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Research Article

Formulation and Evaluation of a Tablet by Using *Nyctanthes Arbor-tristis* Leaves

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ABSTRACT

Nyctanthes arbor-tristis, popularly known as Parijatak or night jasmine, is a medicinal plant of great importance in India. The present study involves the formulation and evaluation of a tablet containing leaf extract of *Nyctanthes arbor-tristis*. Using the phytoconstituents found in the leaf extract, formulate a tablet that is stable, efficient, and standardized. Aqueous extraction produced the extract, and phytochemical screening verified the presence of nyctanthic acid, alkaloids, flavonoids, glycosides, and tannins. Utilizing appropriate pharmaceutical excipients, tablets were created using the wet granulation process. Pre-compression and post-compression parameters, including angle of repose (35°), bulk density (0.60), hardness, friability, weight variation, and disintegration time of drug content, were assessed for the produced tablets. The release profile of the active ingredients was ascertained using in vitro dissolution investigations. The optimized batch of formulations met pharmacopoeial requirements, exhibiting uniform release profiles and excellent physicochemical properties. The present study sets the stage for future pharmacological and clinical studies, showcasing the potential of *Nyctanthes arbor-tristis* leaf extract in the development of potent herbal pills. The combination offers a viable substitute for incorporating conventional herbal treatments into contemporary pharmaceutical dosage forms.

INTRODUCTION

Due to their cultural acceptance, low side effects, and therapeutic effectiveness, herbal medicines have garnered considerable attention worldwide. Traditional medicinal plants must be included into contemporary pharmaceutical dosage forms in order to increase shelf life, ensure dosage

accuracy, and promote patient compliance. Commonly referred to as Night Jasmine or Parijatak, *Nyctanthes arbor-tristis* Linn. is a plant with a long history of use in Ayurvedic and traditional Indian medicine. Many parts of the plant, particularly the leaves, are said to have

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anthelmintic, hepato-protective, antioxidant, antipyretic, and anti-inflammatory qualities ^[1].

Its extensive phytochemical composition, which includes flavonoids, iridoid glycosides, tannins, and alkaloids, is responsible for the pharmacological actions of *N. arbor-tristis*. Even though its leaf extract has several medical uses, there hasn't been much progress in creating standardized, scientifically tested dosage forms. Herbal actives can be delivered precisely and efficiently with tablet formulation, which is both handy and effective.^[2]

Techniques for extraction, excipient selection, formulation, and conventional assessment tests, such as physicochemical characterisation and in vitro drug release studies, are emphasized. By providing a scientific foundation for the integration of *Nyctanthes arbor-tristis* into contemporary phytopharmaceutical formulations, the goal is to advance the plant's medicinal potency through standardized dose forms. ^[3]

Plant Description:-



Fig. No. 01: Plant of *Nyctanthes Arbor-tristis*

- **Scientific Name:** *Nyctanthes arbor-tristis* Linn.
- **Common Names:** Night Jasmine, Parijatak, Coral Jasmine, Tree of Sorrow, Shefali, Harisinghar
- **Family:** Oleaceae

The fragrant white flowers with orange centers that bloom at night and fall by dawn are produced by *Nyctanthes arbor-tristis*. The picture depicts the fragile, star-shaped blossoms that are frequently found beneath the plant.^[1]

Plant Classification:

- **Kingdom:** Plantae
- **Division:** Magnoliophyta
- **Class:** Magnoliopsida
- **Order:** Lamiales
- **Family:** Oleaceae
- **Genus:** *Nyctanthes*
- **Species:** *N. arbor-tristis* ^[3]

Scientific Classification

- **Clade:** Angiosperms
- **Clade:** Eudicots
- **Order:** Lamiales
- **Family:** Oleaceae
- **Genus:** *Nyctanthes*
- **Species:** *Nyctanthes arbor-tristis* L ^[3]

Medicinal Benefits:-

1. **Antipyretic (Reduces Fever):** Traditional uses for leaf decoctions include reducing sporadic and chronic fevers, such as those caused by dengue and malaria. Functions as a natural substitute for artificial antipyretics.^[4]
2. **Analgesic and anti-inflammatory;** Efficient in lowering joint pain and inflammation. Used to treat sciatica (pain radiating along the sciatic nerve), arthritis, and rheumatism ^[5]
3. **Indigestion:** This plant helps enhance the Agni, leading to improved digestion due to its Deepan (appetizer) and Pachan (digestion) properties.
4. **Antioxidant:** Includes phenolic and flavonoid components, which are naturally

occurring antioxidants. Protects against the harm caused by free radicals and promotes overall health.

