



## A study on phytochemical investigation of selected plants extracts

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### Abstract

Herbs are not a novel treatment for diabetes. In Ayurvedic and Chinese medicine, herb-herb mixes, also known as polyherbal remedies, have been used for many years. Since ancient times, plants and plant extracts have been used to cure or prevent diabetes, which appears to be the most successful and non-toxic method. Globalisation, industrialization, and fast urbanisation have all contributed to India's economic and social growth, but they have also drastically changed people's lifestyles and increased the risk of lifestyle-related illnesses. The primary causes of India's diabetes epidemic in urban areas are sedentarism, or the lack of exercise, and the fast-food culture. Despite advancements in modern medicine, patients and their families in rural areas face significant financial challenges. Investigating the ability of polyphenols as extra or substitute antidiabetic capsules is crucial, as evidenced using the surge in consumer interest in natural and plant-primarily based drug treatments. Researchers, scientific specialists, and people seeking out scientifically supported nutritional techniques to help control diabetes may locate great fees in the insights provided via this have a look at. This study can help in the introduction of focused nutraceuticals or nutritional pointers for human beings with diabetes via clarifying the molecular pathways and figuring out particular polyphenols with effective anti-diabetic activities.

**Keywords:** Phytochemical investigation, plants extracts, herbs

### Introduction

As a result, health care is often neglected, leading to severe morbidities and early mortality from metabolic illnesses including diabetes and heart disease, particularly type II. There is no extensive diabetic healthcare programme in India. Patients visit various healthcare providers in search of medical attention. While conventional treatment concentrates on the quick fix of lowering blood glucose levels, Ayurveda and polyherbal formulations aim to address the underlying chronic problems that cause the condition and treat its complications on its own. Since type 2 diabetes mellitus (T2DM) is a multigenic chronic illness, treating it requires a multitargeted strategy. Since developing a medicine using a multi-targeted method is challenging, polyherbal therapy-which has the potential to be safe, cost-effective, and multi-targeted-might be a viable option for creating more potent diabetes formulations. Treatment for diabetes is lifelong, and the main benefit of using an alternative conventional medical system that includes herbal formulations is the use of medications with no known adverse effects.

### Herbal formulation based on two principles:

Polyherbalism, or the use of many drugs in place of a single medicine. There are two ways that synergism operates, depending on how the herbs interact. Two polyherbal formulations, pharmacodynamics and pharmacokinetics (the ability of a herb to aid in the absorption, distribution, metabolism, and elimination of other herbs), have a broad therapeutic range, are safe at high doses and effective even at low doses. They also remove potential poisonous effects that may also arise from high doses of plant extracts.

The people have trusted nature for his or her primary desires along with meals, safe haven, garb, fertilizers, flavours, fragrances, and medicines from prehistoric time. This practice, the great civilizations of the ancient Indians, Chinese, Arabians and North Africans supplied written proof of man's ingenuity in making use of flora for the treatment of a huge style of diseases. Thus, flora have fashioned the basis of state-of-the-art conventional medication systems which have been in life for lots of years and retain to provide humankind with new treatments. Through durations of trial, errors and fulfilment, the ancient

guy and their followers have collected a huge know-how approximately medicinal plant life. The first records, written on clay pills in cuneiform, are from Mesopotamia and date from approximately 2600 BC. Among the substances that used had been oils of *Cedrus* species (Cedar) and *Cupressus sempervirens* (Cypress), *Glycyrrhiza glabra* (Liquorices), *Commiphora* species (Myrrh) and *Papaver somniferum* (poppy juice), all of which are nevertheless in used for the treatment of illnesses ranging from coughs and colds to parasitic infections and infection.

### Traditional drugs

The expertise of the medicinal plant life and the methods of application for precise illnesses were handed down via oral culture. Eventually data concerning medicinal flora was recorded traditional remedy. Many traditional systems do no longer have the scientific perception to explain and predict the healing movement of flowers. It is based totally on the belief that the advent of vegetation may supply clues to their medicinal properties-it is interpreted as God's signature on the plant. For example, Red juice and sap, taken into consideration to be associated with blood and menstrual illnesses; yellow flowers with bile and jaundice; the human shape of sure roots with the girl form of fertility and so forth. However, occasionally this concept labored: *Chelidonium majus*, contains yellow flowers and a yellow alkaloid containing latex, and has been used effectively to deal with jaundice. Historically; all medicinal arrangements are derived from plants, whether or not inside the easy shape of raw plant substances or within the delicate shape of crude extracts, combos, and so forth. The importance of medicinal flowers and traditional fitness structures in solving the health care troubles of the world is gaining accelerated interest. Because of this resurgence of interest, the studies on flowers of medicinal significance are developing phenomenally at the worldwide degree. Most of the developing countries have followed conventional medical exercise as an indispensable a part of their way of life. The Indian conventional medicines have had practiced efficiently in cutting-edge age, have hardly been studied for scientific validation.

