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## Review Article

# Phytochemical Constituents and Therapeutic Potential of *Arisaema nilamburens* : A Review

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### ABSTRACT

Medicinal plants have been widely utilized for centuries as sources of therapeutic agents. They contain numerous bioactive compounds that contribute to their pharmacological properties. *Arisaema nilamburens*, commonly known as Nilambur Cobra Lily, is a rare and endemic plant species found in the Southern Western Ghats of India. This plant belongs to the family Araceae and has attracted attention due to its potential medicinal and phytochemical properties. The plant is reported to contain several secondary metabolites such as alkaloids, flavonoids, phenolic compounds, glycosides, and other phytoconstituents which may contribute to various biological activities. Medicinal plants have gained significant interest in pharmaceutical research due to their effectiveness, safety, and minimal side effects compared with synthetic drugs. This review highlights the phytochemical constituents, extraction methods, and therapeutic potential of *Arisaema nilamburens*. The study also discusses the importance of medicinal plants in drug discovery and emphasizes the need for further pharmacognostical and pharmacological investigations to explore the medicinal value of this plant.

### INTRODUCTION

Medicinal plants represent an important component of traditional healthcare systems and have contributed significantly to modern medicine. In India, herbs have traditionally served as the primary source of therapeutic agents and continue to be widely used in Ayurveda and other indigenous systems of medicine. It is estimated that nearly 70,000 plant species, ranging from

lichens to large trees, have been used at some stage for medicinal purposes. These plants provide valuable raw materials for the isolation and synthesis of several conventional pharmaceutical drugs.

Medicinal plants have played a significant role in the development of ancient Indian materia medica. They are widely used to alleviate human suffering and have been integrated into various industries

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including food, beverages, and cosmetics. Many plant-derived compounds are used as flavoring agents, sweeteners, and natural additives. The therapeutic properties of medicinal plants are mainly attributed to the presence of complex chemical constituents known as secondary metabolites. These compounds include alkaloids, flavonoids, glycosides, phenolic compounds, terpenoids, and steroids. Such phytochemicals are responsible for a wide range of biological activities including antimicrobial, anti-inflammatory, antioxidant, and anticancer effects.

The study of medicinal plants and their extracts is as old as human civilization. Traditional knowledge of herbal medicine has guided scientists in identifying potential therapeutic agents from plants. Ethnopharmacologists, botanists, microbiologists, and natural product chemists continue to explore plant resources in search of bioactive compounds that may serve as leads for the development of new drugs.

It is estimated that approximately 250,000–500,000 plant species exist worldwide, although only a small fraction of these are utilized as food or medicine. With the increasing resistance of pathogens to conventional antibiotics, there is growing interest in identifying plant-derived antimicrobial agents. Additionally, the rapid loss of plant biodiversity due to environmental changes has highlighted the urgency of studying medicinal plants before potentially valuable phytochemicals are lost. Clinical microbiologists and pharmaceutical researchers have shown increasing interest in plant-based antimicrobial compounds. These natural products often demonstrate better biocompatibility and fewer adverse effects compared with synthetic drugs. Furthermore, the misuse and overprescription of antibiotics have led to increased drug resistance, making the

exploration of plant-derived alternatives an important area of research.

Medicinal plants are rich in secondary metabolites such as alkaloids, flavonoids, glycosides, phenolics, terpenoids, and steroids, which exhibit a wide range of biological activities, including: Antimicrobial, Antioxidant, Anti-inflammatory, Analgesic and Anticancer.

Ethnobotanical investigations have become essential for preserving traditional knowledge and identifying plants with potential therapeutic value. Many plant preparations have been used historically as food, insecticides, central nervous system stimulants, cardioprotective agents, antitumor agents, and antimicrobial agents. Advances in phytochemical techniques have enabled researchers to isolate and characterize active compounds from medicinal plants, many of which have been developed into modern pharmaceutical drugs.