5. **Hepatoprotective:** It's possible that some extracts can support liver function and protect liver cells.
6. **Antidiabetic:** Leaf and floral extracts have antibacterial and antiviral properties. Good for small wounds and skin infections.^[6]
7. **Anti-Malarial activity:** It is used to control blood sugar levels, according to some research. used in conjunction with medical supervision as a supplement to help manage Type 2 diabetes.
8. **Antiviral and antibacterial:** Some studies have found that parijatak leaves are more beneficial for treating the symptoms of malaria. Parijatak leaves help alleviate malaria fever and reduce the concentration of parasites in the body. The leaves also reduce the inflammation caused by malaria significantly^[7]

MATERIALS AND METHODS

Materials:-

Nyctanthes arbor-tristis leaves were collected from the local area due to their antipyretic, analgesic, and anti-inflammatory activity to cure joint pain and arthritis.

The excipients used in the formulation are,

- Methylcellulose is used as a disintegrating agent
- Magnesium stearate is used as a lubricant
- Fructose is used as a diluent
- Talc is used as a lubricant and gives a pleasant appearance to the tablet
- Tragacanth and sodium alginate, these two excipients are used as a binder for the preparation of tablets by wet granulation

Methods:-

Step 1 Collection: The leaves of *Nyctanthes arbor-tristis* are collected from the local area

Step 2 Authentication: The leaves of *Nyctanthes arbor-tristis* were authenticated from the botany department of R. T. M. Nagpur University, Nagpur 440033



Fig. No. 02: Authentication

Step 3: Preparation of dry powder of leaves: Fresh leaves of *Nyctanthes arbor-tristis* are first collected, properly cleaned, and shade-dried to retain active ingredients before being ground into a dry powder for tablet manufacturing. The leaves are mechanically ground into a fine powder when they have completely dried, and the resulting uniform particle size is then sieved to make it appropriate for tablet compression.

Step 4: Extraction by the Percolation Method: *Nyctanthes arbor-tristis* leaf percolation: 50 g of coarsely ground, shade-dried leaves are wet with a 70:30 ethanol-water mixture and allowed to sit for four hours. A percolator is filled with the moistened powder, let to macerate for a full day, and then slowly percolated to collect the extract until it is completely gone. If necessary, the collected percolate can be concentrated in a water bath set between 45 - 50°C.

Step 5: Preparation of 1% (W/V) Tragacanth

Solution: Take 1 g of tragacanth and dissolve it in 100 ml of distilled water

Step 6: Preparation of 1% (W/V) sodium alginate:

Take 1 g of sodium alginate and dissolve it in 100 ml of ethanol

Step 7: Formulation of Tablet by using the Wet Granulation Method:

Dried *Nyctanthes arbor-tristis* leaf extract is combined with diluents and a binder solution to create a wet mass, which is subsequently granulated, dried, and combined with lubricants in the wet granulation process. A tablet press is used to compress the dried grains into tablets.

The tablet made with powdered *Nyctanthes arbor-tristis* leaves as the main active pharmaceutical ingredient (API) is detailed in the formulation table. The formulation was designed to ensure the optimal tablet properties, including disintegration, mechanical strength, content consistency, and patient compliance. Preliminary experiments and literature references served as the basis for the excipient selection and quantity

Table No. 01: Formulation Table

Sr. No.	Ingredient	Batch 1	Batch 2
1	<i>Nyctanthes arbor-tristis</i> leaves powder	2.5gm	2.5gm
2	Magnesium stearate	2gm	2gm
3	Talc	1gm	1gm
4	Fructose	5gm	5gm
5	Tragacanth	1gm	-
6	Sodium alginate	-	1gm

Pre-formulation study:-

The purpose of the pre-formulation research was to determine whether *Nyctanthes arbor-tristis* leaves powder was suitable for tablet formulation and to analyse its physicochemical characteristics. Material preparation involved collecting, cleaning,

and ten days of shade drying *Nyctanthes arbor-tristis* leaves. A mechanical grinder was used to grind the dried leaves into a homogeneous powder, which was then sieved through a #60 mesh.^[8]

Angle of Repose

The angle of repose is the greatest angle that can be established between a powder pile's surface and the horizontal plane. Particularly for solid dosage forms like tablets, it is a crucial measure for evaluating the flow characteristics of powders during pre-formulation investigations.

