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LEAF EXTRACT, PHYTOCHEMICAL STUDIES AND PREPARATION OF HERBAL FORMULATION *JUSTICIA ADHATODA* LEHYA

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Abstract

Leyha, a novel pharmaceutical method of administration through licking, offers unique benefits across various medical fields. This approach, starting with the tongue, emphasizes its importance in drug delivery and therapeutic effectiveness. Particularly notable is the inclusion of vasaka, which shows combined effects in treating multiple conditions. Standardizing Leyha formulations not only aids in understanding its preparation but also opens doors to innovative pharmaceutical techniques. The flexibility of this method presents exciting opportunities for developing medications targeting serious diseases. This summary highlights the diverse potential of Leyha in pharmaceutical innovation, underlining its role in enhancing therapeutic results and expanding the scope of medical treatments.

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Introduction

Since ancient times, humans have relied heavily on plants for survival, including essential needs such as food, clothing, shelter, and medicine, with the plant kingdom providing significantly. The bond between humans and plants has remained strong throughout the evolution of human culture. Humanity's unending pursuit of happiness drives us to explore both familiar and uncharted paths. Diseases have been an intrinsic part of human existence from the start. Consequently, the study of drugs is as old as disease itself, with an equally ancient search for remedies. Early on, humans, frequently afflicted by disease, sought relief from injuries and illnesses using plants around them [1-4].

Today, plants, often referred to as the "sleeping giant of drug development," remain a primary source of medicines globally. The World Health Organization estimates that 3.5 billion people in developing countries depend on plant-based medicines for primary healthcare. A renewed global interest in plant-based drugs can be attributed to several reasons, including environmentally friendly cultivation and processing methods. Plants continue to be major sources of new lead molecules. Although herbal medicines are effective in treating various ailments, many of these drugs require comprehensive studies using modern scientific methods [5-6].

In India, about 7,500 plants are utilized in local health traditions, mainly in rural and tribal areas. However, the true medicinal value of over 4,000 of these plants remains either little known or unknown, necessitating detailed investigation and documentation. Thorough research and pharmacological evaluation of these plants and their taxonomical relatives could lead to the development of invalu-

able plant-based drugs for numerous serious diseases [7-8].

Despite significant advancements in the discovery of new therapeutic compounds, modern medicine still falls short in providing suitable treatments for many conditions, such as hepatic disorders, viral infections, AIDS, and rheumatic diseases. Herbal medicines derived from plant extracts are increasingly used to treat a wide variety of clinical conditions, even though there is relatively little knowledge about their mechanisms of action. Interest in the pharmacological evaluation of various plants used in Indian traditional medicine systems is growing. Herbal medicine remains a crucial aspect of traditional medicine worldwide. To promote the use of herbal medicine and determine its potential as a source for new drugs, it is necessary to study medicinal plants with a folklore reputation more intensively [9-11].

Introduction to Pharmacognosy [12-13]

Pharmacognosy is the scientific study of medicines derived from natural sources. While it is often associated with herbal medicine, the field also encompasses animals, fungi, microbes, and minerals, as well as various plant parts like flowers, leaves, and roots. Natural medicines have been utilized for thousands of years to improve human health and treat diseases, and modern pharmaceuticals largely depend on compounds originally found in nature. Approximately 50% of all current prescription medicines are derived from natural sources, including notable examples such as morphine, ephedrine, atropine, salicylic acid, colchicine, and tamoxifen. Increasingly, alternative medicinal sources such as animal venoms (e.g., from snakes and frogs), marine species, parasites, and fungi are being explored for therapeutic use.

The roots of pharmacognosy are deeply embedded in traditional medicine practices worldwide, documented through traditional knowledge systems, folklore, incantations, material medica, and pharmacopeias. Pharmacopeias establish standards for the identity, purity, quality, and clinical efficacy of drugs, while material medica provide traditional indications and applications. These traditional principles have been integrated into modern pharmacological sciences through systematic, evidence-based investigations focusing on the purity, potency, extraction methods, isolation of active constituents, consistency, efficacy, and safety of natural medicines.

Pharmacognosy continues to play a vital role in traditional medicine and pharmacology, especially in developing countries and emerging economies, where traditional medicine remains a primary source of healthcare. However, contemporary pharmacognosy has evolved to include advanced scientific approaches, particularly with the advent of molecular, genomic, and metabolomic techniques. These methods are increasingly applied in various fields such as molecular biology, biotechnology, proteomics, and bioinformatics. The global demand for more holistic, safe, and effective medicinal approaches has led to a significant resurgence in the field of pharmacognosy in recent years.

