

Ojavardhini: A Review on Herbal Syrup Used in Treatment of Diabetes Mellitus Type II

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Abstract: *Diabetes mellitus is a chronic metabolic disorder that continues to pose a major global health burden, particularly in developing countries where access to long-term allopathic therapy may be limited due to cost and adverse effects. Herbal medicines, backed by traditional knowledge and growing scientific evidence, offer a promising alternative for safer and more affordable diabetes management. This review emphasizes the formulation and evaluation of a polyherbal antidiabetic syrup prepared from medicinal plants known for their hypoglycemic, antioxidant, and protective activities. A comprehensive literature survey highlights the therapeutic potential of herbs, which exhibits significant antidiabetic, hepatoprotective, anti-inflammatory, and free radical-scavenging properties due to its phytoconstituents, particularly withanolides.*

The formulation process includes systematic selection, authentication, extraction (decoction and ethanolic extraction), and phytochemical screening of the plant materials. The developed syrup aims to provide improved patient compliance through enhanced palatability and ease of administration, especially for pediatric and geriatric groups. Evaluation parameters such as pH, viscosity, stability, color, odor, and taste ensure the formulation's quality and pharmaceutical suitability. Literature findings strongly support the antidiabetic efficacy of the selected herbs, indicating their ability to regulate blood glucose, modulate insulin action, reduce oxidative stress, and minimize diabetes-related complications. Overall, the polyherbal antidiabetic syrup formulation demonstrates strong potential as a safe, effective, and accessible therapeutic alternative. Future work involving toxicity studies, pharmacological assays, and clinical validation is recommended to establish its efficacy and support commercialization in modern herbal therapeutics.

Keywords: Herbal antidiabetic syrup, polyherbal formulation, hypoglycemic activity, antioxidant activity, phytochemical evaluation, diabetes management, herbal therapeutics, medicinal plants, syrup evaluation

I. INTRODUCTION

Medicinal plants are now regarded as a significant therapeutic tool for lowering human illnesses. Strong medical systems that have been used for more than 1500 years, such as Chinese, Unani, and Ayurveda, are still promising. More than 60–80% of individuals in both industrialized and developing nations rely on these medical systems for their medical needs^[1]. Many active chemical components found in medicinal plants are responsible for treating a variety of illnesses^[2]. Numerous studies Numerous traditional medicinal plants have been the subject of published articles. particular treatment for a number of conditions, including respiratory, digestive, reproductive, diabetic, and visual as well as urinary systems^[3]. Diabetes mellitus (DM) is a metabolic disease that affects a large number of people worldwide. Diabetes mellitus (DM) is characterized by hyperglycemia, hyperlipidemia, hyperaminoacidemia, and hypoinsulinemia due to a decrease in insulin. Type I and type II diabetes are the two forms of diabetes that are commonly recognized to be insulin-dependent. Five percent of people with diabetes have type I diabetes, sometimes referred to as immature diabetes, which is Insulin-dependent. People over 40 are typically affected with Type II diabetes, which is known to be non-insulin dependent. It is commonly known that diabetes's hyperglycemia harms the



body's organs^[4]. Chronic hyperglycemia and abnormalities in the lipid profile are the causes of its significant impact on lipid metabolism. These develop numerous additional issues, such as retinopathy, cardiovascular disease, polyurea and polyphasia^[5]. Even though researchers in academia and the pharmaceutical industry are developing medications for diabetes, over 10% of people globally suffer from diabetes and related conditions, which are serious health problems^[6,7]. Insulin and other oral antidiabetic medications are examples of conventional treatments for diabetes mellitus. However, due to their high cost, many people in developing nations cannot afford anti-diabetic medications. Alternatively, a number of research teams have found beneficial compounds from traditional medicinal herbs to treat diabetes and related oxidative damage.

