qualities are supported by preclinical research, although clinical validation is still necessary. Comprehensive phytochemical profiling, mechanistic understanding, formulation developments, and clinical assessments must be the main areas of future study. With additional research, C. benghalensis may prove to be a cost-effective, safe, and complementary treatment option for diabetes.

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