This chapter aims to provide an overview of herbal pharmacognosy, with a focus on secondary metabolite classes relevant to human biology, pathology, and clinical practice. Pharmacognosy, as a complex and integrated science, is at the forefront of numerous technological advances both in laboratory research and field studies.

Introduction to Ayurveda [14]

Ayurveda, the ancient Indian medicinal system, stands as one of the oldest yet enduring traditions, grounded in a robust philosophical and experimental foundation. It is a holistic science of life, emphasizing health and personalized medicine. Ayurveda is recognized as a comprehensive medical system addressing physical, psychological, philosophical, ethical, and spiritual well-being.

In Ayurveda, each cell is viewed as an intrinsic expression of pure intelligence, earning it the designation of a self-healing science. This self-healing concept is complemented by the extensive use of herbal treatments, which are integral to this traditional system of medicine.

According to the World Health Organization, approximately 70–80% of the global population relies on non-conventional medicines, primarily of herbal origin, for their healthcare needs. The growing public interest in complementary and alternative medicine is driven by several factors: the adverse side effects of synthetic drugs, the absence of curative treatments for many chronic conditions, the high cost of new medications, microbial resistance, and emerging diseases. While Ayurvedic treatments are highly effective, the modes of action, pharmacology, pharmacokinetics, and pharmacovigilance of many Ayurvedic drugs remain underexplored. Additionally, the scientific community often views the foundational principles of Ayurveda with skepticism due to a lack of empirical evidence.

In today's era, where Western medicine has reached its zenith through validated research and advanced techniques, there is a pressing need to validate the principles and drugs used in Ayurveda using modern research methodologies. Advancements in research are crucial for promoting Ayurveda. Despite the superior effectiveness of Ayurveda in treating chronic diseases compared to allopathic treatments, its popularity is limited. Most people globally prefer modern medicine for its quick relief. However, growing awareness and concern about the toxicity of allopathic drugs and the high cost of healthcare are prompting more people to explore alternatives.

Rather than competing with Western medicine, Ayurveda practitioners should focus on enhancing the core competencies of Ayurveda without compromising its fundamental principles. Recent years have seen the introduction of interdisciplinary research in Ayurveda, particularly in integrative medicine. In Western countries, the trend of combining traditional and modern medicine is gaining traction. The clinical efficacy of many traditional medica-

tions has been found to be superior to that of modern medicine for various diseases.

Ayurveda is a very safe medical system that can significantly reduce the burden of mortality and morbidity caused by the side effects of conventional drugs. This traditional system has also proven effective against diseases where pathogens have developed antibiotic resistance. Therefore, interdisciplinary research is essential to combat chronic diseases and harness the full potential of Ayurveda.

Improvement in quality of herbal drugs [15]

Most Ayurvedic Rasayanas, such as Medhya, Jeevaniya, and Lekhaniya, are derived from herbal products. Notable herbs like Ashwagandha (Withaniasomnifera), Shatavari (Asparagus racemosus), Amalaki (Embellica officinalis), and Bhallataka (Semecarpus anacardium) are recognized Ayurvedic Rasayanas with proven immunomodulatory effects. These Rasayanas can potentially serve as adjuvants for vaccines with weak immunogenicity and in cancer treatments, providing safer and more effective immune-boosting options.

Herbal extracts hold significant importance due to their structural and chemical diversity, with over 120 distinct phytochemicals from various plants identified as potential lifesaving medicines. This discovery stems from chemical and pharmacological screening of only about 6% of total plant species. The National Institute of Health has initiated extensive research on anti-inflammatory compounds found in turmeric, ginger, and Boswellia, leveraging Ayurvedic knowledge. Traditional knowledge has also guided the screening of numerous herbs for cancer treatment. Furthermore, traditional medicine offers a variety of immunomodulating drugs that present new therapeutic opportunities. For herbal drugs, maintaining consistency in chemical composition and bioactivity is crucial for ensuring their safety and efficacy. Quality is paramount for plant-derived medicines, and the challenge of ensuring proper quality control for polyherbal formulations in Ayurvedic preparations remains significant. As a result, the international market's acceptance of Ayurvedic drugs is still limited. Implementing robust procedures and techniques to analyze these drugs for their composition and potency is essential to ensure their standard quality.

