Formulation & Evaluation Of Herbal Tablet From Calotropis Gigantea Linn. (Leaf)

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Abstract:

This study focuses on turning the medicinal power of the Calotropis gigantea plant (traditionally used for asthma and pain) into a convenient, professional-grade herbal tablet. While raw plant extracts are effective, they often taste bad and don't last long on a shelf; this research aimed to fix those issues by creating a stable, standardized pill. The process followed three main steps: Extraction: Researchers used ethanol and a specialized heater to pull out the plant's active "healing" ingredients, such as flavonoids and alkaloids. Manufacturing: The extract was mixed with binders and fillers using a "wet granulation" technique to ensure the mixture could be easily pressed into solid tablets. Quality Control: The tablets were tested to ensure they were strong enough not to break in the bottle but quick enough to dissolve in the stomach. The study successfully produced a stable, cost-effective tablet that meets official pharmaceutical standards. This provides a natural alternative for managing asthma and creates a scientific starting point for future medical testing.

Keywords: Calotropis gigantea (Linn.), Herbal Tablets, Leaf Extract, Phytoconstituents, Ethanolic Extraction, Soxhlet Extraction, Traditional Medicine, Anti-asthmatic & Anti-inflammatory.

1. Introduction:

The development of herbal tablets from *Calotropis gigantea* (known as Giant Milkweed or "Arka") represents a modern bridge between ancient Ayurvedic wisdom and pharmaceutical science. Traditionally used to treat asthma and inflammation, this hardy shrub contains powerful natural compounds like flavonoids and glycosides. However, raw extracts are often bitter, unstable, and difficult to dose accurately.

To improve patient care, researchers have transformed these extracts into standardized tablets. This solid dosage form ensures that each pill contains a precise, safe dose of the plant's active ingredients while masking its unpleasant taste. These tablets work by relaxing the airways (bronchodilation) and preventing allergic triggers (mast cell stabilization). While these herbal tablets offer a sustainable, cost-effective alternative to synthetic drugs for long-term asthma management, they require strict scientific testing. This ensures they dissolve correctly in the body and remain safe, providing a reliable natural option for respiratory health.

2. Plant Profile:

Commonly known as Giant Milkweed or Crown Flower, Calotropis gigantea is a perennial shrub belonging to the family Apocynaceae (formerly Asclepiadaceae). It is well-regarded in traditional medicine, particularly in Ayurveda and Unani systems, for its diverse pharmacological properties.

Kingdom	Plantae
Order	Gentianales
Family	Apocynaceae
Subfamily	Asclepiadaceae
Genus	Calotropis
Species	C. gigantea

Table No. 1 Plant Profile

Image No. 1 Calotropis Gigantea

- **Synonym:** Asclepias gigantea L.
- **Common Names:** Giant Milkweed, Crown Flower, Swallow-wort, and Rui (Marathi) or Madar (Hindi).
- **Biological Source**: It consists of the dried leaves, roots, or flowers of the plant Calotropis gigantea (Linn.) R. Br. belonging to the family Apocynaceae (formerly Asclepiadaceae).
- **Geographical Source:**

Primary Distribution (Asia): It is widely distributed across India, Sri Lanka, China, Malaysia, Indonesia, Thailand, and Vietnam.
In India: It is found throughout the country, growing abundantly in plains and lower Himalayan ranges. It is particularly common in states like Maharashtra, Rajasthan, Gujarat, and Tamil Nadu.
Secondary Distribution: It has been naturalized in parts of tropical Africa, Australia, and the Pacific Islands (including Hawaii, where it is used for traditional leis).