Formula,

$$\theta = \tan^{-1} \frac{h}{r}$$

where,

- θ = angle of repose
- h = height of the pile
- r = radius of the pile base

Bulk Density

The mass of powder per unit volume, including interpartical spacing, is known as bulk density. It is an important pre-formulation characteristic that affects tablet weight homogeneity, compaction, and powder flow.

Formula,

$$\text{Bulk Density} = \frac{\text{Mass of Powder (g)}}{\text{Bulk Volume (cm}^3\text{)}}$$

Tapped Density

The mass of the powder divided by its volume after it has been mechanically tapped until a consistent volume is reached is known as the "tapped density." It measures the powder's packability and is used to evaluate compressibility, which is important when creating tablets.



Formula,

$$\text{Tapped Density} = \frac{\text{Mass of Powder (g)}}{\text{Tapped Volume (cm}^3\text{)}}$$

Carr's Index

Carr's Index gauges a powder's flowability and compressibility. A common method for estimating the rate at which a powder can be converted into tablets is to calculate it using bulk and tapped densities.

Formula,

$$\text{Carr's Index} = \frac{\text{Tapped density} - \text{Bulk density}}{\text{Tapped density}} \times 100$$

Hausner's Ratio

Hausner's Ratio is the ratio of tapped density to bulk density. It is an indicator of powder flowability and cohesiveness. Lower values indicate better flow.

Formula,

$$\text{Hausner's Ratio} = \frac{\text{Tapped density}}{\text{Bulk density}}$$

Evaluation of Tablet:-

Appearance:

- Colour
- Shape
- Size

2. Weight variation test:

Twenty tablets are chosen at random and weighed one at a time. To determine if a tablet is within the acceptable ranges according to the standards of the pharmacopeia, the average weight is determined and compared to the average weight of each tablet.

Acceptance Criteria (IP):

- For tablets < 80 mg: $\pm 10\%$
- For tablets 80–250 mg: $\pm 7.5\%$
- For tablets > 250 mg: $\pm 5\%$.

3. Hardness (strength of crushing):

- **Device:** Pfizer, Monsanto, and Digital Hardness Tester
- **Range:** 4–8 kg/cm²

4. Thickness:

- **Instrument:** Vernier caliper

5. Friability test:

In a Roche friabilator, twenty pre-weighed tablets are rotated for four minutes at 25 rpm (100 revolutions). The % weight loss is then determined by reweighing the tablets. A weight loss of no more than 1% is considered friable

6. Disintegration time:

At $37 \pm 0.5^\circ\text{C}$, six tablets are put in the disintegration test device with distilled water. The amount of time it takes for every tablet to fully disintegrate into particles small enough to fit through the mesh screen is noted. The dissolution period for uncoated tablets shouldn't be longer than fifteen minutes.

RESULTS

Table for Extract of *Nyctanthes Arbor-tristis* Leaves

Table No.01: Organoleptic characteristics of aqueous extract

Sr. No.	Characteristics	Observations
1	Colour	Dark Green
2	Odour	Slightly pungent
3	pH	4
4	Consistency	Slightly sticky
5	% Yield	33.42%



Table for Pre-formulation study**Table No.02: Pre-formulation study**

Sr. No.	Parameter	Standard	Result
1	Angle of Repose	31-35	35
2	Bulk density	0.4 – 0.8 g/mL	0.60
3	Tapped density	0.30 – 0.60g/mL	0.50
4	Carr's index	11% and 15%	13%
5	Hausner's ratio	≤1.25	1.20

EVALUATION OF TABLET**Table No.03: Evaluation of the formulated table**

Sr. No.	Parameter	standard	Batch 1	Batch 2
1	Colour	Greenish-white	Dark Greenish	greenish-white
2	Shape	Round, flat	Round	Round
3	Weight variation test	±5%	497±5%	505±5%
4	Hardness test	4-6 kg/cm ²	2.3±0.16	2.17±0.0
5	Thickness	2.5-4.0	2.4	2.9
6	Friability	≥1 %	0.16%	0.24%
7	Disintegration time	>15min	10 min	13 min

The above table shows that research on the formulation and evaluation of the tablets was done successfully, and these tablets can be useful to manage Inflammation as well as Arthritic pain.

CONCLUSION

It was successfully possible to formulate and evaluate tablets utilizing the leaves of *Nyctanthes arbor-tristis*. The produced tablets exhibited acceptable physical characteristics, including hardness, friability, and disintegration time. The presence of active ingredients was verified through phytochemical analysis, as reported in the literature review. Overall, the study demonstrates that *Nyctanthes arbor-tristis* leaves have the potential to be used in the manufacture of strong herbal pills.

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