Ayurveda, one of the oldest holistic branches of medicine, provides comprehensive knowledge about health, various ailments, and their treatments. The term "Ayurveda" is derived from the Sanskrit words "ayu," meaning "life," and "veda," meaning "science" or "sacred knowledge," thus translating to "Science of Life" or the "Mother of Healing." This Science of Life encompasses all aspects vital to life, such as nutrition, a balanced diet, exercise, yoga, lifestyle, health conditions, and their treatment options. As depicted in the Charaka Samhita, one of the oldest Ayurvedic texts, Ayurveda offers a complete understanding of life and its maintenance.

By integrating traditional knowledge with modern research methodologies, Ayurveda can enhance its therapeutic spectrum, providing effective treatments for various ailments while ensuring safety and efficacy.

Ayurvedic Medicine Formulations [1-22]

Method of Preparation:

1. Lehya

Lehya is a semi-solid or thickened extract prepared using a medium of sugar or jaggery. It is made by mixing powdered drugs and fruit pulp with sugar, jaggery, sugar candy, or honey in water. This mixture is then boiled until it reaches the desired consistency. Spices and ghee are added and stirred in. Once cooled, honey is also incorporated.

2. Arista and Asava

Asavas and Aristhas are prepared by soaking herbs in either powdered form or as a decoction in a sugar or jaggery solution for a specific period. This process induces fermentation, generating alcohol and aiding in the extraction of the active ingredients from the herbs.

3. Rasa Rasayan

Ayurvedic medicines that primarily contain mineral drugs are known as Rasa Rasayan or Ras-yoga. These medicines are available in pill or powder form. Minerals such as Arsenic, Gold, Silver, and Copper, along with purified sulfur, are converted into bhasma (ash). These are then combined with other drugs in small quantities, mixed thoroughly, and ground into a fine powder.

4. Lauha

Lauhakalpas are preparations that use Loha Bhasma (iron ash) as the main ingredient, combined with other finely powdered drugs.

5. Vati or Gutika

Vati or Gutika are medicines formed into tablets or pills. These can be composed of one or more drugs derived from plant, animal, or mineral origins.

6. Churna

Churna is a fine powder made from various herbs and active ingredients. These components are cleaned, dried, and mechanically powdered to a fineness of at least 80 mesh.

7. Avalehya

Avalehya, also known as Lehya, is a semi-solid preparation. It is made by adding jaggery or sugar to the prescribed drug juices or decoctions and boiling the mixture. Honey may be added once the preparation has cooled and is mixed thoroughly.

8. Ghrita

Ghrita preparations involve boiling ghee with prescribed decoctions (Kasayas) and drug pastes (kalkas) according to Ayurvedic formulations.

9. Parpati

Parpati is made by first preparing Kajjali with purified mercury and sulfur. Other drugs, as per the Ayurvedic formula, are then added and mixed in a grinder. This powder is heated in an iron vessel until it melts. The melted material is purified, cooled, and then formed into flakes which are subsequently powdered.

10. Taila

Tailas are prepared by boiling prescribed decoctions (kasyas) and drug pastes (kalkas) in oils according to Ayurvedic formulations.

11. Guggulu

Ayurvedic medicines prepared from the exudates of the Commiphoramukul plant are known as Guggulu. There are five varieties of Guggulu, but Mahishaksha and Kanaka are commonly used. Small pieces of exudate are boiled in cow urine, milk, or Triphala decoction until they dissolve into the liquid. This fluid is filtered and boiled until it thickens into a mass. After drying, ghee is added to make the mass waxy.

Plant Profile – Vasaka

Introduction

Botanical Name

Justicia adhatoda

Biological source

It is dried and fresh leaves of *Justicia adhatoda* or Malabar nut. Belongs to the family Acanthaceae.

Family

Acanthaceae

Chemical Constituents

- The major chemical constituents of vasaka are its several alkaloids, and the chief one is vasicine.
- Leaves composed of major constituents which are vasicine and vasicinone.
- The leaves of vasaka contain vitamin C in large amount.
- They also have carotene and essential oil in large amount.
- The roots of this plant contain vasicinolone, vasicol, peganine, and sitosterol.