NEED & OBJECTIVE

The need arises for a formulation that leverages the synergistic antidiabetic actions of multiple medicinal plants into stable and effective syrup. Herbal syrup offers advantages like ease of administration, especially in pediatric and geriatric populations, faster absorption, and better compliance due to improved taste and convenience. Moreover, current allopathic medications often come with side effects and limitations in long-term use, which highlights the demand for safer alternatives.

This study aims to bridge this gap by formulating and evaluating a herbal syrup with proven anti diabetic herbs, ensuring it meets pharmaceutical standards in terms of pH, viscosity, stability, and efficacy. Through such innovation, the work contributes to both the modernization of Ayurvedic principles and the development of accessible herbal therapies for Diabetes management.

Selection of Formulation:

Formulation and Evaluation of Anti-diabetic herbal syrup

Selection of drug :

Herbal fruit extract.

Objectives

To develop and evaluate a polyherbal syrup formulation using selected medicinal plants with proven antidiabetic activity, with the aim of effectively regulating blood glucose levels, enhancing insulin function, and minimizing the risk of diabetes-related complications in a safe and natural manner.

Specific Objectives:

- To identify and select medicinal plants with proven hypoglycemic and antioxidant properties through ethnobotanical and literature review.
- To extract and standardize bioactive compounds from the selected plants using appropriate extraction techniques.
- To develop stable and palatable syrup formulation incorporating the standardized extracts.
- To evaluate the in vitro and/or in vivo antidiabetic activity of the polyherbal syrup using established pharmacological models.
- To assess the antioxidant and anti-inflammatory potential of the formulation.
- To conduct toxicological evaluations to determine the safety profile of the syrup.
- To compare the efficacy of the formulation with standard antidiabetic drugs (e.g., metformin or glibenclamide).

PLAN OF WORK

Literature Survey

Conduct a comprehensive review of traditional texts and scientific journals as well as by using an internet to identify herbs with proven antidiabetic and antioxidant properties, focusing on herbs

Procurement -

Collect raw plant materials from verified sources and authenticate them through the Botanical Survey of India to ensure correct species identification.



Extraction and Phytochemical Screening-

Perform extraction using ethanol and decoction methods. Conduct preliminary phytochemical analysis to confirm the presence of active constituents such as flavonoids, saponins, alkaloids, and tannins.

Formulation Development-

Develop the herbal syrup by combining standardized extracts with pharmaceutical excipients and preservatives. Optimize for palatability, stability, and therapeutic efficacy.

Evaluation of Syrup-

Assess the formulation based on physicochemical parameters such as pH, viscosity, taste, odor, and color. Perform stability studies under different conditions to check for changes over time.

Documentation and Conclusion-

Analyze all data and compile the results to conclude the effectiveness of the formulated syrup. Suggest future scope, including clinical trials and commercial scalability.

Procurement of Anti-Diabetic polyherbal syrup:-

Polyherbal syrup manages and regulates the blood glucose levels by using Antidiabetic activities ingredients.

II. LITERATURE REVIEW

Devkar M. J. et al Formulation and Evaluation of Herbal Syrup. A review explored or works done on: The current study aims to develop and evaluate herbal syrup and ascertain its effectiveness against cough. The fact is that the absorption of medicaments in solution from the GI tract into the systemic circulation may be expected to occur more rapidly than other oral dosage forms of the same medicinal agent. Ayurvedic Formulations are preferentially administered by oral route, and most of the orally^[8].

M.D. Sonawane et al Formulation And In-Vitro Evaluation of Herbal Tablet Containing WITHania Coagulans Extract., A review explored or works done on: The fruits of WITHania coagulans exhibit notable anti-diabetic action, according to the ethnopharmacological usage and a literature assessment. A formulation incorporating the plant material was created after a thorough analysis of the powdered ethanolic extract of WITHania coagulans fruits, making it more palatable and appropriate for diabetics. Pharmaceutical dosage formulations with a special dry plant extract and other components like tale, starch, and microcrystalline cellulose have been shown to have statistically significant anti-diabetic action^[9].