### **Botanical Description of *Arisaema nilamburens***

*Arisaema nilamburens*, commonly known as the Nilambur Cobra Lily, belongs to the family Araceae. It is a rare and threatened herbaceous plant endemic to the Southern Western Ghats of India. The species was first discovered in the Nilambur region of Kerala, from which it derives its name. The plant typically possesses a corm measuring approximately 2 cm in diameter. It bears a single digitately compound leaf consisting of five to six leaflets. The leaflets are ovate to elliptic in shape, measuring up to 16 cm in length and 8 cm in width, with a tapering apex and wedge-shaped base.

The leaf stalk may grow up to 45 cm long and forms a sheath around the inflorescence stalk. Flowering occurs simultaneously with leaf



emergence, usually between June and September. The inflorescence resembles the hood of a cobra, which gives the plant its common name. The spathe is approximately 7 cm long and displays a greenish-purple coloration. The limb is elongated and curved inward with a tail-like extension measuring about 5 cm. The spadix is approximately 9 cm long and slightly curved at the tip. Male flowers are scattered at the base of the male spadix, whereas female flowers are densely clustered. The ovary is oblong in shape with a flat apex and a sessile stigma.

### **Phytochemical Constituents of Medicinal Plants**

Phytochemicals are naturally occurring compounds present in plants that contribute to their biological activity. These compounds are responsible for various therapeutic effects and play a crucial role in drug discovery and development.

Common classes of phytochemicals include:

- Alkaloids
- Flavonoids
- Glycosides
- Phenolic compounds
- Terpenoids
- Steroids
- Tannins

These secondary metabolites exhibit several pharmacological activities such as antimicrobial, antioxidant, anti-inflammatory, and anticancer effects. The diversity of phytochemicals in plants provides an enormous resource for the development of novel therapeutic agents.

### **Extraction Techniques for Phytochemicals**

Extraction is a critical step in the preparation and analysis of medicinal plants. The efficiency of

extraction depends on factors such as the nature of the solvent, temperature, extraction method, and plant material used.

Common solvents used in extraction include:

- Polar solvents: water, ethanol, methanol
- Intermediate polarity solvents: acetone, dichloromethane
- Non-polar solvents: hexane, chloroform, ether

Several conventional and modern extraction techniques are used to isolate phytochemicals from plant materials. These include maceration, infusion, decoction, Soxhlet extraction, ultrasound-assisted extraction, microwave-assisted extraction, and supercritical fluid extraction. The selection of an appropriate extraction method and solvent is essential to obtain maximum yield of bioactive compounds.

### **Therapeutic Potential of Medicinal Plants**

Natural products derived from medicinal plants have been used for centuries to treat a wide range of diseases. According to the World Health Organization, more than 80% of the global population relies on traditional medicine for primary healthcare.

Medicinal plants have been reported to possess several therapeutic activities such as:

- Antimicrobial activity
- Anti-inflammatory activity
- Antioxidant activity
- Anticancer activity
- Analgesic activity

These biological properties are largely attributed to the presence of diverse phytochemicals that interact with various biological pathways in the human body.



## Morphology of *Arisaema nilambureense*



**Fig No 1: *Arisaema nilambureense* Plant**

*Arisaema nilambureense* is a rare herbaceous plant belonging to the family Araceae and is endemic to the Western Ghats of India. The plant grows from a subterranean corm and typically produces a single compound leaf with several leaflets. The inflorescence consists of a spathe and spadix structure that resembles the hood of a cobra, which

is the reason for its common name “Cobra Lily.” The plant generally flowers during the monsoon season, particularly between June and September. The unique morphological features of the plant play an important role in its taxonomic identification.

**Table 1: Taxonomic Classification of *Arisaema nilambureense***

Taxonomic Rank	Classification
Kingdom	Plantae
Division	Angiosperms
Class	Monocotyledonae
Order	Alismatales
Family	Araceae
Genus	<i>Arisaema</i>
Species	<i>Arisaema nilambureense</i>

**Table 2: Major Phytochemical Constituents Reported in Medicinal Plants**

Phytochemical	Chemical Nature	Pharmacological Activity
Alkaloids	Nitrogen containing compounds	Analgesic, antimicrobial
Flavonoids	Polyphenolic compounds	Antioxidant, anti-inflammatory
Glycosides	Sugar bound compounds	Cardiotonic, antimicrobial
Phenolic compounds	Aromatic compounds	Antioxidant activity
Terpenoids	Isoprene derivatives	Anti-inflammatory, anticancer
Tannins	Polyphenols	Antimicrobial, astringent