Uses

The leaves of vasaka are used to treat cough, asthma, fever, tuberculosis, piles, jaundice, bleeding gum.

It is also used as an expectorant.

It has ability of bronchodilator.

Its decoction has ability to treat cold and rheumatism.

The extract of leaves, bark and flower is used to treat bronchial, asthmatic and pulmonary affection.

Scientific Classification [23]

Kingdom	- Plantae
Sub kingdom	- Tracheobionta
Division	- Magnoliophyta
Class	- Magnoliopsida
Sub class	- NA
Order	- Lamiales
Genus	- Adhatoda
Species	- Vasica
Part used	- Leaves, roots, flowers, bark.[30]

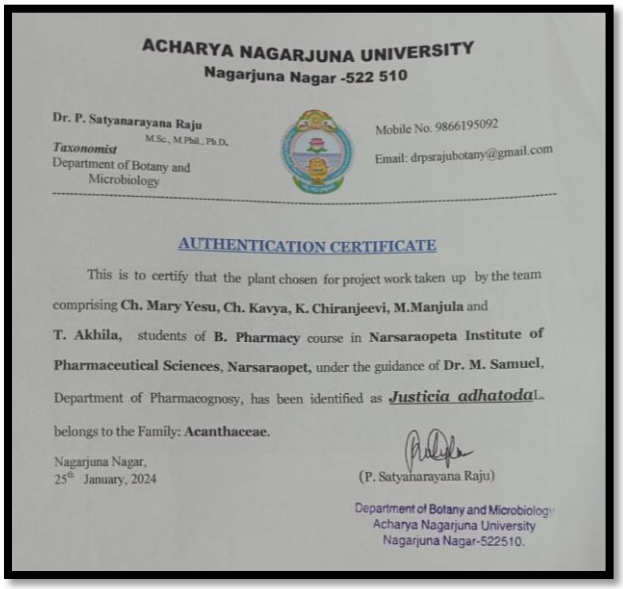
Fig: 1 *Justicia adhatoda* plant

Geographical Distribution [24-25]

Adhatodavasica, commonly known as Adulsa or Vasaka, is a plant indigenous to India and is found in various regions ranging from plains to mountainous areas. In the Himalayan region, this plant thrives at altitudes ranging from 200 meters to 1300 meters. The name "Vasaka" is derived from Sanskrit and is widely recognized in India.

Vasaka is prevalent throughout India and the tropical regions of Southeast Asia. It is well-suited to the dry climates and soils of its native habitats. The plant grows abundantly at the foothills of the Himalayas and is also found in Sri Lanka, Burma, and Malaysia.

Authentication Certificate



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AUTHENTICATION CERTIFICATE

This is to certify that the plant chosen for project work taken up by the team comprising **Ch. Mary Yesu, Ch. Kavya, K. Chiranjeevi, M.Manjula** and **T. Akhila,** students of **B. Pharmacy** course in **Narsaraopeta Institute of Pharmaceutical Sciences, Narsaraopet,** under the guidance of **Dr. M. Samuel,** Department of Pharmacognosy, has been identified as ***Justicia adhatoda*** L. belongs to the Family: **Acanthaceae.**

Nagarjuna Nagar,
25th January, 2024

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Collection and Preparation of Plant Extract [26]

Freshly collected Justicia adhatoda leaves were dried in the shade and then powdered. The powdered material was sieved to separate coarse particles from fine powder. The coarse material was extracted with ethanol using a Soxhlet apparatus continuously, and the resulting extract was concentrated to a small volume under vacuum at 50°C before being dried in a vacuum desiccator. The fine powder was combined with 2 liters of ethanol in a glass jar and left to macerate cold for 7 days. The liquid extract ob-

tained was then concentrated and evaporated under reduced pressure below 50°C until a soft mass was formed. This dried ethanolic extract was subsequently subjected to qualitative phytochemical analysis.

Fig:2 Collection of Leaves *Justicia adhatoda*

Fig: 3 ***Justicia adhatoda*** **leaf powder**

Extraction procedure - 1

The coarsely powdered material was subjected to ethanol extraction. Specifically, 250g of the drug powder was placed in a round bottom flask, and 500ml of ethanol was used as the solvent. Soxhlation was conducted for up to 6 cycles using the hot percolation method.