2.1 Botanical Description:

- Appearance: A large shrub reaching up to 4 meters in height. It has a waxy, pale green appearance due to a fine coating of soft hairs.
- Leaves: Large, sessile (without a stalk), oval-shaped, and opposite-decussate. When broken, the leaves and stems exude a thick, white milky latex.
- Flowers: Characteristic crown-shaped flowers that are usually lilac, purplish, or white.
- Fruit: Simple, fleshy follicles that contain numerous seeds with long, silky hairs (coma).
- Roots: The roots of Calotropis gigantea are a sturdy taproot system, characterized by a greyish-yellow, wrinkled surface and a thick, easily separable bark that contains a bitter, milky latex and high concentrations of cardiac glycosides.

2.2 Phytochemical Constitutents:

Class of Chemical Constituent	Name of the Chemical Constituent	Plant Part Use	Extract Taken
Triterpenoids	Alpha-amyrin and beta-amyrin	Leaves	Ethanol extract
	Stigmasterol		
	Di-(2-ethylhexyl) Phthalate	Flowers	Ethyl acetate extract
	Anhydrosophoradiol-3- acetate		
	Lupeol	Aerial Parts	Latex
	Alpha -Taraxerol	Root Bark	Ethyl acetate extract
Alkaloids	Choline	Leaves	Ethanol extract
	Mudarine		
Flavonol	Quercetin	Leaves and	Ethanol extract
	Kaempferol		
	Rutin		
	Isorhamnetin	Aerial Parts	Methanol extract
Cardiac Glycosides	Calotropin	Leaves	Ethanol extract
	Calotoxin		
	Uscharin		
	Gigantin		
	Calactin		
	Calotropane	Roots	Ethanol extract
Steroids	Beta-sitosterol	Leaves	Ethanol extract
	Stigmasterol	Root bark	Methanol extract

Resin	B-Amyrin	Root bark	95% Alcohol extract
	B-Amyrin acetate		
Fatty Acids	Isovaleric acid	Root bark	95% Alcohol extract
Miscellaneous	Asclepin	Roots	Latex
Triterpene Esters	y-Taraxasterol	Aerial parts	Hexane and methanol soluble extract
	Lupenyl-1-acetate	Root bark	Petroleum ether extract

Table No. 2 Phytochemical Constitutents

2.3 Pharmacological Action:

2.3.1 Antiasthmatic Activity:

S. Sarkar et al. (2018) was studied anti asthmatic activity of Calotropis gigantea in ova albumin (OVA) induced asthma. The impact of Calotropis gigantea at 100, 200, 400 mg/kg, on various body cells, catalysts and histopathological changes were noticed. Along these lines, plant concentrate might help for treating asthma.

2.3.2 Anti-Inflammatory Activity:

V. A. Jagtap et al. (2010) was examined that ethanolic extract of leaves of Calotropis gigantea linn. On in-vitro models shows significant anti-inflammatory activity.

2.3.3 Antimicrobial Activity:

Madhu Prakash Srivastav et al. (2020) was studied that the antimicrobial activity of aqueous, methanolic and ethanolic extract of leaves and flower of Calotropis gigantea Linn shows potent antimicrobial activity against Staphylococcus aureus.

2.3.4 Antipyretic Activity:

Namrata Singh et al. (2014) was studied that root extract of Calotropis gigantea has expected antipyretic action against both yeast-induced and TAB vaccine-induced fever, showing the chance of creating Calotropis gigantea as a less expensive and intense antipyretic agent.

3. Material And Methods:

3.1 Collection and authentication of plants:

3.1.1 Plant Collection and Authentication:

The leaves of Calotropis gigantea were collected from the vicinity of Lonar Road, Buldhana (Maharashtra). The plant was identified and authenticated by the Dr. R. N. Lahoti Institute of Pharmaceutical Education and Research Centre, Sultanpur. A voucher specimen has been deposited at the institutional herbarium for future reference.

3.1.2 Preparation of Plant Material:

The collected leaves were thoroughly cleaned and dried under sun exposure to remove moisture. Once completely dried, the leaves were reduced to a coarse powder using a mechanical grinder. This powdered material was then stored in an airtight container to prevent microbial growth and moisture absorption, ensuring its stability for the extraction process.