Prakash Chandra Gupta et al, An overview. A review explored or worked on: In the ancient system of medicine, many plants have been reported to cure various health problems and diseases. Withania coagulans (W. coagulans) Dual commonly known as 'Indian cheese maker' or 'vegetable rennet' belongs to family Solanaceae and is one of the important medicinal plants. W. coagulans Dunal is a gray-whitish small shrub distributed east of the Mediterranean region extending to South Asia. It is a common medicinal plant in many parts of Pakistan and India. In the Ayurvedic system of medicine, W. coagulans is widely used in diabetic cases. W. coagulans is also used to treat nervous exhaustion, disability, insomnia, wasting diseases, failure to thrive in children and impotence. The fruits of the plant are reported to be sedative, emetic, alternative and diuretic. Further, they are used for liver complaints, asthma and biliousness. The active compounds, in particular, withanolides isolated from the plant are considered to have antimicrobial, anti-inflammatory, antitumor, hepatoprotective, anti-hyperglycemic, cardiovascular, immuno-suppressive, free radical scavenging and central nervous system depressant activities. This review gives a bird's eye view mainly on the biological activities of some of the W. coagulans compounds isolated and phytochemistry as well as pharmacognostic properties of the plant extracts^[10].

Pooja Sinoriya et al, Comprehensive Review on Withania coagulans Dunal: Unveiling Pharmacognosy, Phytochemistry and Pharmacological Potentials. A review explored or work done on : The Solanaceae family plant Withania coagulans (Stocks) Dunal is also known by the names vegetable rennet, paneer doda, paneer ka phool and rishyagandha. It is widely used in traditional medicines in countries like Pakistan, Iran, Afghanistan and East-West India. Since ancient times, herbs have been effective such as sedative, nervous system, depressant, hepatoprotective and treatment for various illnesses like diabetes, heart problem, cancer and asthma. The smoke from the plant is inhaled to ease toothaches and the twigs are chewed to clean teeth. This overview study analyses scientific and therapeutic



prospects for further research on Withania coagulans and offers extensive information on the morphological, biochemical and pharmacological effects^[11].

Rakesh Maurya et al, Chemistry and pharmacology of Withania coagulans: an Ayurvedic remedy. A review explored or work done on: The use of Withania coagulans, a member of the solanaceae family, has been highlighted in Ayurveda. We have reviewed the chemical constituents and pharmacological properties of W. coagulans, as well as its morphology. This has included therapeutic effects of the whole plant and its extracts, fractions and isolated withanolides. The hepatoprotective, anti-inflammatory, antihyperglycemic, hypolipidemic, free radical scavenging, antimicrobial, cardiovascular, central nervous system depressant, immuno-modulating, antitumour and cytotoxic activities of W. coagulans have been described^[12].

Sanskriti Pawar et al, The phytochemical and pharmacological screening of Withania coagulans. A review explored or work done on: In the ancient system of the drug, colorful shops show to cure colorful health disorders and conditions. Withania coagulans Dunal, is generally known as Indian bubbish maker Or Vegetable Rennet because the part of withania. E fruits and Leaves are used as a coagulant. Withania coagulans (Withania coagulans) dunal belongs to Family solanaceae. Withania coagulans dunal is a argentine whitish In colour, It's small under shrub 11 Is distributed In east of The mediterranean region. It is one of The Most Important Medicinal Factories and It's veritably useful in ayurveda. In ayurvedic system Of Drug, Withania coagulans Is extensively Used In diabetic Cases, antimicrobial, antitumor and also shows other colorful exertion. Coagulin H Insulated From Withania coagulans displayed effect On The vulnerable response. The Dried Flowers were uprooted consecutively by methanol and water. Withania coagulans Show remedial effect Of The Part of whole factory Withania coagulans dunal Is A Rigid, argentine- whitish Small Shrub, about 30-150 Cm Altitudinous. The leaves are about 2.5-7.5 Cm long and 1.5 Cm broad. The Seeds Are Dark Brown, Ohservance Shaped, rough with sharp Fruity smell. Donald Flour may contain bioactive elements to Treat colorful conditions. Withania coagulans is pharmacological Important remedial Factory, generally Known As Rishyagandha. It's used In treatment of colorful conditions like Indigestion, diabetes mellitus, liver diseases, sanctification Of blood and controls blood Pressure. In addition, It's reported To control tube glucose situations and precluding renal complications. A standard protocol was Followed For The birth Of Withania coagulans. The fruits of Withania coagulans 0.28 G/ 100 MI) Were Soaked In distilled water overnight followed by a mechanical dissipation using sterile cotton wood and filtration through rubbish cloth^[13].