Soxhlet Extraction Process [27-29]

The Soxhlet apparatus is a specialized glass unit designed primarily for organic solvent extractions. It is a well-established technique known for its efficiency, though it may not be suitable for extracting thermolabile compounds. In this method, the powdered solid material is placed in a filter paper thimble inside the Soxhlet apparatus. The apparatus is connected to a round bottom flask (RBF) containing the solvent and a reflux condenser. The solvent in the flask is gently heated to produce vapor, which ascends through a side tube, condenses in the condenser, and drips into the thimble containing the material. The solvent gradually fills the Soxhlet chamber until it reaches the top of the attached tube, at which point it siphons back into the flask, carrying the extracted compounds with it. This cycle is repeated until complete extraction is achieved.

Advantages

1. **High Capacity**: Allows extraction of large amounts of plant material at once.
2. **Solvent Reusability**: The solvent can be reused multiple times.
3. **Filtration-Free**: No filtration is needed post-extraction.
4. **Versatile Matrix Compatibility**: Works regardless of the type of matrix.
5. **Simplicity**: The technique is straightforward and easy to perform.
6. **Effective Solvent Contact**: Fresh solvent continuously contacts the solid matrix, ensuring efficient extraction.

Disadvantages

1. **Thermal Degradation**: Risk of thermal destruction of heat-sensitive compounds due to prolonged high temperatures.
2. **Lengthy Process**: Extraction time is extensive, making the process labor-intensive.
3. **Limited Variable Manipulation**: Few variables can be adjusted during the process. The large solvent requirement and time-consuming nature of Soxhlet extraction are notable criticisms of this technique.

For the second extraction procedure, the fine powder was subjected to maceration by adding 2 liters of ethanol in a glass jar and allowing it to undergo cold maceration for a duration of 7 days. The resulting liquid extract was then concentrated and evaporated under reduced pressure at temperatures below 50°C until a soft mass was obtained. Subsequently, the dried ethanolic extract was prepared for qualitative phytochemical analysis.

Maceration Extraction Procedure [30-35]

Maceration is a straightforward extraction technique widely used to extract bioactive compounds from plant materials. In this method, coarsely powdered plant material, such as leaves, stem bark, or root bark, is placed in a container. The plant material is covered completely with a suitable solvent like methanol, ethanol, ethyl acetate, acetone, or hexane. The container is then sealed, and the mixture is allowed to stand for a specified period, typically at room temperature or sometimes under refrigeration.

Advantages:

1. **Simplicity**: Maceration is one of the simplest extraction methods, requiring minimal equipment and expertise.
2. **Cost-Effective**: It is an inexpensive technique compared to other extraction methods.
3. **Versatility**: Can be used with various solvents depending on the polarity of the compounds being extracted.
4. **Wide Applicability**: Suitable for extracting a broad range of bioactive compounds from plant materials.

Process Description

- **Preparation**: The plant material is finely powdered to increase the surface area for extraction.
- **Solvent Addition**: A sufficient quantity of ethanol (in this case, 2 liters) is added to cover the powdered material in a glass jar.
- **Maceration Period**: The mixture is left to macerate for 7 days, allowing the solvent to penetrate the plant material and extract the desired compounds.
- **Extraction**: After maceration, the liquid extract is separated from the solid residue.
- **Concentration**: The extract is concentrated under reduced pressure (vacuum) to remove the solvent and obtain a concentrated extract.
- **Final Product**: The concentrated extract is dried until a soft mass is achieved, ready for further analysis or formulation.

Maceration is valued for its simplicity and effectiveness in extracting bioactive compounds from plant materials, making it a preferred method in phytochemical research and herbal medicine preparation.

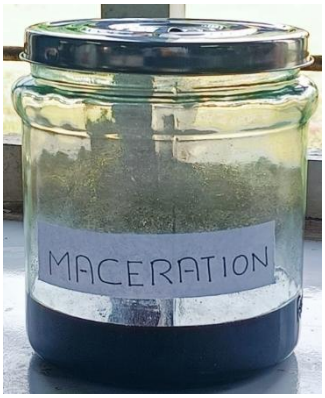

Fig: 4 Maceration Process of *Justicia adhatoda* leaf powder

Distillation Process

Distillation is a method used to separate components of a liquid mixture based on differences in their boiling points. It involves converting the liquid into vapor, transferring the vapor to another location, and then condensing it back into liquid form by cooling.