3.1.3 Extraction and Formulation Strategy:

Based on the literature survey, the ethanolic extract of Calotropis gigantea (Linn.) leaves has demonstrated significant anti-inflammatory activity.
To develop these into a stable dosage form, the herbal extract will be processed into herbal tablets using a variety of pharmaceutical excipients, including:

- Binders: To ensure tablet integrity (e.g., PVP K-30).
- Fillers/Diluents: To provide necessary bulk (e.g., Lactose).
- Disintegrants: To facilitate tablet breakup in the gastric fluid (e.g., Starch).
- Lubricants & Glidants: To prevent sticking and improve flow (e.g., Magnesium Stearate and Talc).

The extraction process is a critical step in isolating the bioactive phytoconstituents (such as alkaloids, flavonoids, and glycosides) from the plant matrix. Based on your methodology, here is a concise breakdown of the process:

3.2 Extraction of Calotropis gigantea Leaves:

3.2.1 Pre-Processing (Drying & Size Reduction):

- Air Drying: The leaves were dried in the shade for one week. Shade drying is preferred over direct sunlight to prevent the thermal degradation of volatile oils and thermolabile active constituents.
- Size Reduction: The dried leaves were cut into small pieces and ground into a coarse powder. This increases the surface area, allowing the solvent to penetrate the plant cells more efficiently during extraction.

3.2.2 Soxhlet Extraction (Continuous Hot Extraction):

- Apparatus: The coarse powder was placed in a thimble within a Soxhlet apparatus.
- Solvent Selection: Ethanol was used as the solvent. Ethanol is a versatile, polar solvent capable of dissolving a wide range of phytoconstituents, including those responsible for the plant's anti-inflammatory properties and anti-asthamatic activity.
- Mechanism: The solvent is heated to its boiling point in a round-bottom flask. The vapors rise, condense, and drip onto the plant material. Once the extraction chamber is full, the solvent (now containing the dissolved extract) siphons back into the flask.
- Efficiency: This process is repeated until the plant material is completely exhausted of its chemical constituents, ensuring maximum yield.

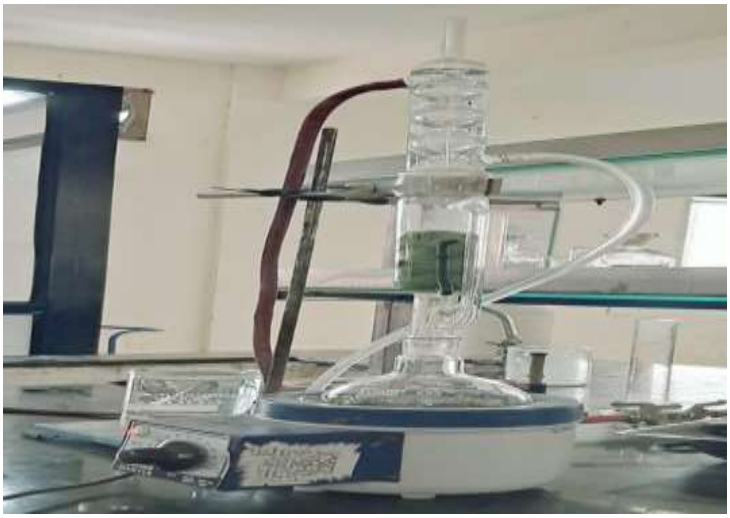

Image No. 2 Soxhlet Extraction

3.2.3 Post-Extraction (Concentration):

- Concentration: The resulting ethanolic extract is typically concentrated using a Rotary Evaporator under reduced pressure. This removes the ethanol, leaving behind a thick, semi-solid or solid crude extract.
- Storage: The final extract is stored in a cool, dry place in an airtight container to be used for further phytochemical screening or tablet formulation.