### Indian systems of medicine

India boasts a rich cultural heritage of traditional medicine, primarily characterized by two highly esteemed systems: Ayurveda and Siddha. These systems are not merely seen as ethnomedicine but as comprehensive medicinal frameworks that encompass physical, mental, philosophical, ethical, and spiritual well-being. Emphasizing harmony with the universe and the alignment of nature and science, they offer a holistic approach to healing that sets them apart.

The diagnostic and treatment principles of Ayurveda and Siddha, rooted in concepts such as the panchamahabhutha (five elements of nature), tridosha (three humors), and prakrithi (individual constitution), remain relevant even in today's modern era. The balanced state of tridosha ensures bodily health, while imbalances can lead to disease states. This ancient understanding continues to inform contemporary medical practices, highlighting the enduring wisdom of these traditional systems.

## Materials and Methods

### Collection plant material

The chosen plant material, which was needed for the current study, was gathered from the Satpuda Mountains' hills, particularly those of Toranmal and Boradi Forest. Plant material such as *Evolvulus alsinoide*, *Gymnema sylvestre* (Retz.) R. Br. Ex Roem and schut, (Asclepidaceae) (Bedki Pal), *Tinospora cordifolia* (Gulvel), and *Caesalpinia bonduc* L. Roxb. are obtained with the assistance of traditional healers in Tranmal. paneer, *Withania coagulance* Dunal (Solanaceae), (Caesalpiniaceae) (Sagargota), bought from the neighbourhood market. *Curcuma caesia* Roxb (Zingiberaceae) acquired from Mr. Ashish Behuria Bhuvneshawar, Asam, and Mr. Ruuvilie Kotsu Medziphema. Purchased from the neighbourhood market, watermelon (*Citrullus lanatus* (Thumb) Matsumura and Nakai; Family: Cucurbitaceae).

### Procurement of Drug and chemical

For this study, A.R. grade chemicals, solvents, and conventional pharmaceuticals were all employed. Purchased alloxan monohydrate from S.D. Fine Chemicals in Mumbai. Commercially available kits (ERBA diagnostics) were purchased for biochemical observation.

### Extraction and phytochemical investigation

#### Extraction

The plant material used for this investigation was bought from the market and gathered from Satpuda's hills. After receiving enough shade, the chosen plant portion of each plant was coarsely ground. In a Soxhlet extractor, ethanol was added after the 100gm of ground plant powder was defatted and extracted using petroleum ether at temperatures between 40 and 600 degrees Celsius. The maceration process is recommended when extracting materials using water. Concentrations of extracts were made at lower pressure. The residue was dried over sodium sulphate in a desiccator to determine the yield percentage. The extracts were lyophilized once they had completely dried.

#### Phytochemical investigation

Following the extraction of specific plant sections, each extract underwent a qualitative phytochemical analysis.

1. Tests for Phytosterols
2. Tests for Triterpenoid
3. Tests for Glycosides
4. Tests for Saponin
5. Tests for Carbohydrates
6. Tests for alkaloids
7. Tests for Flavonoids
8. Tests for Flavonoids
9. Tests for Proteins

### Results and Discussion

The chosen plant material was gathered, verified, ground up, and put through a continuous hot extraction process using ethanol and petroleum ether in turn. The marc is then macerated in order to facilitate aqueous extraction. Table No. 1 contains information on the extract's percentage yield. Pet ether, ethanolic, and aqueous extracts of *Curcuma caesia*

rhizome, *Evolvulus alsinoide* whole plants, *Citrullus lanatus* (Seeds), *Withania coagulance* (fruit), *Gymnema sylvestre* (leaf), and *Tinospora cordifolia* were used in the qualitative phytochemical analysis. (Stem), *Caesalpinia bouduc* medications have demonstrated the presence of a number of chemical components, which are listed in Table and are briefly described below:

The ethanolic extract of the rhizome of *Curcuma caesia* displays the presence of glycoside, terpenoids, flavonoids, tannins, and phenolic compounds; the aqueous extract displays the presence of protein components, saponin, phenolic carbohydrates, and glycoside. The ethanolic extract of complete *Evolvulus alsinoide* plants reveals the presence of phenolic, steroid, glycoside, flavonoid, and alkaloid components; the aqueous extract reveals the presence of carbohydrates, alkaloid, and glycoside compounds. Aqueous extracts of *Citrullus lanatus* (seeds) reveal the presence of glycoside, alkaloid, tannin, carbohydrates, and protein; ethanolic extracts reveal the presence of saponin, steroid, terpenoids, flavonoid, and carbohydrates. The ethanolic extract of the fruit *Withania coagulance* reveals the presence of tannin, terpenoids, alkaloids, glycosides, and saponin; the

aqueous extracts reveal the presence of tannin, terpenoid, flavonoid, and steroid components. Alkaloid, glycoside, steroid, carbohydrate, and phenolic compounds are present in the ethanolic extract of *Tinospora cordifolia* (stem); alkaloid, glycoside, flavonoid, and carbohydrate compounds are present in the aqueous extract. Alkaloid, glycoside, flavonoid, carbohydrate, and phenolic chemicals are present in *Gymnema sylvestre* (leaf) ethanolic extract; similar compounds are present in water extracts. Alkaloid, glycoside, and flavonoid compounds are present in the ethanolic extract of *Caesalpinia bonduc* seeds; alkaloid, saponin, steroid, flavonoid, and carbohydrate compounds are present in the aqueous extracts. The results of qualitative chemical testing validate the phytochemical findings, which are associated with the literature review. It displays the main chemical components found in different extracts. There was thin-layer chromatography. Furthermore, using a trial-and-error approach, the appropriate solvent system with the best resolution was chosen for the identification of spots on the TLC plates along with their Rf values. This was accomplished by using different solvent systems as mobile phases and spraying reagents as visualising agents.

**Table 1:** Percentage yield of extracts of Plant Material

Sr. No	Extract	<i>Curcuma caesia</i> % yield	<i>Evolvulus alsinoides</i> % yield	<i>Citrullus lanatus</i> % yield	<i>Withania coagulance</i> % yield	<i>Tinospora cordifolia</i> % yield	<i>Gymnema sylvestre</i> % yield	<i>Caesalpinia bonduc</i> % yield
1	Pet ether	0.72%	6.0%	5%	6%	4%	10.62%	6.92%
2	Ethanol	6.82%	9.14%	8.42%	13%	32.52%	16.42%	4.47%
3	Aqueous	1.3%	9.35%	6.00%	30.3%	25.52%	24.82%	4%

Rhizome of *Curcuma caesia* displayed six When seen under UV light at 256 / 366 nm (Rf 0.72), the greenish yellow fluorescence spot and red spot that indicated the presence of terpenoids are likewise comparable to curcumin. When *Evolvulus alsinoide* complete plants are sprayed with vanillin-sulphuric acid (Rf 0.73), the presence of phenolic compounds is confirmed by the yellow, blue, and brown marks. The ethanolic extract of *Citrullus lanatus* (Seeds) exhibits four blue, reddish brown colour spots at UV 256/366 nm, which indicates the presence of quercetin (Rf: 0.71, 0.75). According to published research, the ethanolic extract of *Gymnema sylvestre* (leaf) exhibits a brown colour spot at Rf. 0.45 following the application of the vanillin-sulphuric acid reagent, signifying the presence of Gymnemic acid. The ethanolic extract of *Tinospora cordifolia* (stem) exhibits four spots: a red and blue fluorescence band at UV wavelengths of 254 and 366 nm. Anisaldehyde sulphuric acid spraying revealed a red colour spot, indicating the presence of alkaloid (Rf: 0.65). In UV wavelengths of 254 and 366 nm, *Caesalpinia bonduc* seeds exhibit five spots—blue, red, green, and band. The ethanolic extract of *Withania coagulance* (fruit) exhibits three spot bands at UV 254 and 366 nm. Brown spots at 0.72 are seen following spraying with Lieberman Buchard reagent, indicating the presence of steroids.

Natural bioactive chemical compounds constructed from diverse assets, specifically plants, are of increasing and reported interest in the context of present-day healthcare and clinical research. This hobby is sparked by way of developing know-how of the shortcomings and capacity downsides of traditional medications as well as the complicated interactions between human fitness and the environment. Natural bioactive substances, which are frequently determined in excessive concentrations in plant extracts, present an attractive course for developing novel healing remedies that are both efficient and minimally invasive.

Bioactive substances are a vast category of chemical compounds that can engage with biological structures, regulate physiological methods, and in all likelihood improve fitness. Plants stand out as natural vendors of an extensive range of bioactive substances, including polyphenols, alkaloids, terpenoids, flavonoids, and more. These materials have developed inner plant life to serve a variety of ecological features, including protection against predators, pollinator attraction, and environmental stress adaption. However, both researchers and scientific specialists at the moment are interested in them due to their possible outcomes on human health.