**Table 3: Common Extraction Methods Used in Phytochemical Studies**

Extraction Method	Principle	Advantages
Maceration	Soaking plant material in solvent	Simple and inexpensive
Soxhlet Extraction	Continuous solvent reflux	Efficient extraction
Ultrasound Extraction	Ultrasonic waves break plant cells	Faster extraction
Microwave Assisted Extraction	Microwave energy releases compounds	High yield and short time
Supercritical Fluid Extraction	Uses supercritical CO <sub>2</sub>	Environment friendly

## Pharmacological Activities of Medicinal Plants

Medicinal plants contain a variety of bioactive compounds responsible for numerous pharmacological activities. Some important activities include:

### 1. Antioxidant Activity

Many plant extracts contain phenolic compounds and flavonoids that help neutralize free radicals and prevent oxidative stress.

### 2. Antimicrobial Activity

Plant-derived compounds have been reported to inhibit the growth of bacteria, fungi, and viruses. This property makes them useful in treating infectious diseases.

### 3. Anti-inflammatory Activity

Certain phytochemicals reduce inflammation by inhibiting inflammatory mediators and enzymes.

### 4. Anticancer Activity

Several plant metabolites have demonstrated cytotoxic effects against cancer cells and may serve as leads for anticancer drug development.

### 5. Analgesic Activity

Some medicinal plants possess pain-relieving properties and are traditionally used for treating headaches, body pain, and other inflammatory conditions.

## Importance of Medicinal Plants in Drug Discovery

Medicinal plants play an essential role in the discovery and development of new pharmaceutical drugs. Many modern medicines have originated from plant sources, including important

therapeutic agents used in the treatment of various diseases. Natural products provide a vast reservoir of structurally diverse compounds that can serve as templates for the development of synthetic drugs. The exploration of medicinal plants is therefore crucial for identifying new bioactive compounds and developing safer and more effective medications.

In addition, medicinal plants have been widely used in traditional systems of medicine such as Ayurveda, Unani, and Traditional Chinese Medicine for centuries. These traditional practices provide valuable knowledge about the therapeutic potential of plants, which helps researchers identify promising species for further pharmacological investigation. Ethnobotanical studies often guide scientists in selecting plants with potential medicinal value.

Plant-derived compounds exhibit a wide range of biological activities including antimicrobial, anti-inflammatory, antioxidant, antidiabetic, and anticancer properties. These pharmacological activities are mainly attributed to the presence of secondary metabolites such as alkaloids, flavonoids, tannins, terpenoids, glycosides, and phenolic compounds. Such phytochemicals serve as lead molecules in drug development and help in the synthesis of new therapeutic agents.

Another important advantage of medicinal plants is their relatively lower toxicity and fewer side effects compared to many synthetic drugs. As a result, natural products are increasingly being investigated as safer alternatives in modern medicine. The growing problem of antimicrobial resistance has also increased the demand for plant-based compounds that can act as novel antimicrobial agents.

Furthermore, medicinal plants play an important role in the pharmaceutical industry by providing



raw materials for the production of herbal medicines, nutraceuticals, and natural health products. Advances in phytochemical analysis, biotechnology, and pharmacognosy have improved the ability to isolate, characterize, and evaluate active compounds from plant sources.

Overall, the continuous exploration and scientific evaluation of medicinal plants remain essential for the discovery of new drugs and the development of effective therapeutic agents for the treatment of various diseases.

## CONCLUSION

Medicinal plants continue to play a crucial role in the development of modern pharmaceuticals. *Arisaema nilamburensis*, a rare and endemic species of the Western Ghats, represents a promising source of bioactive phytochemicals with potential therapeutic applications. The presence of various secondary metabolites in medicinal plants contributes to their pharmacological activities and makes them valuable resources for drug discovery. Further pharmacognostical, phytochemical, and pharmacological studies are required to fully explore the medicinal potential of *Arisaema nilamburensis* and to develop novel pharmaceutical agents derived from this plant.

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