Principle: When a liquid's vapor pressure equals the atmospheric pressure, it boils. Simple distillation is conducted at the boiling point of the liquid. The effectiveness of separation depends on the relative volatility of the components; higher relative volatility leads to better separation. Heat is applied to the liquid to induce boiling, and the resulting vapor is condensed.

Apparatus: The setup consists of a distillation flask with a side arm sloping downwards. A condenser is attached to the side arm using a cork, typically a water-cooled condenser. The condenser is connected to a receiver flask via an adaptor.

Procedure

1. **Preparation:** The liquid to be distilled is placed into the distillation flask.
2. **Temperature Control:** A thermometer is inserted through the cork and positioned in the flask to monitor the temperature.
3. **Condensation:** Water is circulated through the condenser jacket to keep it cool. Heat is applied to the flask, causing the liquid to boil.
4. **Vaporization:** As the liquid boils, vapor rises and travels through the side arm into the condenser.
5. **Cooling and Collection:** In the condenser, the vapor cools and condenses back into liquid form due to contact with the cold surface provided by the water circulation. The condensed liquid collects in the receiver flask.

Advantages

1. Efficient separation of components based on boiling points.
2. Widely applicable in laboratories and industrial settings for purification and separation processes.
3. Allows for the recovery and reuse of solvents and valuable components.

Disadvantages

1. Requires significant energy input for heating.
2. Some compounds may decompose at high temperatures.
3. Complex mixtures may not be fully separated using simple distillation alone.

Distillation remains a fundamental technique in chemistry, essential for purifying liquids, isolating components, and producing high-purity substances for various applications in research, industry, and medicine

Qualitative Phytochemical Screening

The extract of Justicia adhatoda was subjected to various tests to detect and identify the phytoconstituents present within it. These tests are essential in establishing the chemical profile and understanding the pharmacological potential of the plant extract.

Phytochemical Analysis

Phytochemical analysis involves a series of tests designed to identify and quantify the bioactive compounds present in plant extracts. These tests provide valuable information about the chemical composition and potential therapeutic properties of the extract.

Tests Conducted

1. **Alkaloids Test:** Alkaloids are nitrogenous compounds often possessing pharmacological activities. The extract was tested using specific reagents such as Dragendorff's reagent or Mayer's reagent to detect the presence of alkaloids. Positive results indicate the presence of alkaloidal compounds in the extract.
2. **Glycosides Test:** Glycosides are compounds containing a sugar molecule bonded to a non-sugar (aglycone) moiety. The extract was subjected to tests like the Legal's test or Bornträger's test to confirm the presence of glycosides. Formation of colored precipitates or other characteristic reactions indicates the presence of glycosidic compounds.
3. **Tannins Test:** Tannins are polyphenolic compounds known for their astringent properties. The extract was tested with ferric chloride solution to detect tannins. Formation of a blue-black or greenish black coloration indicates the presence of tannins.
4. **Essential Oils Test:** Essential oils are volatile aromatic compounds. The extract was tested using the steam distillation method to assess the presence of essential oils. Distillation of the extract followed by identification of the oil layer confirms the presence of volatile constituents.
5. **Flavonoids Test:** Flavonoids are phenolic compounds with diverse biological activities. The extract was tested with magnesium and hydrochloric acid to detect flavonoids. Formation of yellow coloration indicates the presence of flavonoids.
6. **Saponins Test:** Saponins are glycosides with foaming properties. The extract was tested by shaking with water to observe foam formation. Persistent frothing indicates the presence of saponins.
7. **Carbohydrates, Proteins, and Lipids Test:** These basic components of plant metabolism were assessed through chemical tests such as Molisch's test for car-

bohydrates, Biuret test for proteins, and Sudan III test for lipids. Positive results confirm the presence of these biomolecules in the extract.

Importance of Phytochemical Analysis

Phytochemical analysis provides critical information about the chemical composition of plant extracts, which is essential for understanding their medicinal properties and potential therapeutic applications. By identifying specific phytoconstituents, researchers can correlate these compounds with observed biological activities, guiding further studies in pharmacology and drug development.

In conclusion, comprehensive phytochemical analysis of Justicia adhatoda extract helps establish its chemical profile and supports its traditional and medicinal uses by identifying the bioactive compounds responsible for its therapeutic effects.