Image No. 3 Ethanolic Extract

4. Preformulation Study:

4.1 Organoleptic characteristics:

Characteristic	Observation
Color	Dark Green to Brownish-Green (due to the presence of chlorophyll and concentrated phytoconstituents)
Odour	Characteristic / Slightly Pungent (a distinct herbal smell)
Taste	Bitter (typical of plants containing glycosides and alkaloids)
Appearance / State	Semi-solid to Solid (sticky or resinous after solvent evaporation)
Texture	Smooth to slightly granular

Table No. 3 Organoleptic characteristics

4.2 Different Tests:

Tests	Results
Angle of Repose	The Final Angle Of Repose is 33.94
Ash Value	The percentage of Ash Value is 18%
Identification tests:	
Mayers Test	Pale yellow Color is Observed it confirms the presence of alkaloids.
Shinoda Test	Crimson red Color is Observed it confirms the presence of Flavonoids.
Ferric Chloride Test	Dark Green Color is Observed it confirms the presence of Phenolic Compound.

Molisch's Test	Purple ring forms at the junction of the two liquids is Observed it confirms the presence of Carbohydrates
Keller-Kiliani Test	Reddish-brown ring forms at the junction of the two liquids is Observed it confirms the presence ofCardiac Glycosides

Table No. 4

5. Preparation Of Herbal Tablet Formulation:

All ready standardized ethanolic leaf extract from Calotropis gigantea Linn were used to prepared granules by wet granulation technique as follows:

- Following the addition of lactose to absorb moisture, the precisely weighed extract amounts were put through sieve number 60.
- Add enough isopropyl alcohol to the mixture together with weighed amounts of the excipients (Starch, PVPK-30, Sodium methyl paraben, and Sodium propyl paraben) to create dough mass.
- The wet mass was passed through sieve no.12.
- Granules were dried for 30 minutes at 50-55 °C in an oven.
- Dried granules were passed from sieve no. 20.
- Then granules were mixed with Lubricants (Talc, Magnesium stearate & Sodium starch glyconate).

Formula For Tablet:

Granulation				
Sr. No.	**Contents**	**Quantity Per Tablet**		
		Formula 1	**Formula 2**	**Formula 3**
1	Extract of Calotropis Gigantea	71.4 mg	71.4 mg	71.4 mg

2	Lactose	30.61 mg	28.42 mg	35.71 mg
3	Starch	15.7 mg	16.8 mg	17.8 mg
4	Poly vinyl pyrrolidone K-30	23 mg	24 mg	25 mg
5	Methyl Paraben	1.75 mg	1.90 mg	2.85 mg
6	Propyl paraben	0.81 mg	0.91 mg	0.71 mg
7	Isopropyl Alcohol	Quantity Sufficient	Quantity Sufficient	Quantity Sufficient
Compression				
1	Granules	250 mg	250 mg	250 mg
2	Magnesium Stearate	7.5 mg	6.4 mg	7.1 mg
3	Talc	9.5 mg	10.15 mg	10 mg

Table No. 5 Formula for Tablet

- The granules developed in this this study were were evaluated to ensure that they meet the specified formulation criteria. (e.g.,practicle size, dissolution rate,stability,etc,).
- Based on the results obtained from the tests, it is confirmed that the granules prepared according to the formula 3 comply with the formulation.
- 40 tablets for 250mg were prepared.

Compression Process:

The formulation consisted of ethanolic extract of leaves of Calotropis gigantea Linn in defined proportions. Wet granulation was performed Magnesium stearate was used as a lubricant. Tablets were compressed with a target weight of 250mg each.

Image No. 4 Compress Tablets

6. Evaluation Tests of Tablet Formulation:

Tablets prepared by compression method were evaluated for General Appearance, Weight Variation, Thickness of Tablet, Hardness of Tablet, Friability, Disintegration time, dissolution test as per IP.

6.1 General Appearance:

Consumer acceptability, lot-to-lot uniformity control, and tablet-to-tablet uniformity are all dependent on a tablet's overall look, identity, and general elegance. Measurements of size, form, color, taste, odor, and other elements

are all part of controlling overall appearance.