Muhammad Issa Khan et al, A review explored or work done on: Herbal plants have been utilized to treat and cure various health-related problems since ancient times. The use of Ayurvedic medicine is very significant because of its least reported side effects and host of advantages. Withania coagulans (Family; Solanaceae), a valuable medicinal plant, has been used to cure abnormal cell growth, wasting disorders, neural as well as physical problems, diabetes mellitus, insomnia, acute and chronic hepatic ailments. This review provides critical insight regarding the phytochemistry, biological activities, and pharmacognostic properties of W. coagulans. It has been known to possess diuretic anti-inflammatory, anti-bacterial, anti-fungal, cardio-protective, hepato-protective, hypoglycemic, anti-oxidative, and anti-mutagenic properties owing to the existence of withanolides, an active compound present in it. Apart from withanolides, W. coagulans also contains many phytochemicals such as flavonoids, tannins, and B-sterols. Several studies indicate that various parts of W. coagulans and their active constituents have numerous pharmacological and therapeutic properties and thus can be considered as a new drug therapy against multiple diseases^[14].

Upadhyay S.U.1,4 et al, School of Pharmacy. RK University, Rajkot, India, Review on Withania coagulans-A Versatile Medicinal Plant. A review explored or work done on Thousands of research thesis awarded are not coming to the actual usage of mankind. Diabetes mellitus and its complications are listed in the prioritized area of Govt. of India which should be given attention. Withania coagulans (known as Paneerful or paneer dodij is widely used for various diseases and disorders by the locals and natives but it is not documented and therefore it is not accepted at the world level. We intend to gather the data on safety, standardization and quality control which will be helpful to develop evidence based documentation on the efficacy of Withania coagulans. We could get encouraging results of Withania coagulans in the pre-clinical studies for its antidiabetic effects. Many reports are also available for its use on the human volunteers. We would like to document the present study in such a way that the society at large can be benefited for the treatment of



Diabetes mellitus. The ultimate aim of the present review article is to transcend the research of the laboratory to the level of mankind^[15].

Rupal Gupta, et al, Advances in Traditional Medicine 22 (4), 673-683, 2022. A review explored or work done on: Withania coagulans is a therapeutic plant, commonly known as Rishyagandha. It is used in treatment of various diseases like indigestion, diabetes mellitus, liver disorders, purification of blood and controls blood pressure. In addition, it is reported to control plasma glucose levels and prevent renal complications. The plant contains various metabolites, and the most important being withanolides isolated from its fruits. Apart from above, the plant is known for its various pharmacological effects viz. cardioprotective, hepatoprotective, and anti-inflammatory activity. The current review includes information about pharmacological effects, therapeutic uses, extraction of plant metabolites and its use in treatment of various diseases. Furthermore, biotechnological advancement of W. coagulans has also been discussed^[16].

III. MATERIALS AND METHODS

MATERIALS

Antidiabetic drug (dried fruits) :Dried fruit obtained from plant belonging to family solanaceae. It obtained from local spices shop.

Distilled Water : Having pH of 6.9-7.0. Obtained from VNCOP laboratory.