S. No	Name of the test	Ethanolic extract	Aqueous ethanolic extract
1	Mayer's test (for alkaloids)	Positive	Positive
2	Benedict's test (for carbohydrates)	Negative	Negative
3	Shinoda test (for flavonoids)	Negative	Negative
4	Foam test (for glycosides)	Positive	Positive
5	Ferric chloride test (for phenols)	Positive	Positive
6	Liebermann Buchard test (Steroids & Triterpenes)	Positive	Positive

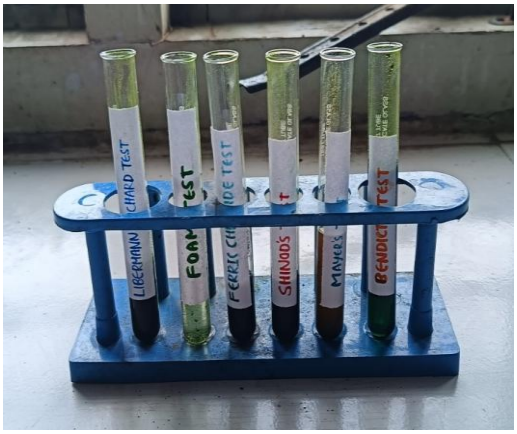

Fig: 6 Phytochemical Screening of leaf extract of *Justicia adhatoda*

Herbal Formulation of Lehya

Lehya represents a unique form of Ayurvedic medicine known for its semi-solid consistency and therapeutic benefits. It is meticulously prepared using a combination of powdered herbs and fruit pulp, cooked in a base of sweeteners like jaggery (Gur), sugar (Sharkar), sugar candy, or honey, dissolved in aqueous mediums such as water. This traditional formulation is esteemed for its ability to enhance stamina, improve complexion, and effectively address various ailments.

The preparation process involves blending the powdered herbs and fruit pulp with the sweetening agent, then boiling the mixture along with prescribed swarasa (juice extracted from medicinal plants) or Kwath/Kashayam (decoctions). This method ensures that the active constituents of the herbs are effectively extracted and incorporated into the final product.

Methodof Preparation of Lehya

Lehya is prepared by using powdered medicine, jaggery, sugar, and honey in an aqueous medium of water.

Ghee is often added as a preserving agent and after preparation; the food may be rolled into small balls and left to harden within a vessel, edible for up to a year.

In the preparation of lehya ingredients present are:

Ingredients

1. Powdered medicine of vasaka
2. Sugar or sugar candy or jaggery
3. Green cardamom
4. Honey
5. Jeera

Procedure

Take 250gm of vasaka powder and 10gm of jeer powder were added to water

After the solution get boiled simmed the mixture.

Filtered the decoction and sugar is added sufficiently in the filtered decoction.

Again, the decoction is simmed with the sugar until it becomes thick having jam like consistency.

It is removed from heat and 10 gm of green cardamom is added.

It is allowed to cool naturally up to room temperature.

And finally, 250 gm. of honey added and mixed well.[35]

Preparation of Lenya

2 Liters of water is taken in a bowl and 250 gm of vasaka powder was added then stirred vigorously on heating. While heating the content 10gm of jeera powder is added. After 5 min 500gm of jaggery is added to the preparation, stirred 1 hr continuously until it become thick slurry on heating. After becoming slurry, it is removed from heating and cooling down to obtain room temperature. When it is cooled 500gm of honey and 10gm of cardamom is added and prepared a herbal formulation of lehya.

Fig: 7*Justicia adhatoda*lehya herbal formulation

Precautions taken

1. All the apparatus/vessel must be clean.
2. Medium flame must be maintained throughout the procedure.
3. Continuous stirring is a must during the procedure.
4. Honey should be added in the last at room temperature.

Storage

The lehya should be kept in glass or porcelain jars.

Conclusion

Lehya refers to a unique pharmaceutical mode designed for ingestion through licking, which sets it apart due to its specific method of action originating from the tongue. This distinctive characteristic plays a crucial role in its therapeutic efficacy. Vasaka, an essential ingredient in many formulations, demonstrates synergistic effects in treating various disorders. Standardizing the preparation of lehya not only enhances our understanding of its formulation but also opens avenues for innovative pharmaceutical approaches aimed at combating serious illnesses. This method offers versatility and promising prospects in drug development, emphasizing its potential to advance therapeutic outcomes and broaden the horizons of medical treatment.

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No Conflict of interest

Informed Consent

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Ethical Statement

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Author contribution

All authors are contributed equally.

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