6.2 Size & Shape:

It is controllable and dimensionally characterized. A tablet's thickness is only one of several factors. A micrometer or another equipment can be used to measure the thickness of a tablet. Tablet thickness needs to be managed within a standard value fluctuation of ± 5%.

6.3 Organoleptic properties:

Color distribution must be uniform with no mottling. For visual color comparison compare the color of sample against standard color.

6.4 Hardness:

A tablet needs to be strong enough to endure mechanical shaking during manufacturing, packing, and delivery, as well as resistant to friability. In general, hardness indicates how strong a tablet can be crushed.

6.5 Friability:

A Roche friabilator can be used in a lab to test a tablet's friability. This is made out of a plastic chamber that spins at 25 rpm and drops the tablets into the friabilator six inches away. The friabilator then runs for 100 revolutions. We weigh the pills once aqain. Tablets that compress to less than 0.1 to 0.5% of their original weight are deemed acceptable.

6.6 Weight Variation test:

10 tablets should be taken and weighed separately. Compute the mean weight and contrast each tablet's weight with the mean. If no more than two tablets deviate from the % restriction and if no tablet varies by more than twice the percentage limit

6.7 Disintegration Test:

A 1-liter beaker of water, simulated gastric fluid, or simulated intestinal fluid at 37 ± 20 °C is used to hold the basket rack while one tablet is placed inside each of the six 3-inch glass tubes with 10 mesh screens at the bottom end and an open top. The tablet should remain 2.5 cm below the liquid's surface during its upward movement and should not come any closer to the beaker's bottom during its downward movement. Move the tablet-containing basket up and down at a rate of 28 to 32 cycles per minute acrossa distance of 5 to 6 cm. Placing perforated plastic disks on each tablet can stop it from floating. The tablet needs to break down and all of the particles need to get through the 10 mes within the allotted time, according to the any residue is left, it ought to be soft in texture. Breakdown duration:

Tablets without coating: 5-30 minutes; tablets with coating: 1-2 hours.

6.8 Dissolution Test:

The dissolution apparatus is crucial for ensuring the quality, efficay, and safety of oral dosage forms. It stimulates gastrointestinal conditions to predict the release and bioavailability of active pharmaceutical ingredients, ensuring consistency between batches and supporting formulation development

Results:

The research successfully transformed bioactive components from Calotropis gigantea into a standardized solid dosage form. The key findings from the evaluation are as follows:

Phytochemical Analysis: Confirmed the presence of essential bioactive compounds, including flavonoids, cardiac glycosides, alkaloids, and triterpenoids..

Obeservation Tabel of Organoleptic Properties of Caloropis Gigantea leaves:

Sr. No	Features	Observations
1	Shape	elliptic-oblona
2	Width	8-12 cm
3	Length	10-15cm
4	Color	Green
5	Odour	Toxic
6	Taste	bitter

Table No. 11 Observations

Obeservation Tabel of Evaluation Tests of Formulation:

Around 40 tables were prepared and pharmaceutically evaluated. The results observed are as follows

Sr. No.	Tests	Results
1	Avg. Weight (mg)	255
2	Thickness (mm)	3.2
3	Hardness (kg/mm)	4.2
4	Friability (%)	0.86
5	Disintegration time (min)	25-35
6	Dissolution Test (min)	30 min

Table No. 12 Obeservation

Conclusion:

The study concludes that a stable and cost-effective herbal tablet was successfully developed while preserving the therapeutic integrity of Calotropis gigantea. This standardized formulation offers a promising natural alternative to conventional synthetic drugs specifically for asthma management. The research provides a scientific basis for further clinical investigations into the long-term safety and efficacy of these tablets. By moving from traditional "Arka" (powders) to a modern unit dosage form, the study ensures better precision dosing, stability, and patient compliance by masking the plant's naturally bitter taste.

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