**Table 2:** Phytochemical Investigation of selected plants extracts

Name of Phytoconstituents	<i>Curcuma caesia</i> Rhizome			<i>Evolvulus</i> <i>alsinoides</i> whole			<i>Citrullus lanatus</i> Seed			<i>Withania coagulans</i> Fruit			<i>Tinospora</i> <i>cordifolia</i> stem			<i>Gymnema</i> <i>sylvestre</i> leaves			<i>Caesalpinia</i> <i>bonduc</i> seed		
	Pet Ether (40-60)	Eth anol	Aque ous	Pet Ether (40-60)	Eth anol	Aque ous	Pet Ether (40-60)	Eth anol	Aque ous	Pet Ether (40-60)	Eth anol	Aque ous	Pet Ether (40-60)	Eth anol	Aque ous	Pet Ether (40-60)	Eth anol	Aque ous	Pet Ether (40-60)	Eth anol	Aque ous
Alkaloids	-ve	-ve	-ve	-ve	+ve	+ve	-ve	-ve	+ve	+ve	+ve	-ve	-ve	+ve	+ve	-ve	+ve	+ve	-ve	+ve	+ve
Glycosides	-ve	+ve	+ve	-ve	+ve	+ve	-ve	+ve	+ve	-ve	+ve	-ve	-ve	+ve	+ve	-ve	+ve	-ve	-ve	+ve	-ve
Saponins	-ve	-ve	+ve	-ve	-ve	-ve	+ve	-ve	-ve	-ve	+ve	+ve	-ve	-ve	-ve	-ve	-ve	+ve	+ve	-ve	+ve
Steroids	+ve	-ve	-ve	+ve	+ve	-ve	+ve	+ve	-ve	-ve	+ve	+ve	+ve	+ve	-ve	-ve	-ve	-ve	-ve	+ve	-ve
Terpenoides	-ve	+ve	-ve	-ve	+ve	-ve	-ve	+ve	-ve	-ve	+ve	+ve	-ve	-ve	-ve	+ve	-ve	-ve	-ve	-ve	+ve
Flavonoids	-ve	+ve	-ve	-ve	+ve	-ve	-ve	+ve	-ve	-ve	+ve	-ve	-ve	+ve	-ve	+ve	-ve	-ve	-ve	-ve	+ve
Tannins	-ve	-ve	-ve	-ve	-ve	-ve	-ve	+ve	+ve	-ve	-ve	+ve	-ve	-ve	-ve	-ve	-ve	+ve	-ve	-ve	-ve
Carbohydrate	-ve	-ve	+ve	-ve	-ve	+ve	-ve	+ve	-ve	-ve	-ve	-ve	-ve	+ve	+ve	+ve	+ve	+ve	-ve	+ve	-ve
Phenolic	-ve	+ve	+ve	-ve	+ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve	+ve	+ve	+ve	+ve	-ve	-ve	-ve
Protein	--	--	+ve		--	--	-ve	+ve	-ve	-ve	-ve	--	--	-ve	-ve	--	---	--	-ve	-ve	-ve

+= Positive - = Negative

### Conclusion

This study examines the polyherbal formulation's antidiabetic effects in both normal and alloxan-induced diabetic rats. The polyherbal formulation utilised in this study is verified to be a rich source of flavonoids, glycoside, polyphenol, phenolic, triterpenoid, steroid, and alkaloid based on the phytochemical screening. These substances have the ability to rejuvenate, scavenge free radicals, raise insulin levels, block intestinal glucose absorption, or facilitate the action of metabolites in insulin-dependent processes. Alloxan works by producing superoxide radicals, which are then converted to hydrogen peroxide. This process also causes a significant rise in the concentration of calcium in the cytosol, which accelerates the demise of pancreatic cells. The administration of a polyherbal formulation may result in pharmacological interactions that have a hypoglycemic effect. *Curcuma caesia* rhizome, which the Manipur people have traditionally used to lower blood glucose levels, *Evolvulus alsinoides* whole plant and *Citrullus lanatus* seeds are documented in Sri Lankan ayurvedic treatises for their use in diabetic conditions, *Gymnema sylvestre* increasing serum insulin levels through repair/regeneration *Evolvulus alsinoides* extract lowers the level of lipid peroxidation and increases the antioxidant level while also suppressing oxidative stress, and *Caesalpinia bonducella* extracts may be caused by the blocking of glucose absorption. Curcumin and quercetin are found in ethanolic extracts of black haldi and watermelon, according to HPTLC and TLC analysis. The literature claims that it has antidiabetic effect through a variety of mechanisms. After considering the aforementioned points, we can conclude that the hypoglycemic action of PHF 3 (400 mg/kg) formulation might be attributed to a variety of phytoconstituents and their role in extending the duration of treatment.

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