Methylparaben sodium & Propylparaben sodium:Preservatives with broad-spectrum antifungal and antibacterial qualities that work well in a variety of pH ranges include methyl and propyl paraben. They prolong the shelf life of goods by inhibiting the growth of microorganisms. While propylparaben is more efficient against some fungi and yeasts and both are heat-stable, methylparaben is more soluble in water. Obtained from VNCOP laboratory.

Citric acid: It maintain the pH of formulation. It act as buffer in it. Obtained from VNCOP laboratory.

Flavoring agent(Peppermint Oil): It suppress the foul odour of drug & gives desirable odour to formulation. Obtained from VNCOP laboratory.

METHODS

Selection of methods:-

Decoction or extraction method.

Development of Formulation:-

Step 1: Herbal Decoction

Soak 100 g of herbal fruit in 1000 ml water overnight.

Next day, boil the soaked material with an additional 1000 ml water.

Reduce the mixture to approximately 800 ml.

Cool and filter using muslin cloth or 0.45 µm filter.

Step 2: Preservative Base

In a separate container, dissolve methylparaben sodium, propylparaben sodium, sodium benzoate, and Citric acid in ~150 ml purified water.

Mix until completely dissolved.

Step 3: Mixing and Finalization

Combine the filtered decoction with the preservative solution.

Add flavoring and coloring (if desired).

Make up the final volume to 1000 ml with purified water.

Adjust pH to 4.0-4.5 using citric acid.

Final filtration (optional but recommended).

Step 4: Packaging and Storage

Fill the prepared syrup into sterilized amber bottles immediately.

Seal bottles with airtight caps (induction/seal band preferred).

Label each bottle with product name, dosage, ingredients, Mfg/Exp date.



EVALUATION PARAMETER

Colour

Indicates the appearance and uniformity of the syrup.
Helps detect any contamination, degradation, or instability.
A stable syrup retains the same colour throughout storage.

Taste

Ensures palatability for better patient compliance.
Herbal extracts may be bitter; sweeteners and flavours are used to balance the taste.
Taste should remain consistent during stability testing.

Odour

Identifies the characteristic smell of the formulation.
A pleasant or neutral odour improves acceptance.
Any foul or unusual odour indicates microbial growth or degradation.

Viscosity

Refers to the thickness or flow property of the syrup.
Proper viscosity ensures easy pouring and accurate dose measurement.
Too high or low viscosity affects stability and patient acceptability.

pH

Measures the acidity or alkalinity of the syrup.
Helps maintain stability, solubility of ingredients, and prevents microbial growth.
Ideal range for syrups: 4.0–6.0, depending on preservatives used.

Density

Indicates the mass per unit volume of the syrup
Ensures dose accuracy and uniformity.
Helps confirm proper mixing of all ingredients.

Stability Study

Checks whether colour, pH, viscosity, taste, and odour remain unchanged over time.
Ensures the syrup stays effective and safe till the expiry date.

IV. CONCLUSION

The present work highlights the importance and potential of developing an effective herbal antidiabetic syrup using medicinal herbs known for their hypoglycemic, antioxidant, and protective properties. Diabetes mellitus continues to be a major global health challenge, and limitations of existing therapies—such as high cost, long-term side effects, and reduced patient compliance—create a growing need for safer and more affordable alternatives. Herbal medicine, supported by traditional knowledge and modern scientific validation, offers a promising solution.

This study focuses on selecting suitable herbs, extracting their active phytochemicals, and formulating them into a stable, palatable syrup that can be easily administered to various age groups. The evaluation parameters, including pH, viscosity, stability, and sensory characteristics, ensure that the formulation meets pharmaceutical standards. The literature reviewed strongly supports the antidiabetic potential of the chosen herbs, indicating their ability to regulate blood glucose levels, improve insulin response, and prevent diabetes-related complications.

Overall, the formulation of an herbal antidiabetic syrup represents a valuable step toward integrating traditional medicinal wisdom with modern dosage-form development. With further in vivo studies, toxicity testing, and clinical validation, this herbal syrup can become a safe, effective, and accessible therapeutic option for diabetes management.

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