International Journal on Science and Technology (IJSAT)

E-ISSN: 2229-7677 ● Website: www.ijsat.org ● Email: editor@ijsat.org

Formulation and Evaluation of Parijatak -Based Polyherbal Cough Tablets

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Abstract:

Cough is one of the most common respiratory problems associated with throat irritation, cold, bronchitis, allergies, and respiratory tract infections. Synthetic cough medications may produce side effects such as drowsiness, dizziness, and gastrointestinal disturbances after prolonged use. Therefore, herbal formulations are gaining importance due to their natural origin, safety, effectiveness, and better patient compliance. The present study focuses on the formulation and evaluation of a Parijatak-based herbal cough tablet intended for symptomatic relief from cough and throat irritation. Parijatak leaves are traditionally used in Ayurveda for the treatment of cough , fever, inflammation, cold, and respiratory disorders because of their expectorant, anti-inflammatory, antimicrobial, and antioxidant properties. In this formulation, Parijatak leaf powder was selected as the primary active ingredient and combined with other herbal excipients to enhance therapeutic activity and tablet stability. The herbal ingredients were cleaned, shade dried, pulverized, and passed through suitable sieve sizes before formulation. The tablets were prepared by the direct compression method using Parijatak leaf powder along with suitable excipients such as binder, diluent, lubricant, and sweetening agents to improve tablet hardness, stability, and palatability. The prepared tablets were evaluated for various pre-compression and post-compression parameters including angle of repose, bulk density, tapped density, Carr's index, Hausner ratio, weight variation, hardness, friability, thickness, disintegration time, and drug content uniformity. The tablets possessed adequate hardness, low friability, uniform weight distribution, and appropriate disintegration time, indicating good mechanical strength and stability. The study concludes that Parijatak-based herbal cough tablets can be successfully formulated using suitable pharmaceutical excipients and may serve as an effective, economical, and safer alternative to synthetic cough remedies. The formulation has promising therapeutic potential for the management of cough and throat irritation and can be further evaluated through advanced pharmacological and clinical studies for commercial herbal product development.

INTRODUCTION:

Coughing excessively may indicate the presence of an illness. There are non infectious causes of cough in addition to viral diseases like the common cold, coughing repeatedly causes discomfort and inflammation. Categorization of cough : Depending upon two kinds,

1)Dry Cough : This type of cough occurs when the throat's mucus content is low or nonexistent. A dry cough typically feels like a tickle in your throat and doesn't generate any mucus or phlegm. Because it doesn't clear anything from your throat or lungs.
B) Wet cough: This type of cough is brought on by phlegm or mucus. Wet coughs are caused by infections such as the flu, common colds, and chest infections.

Introduction of Herbal Tablets : Herbal tablets are solid pharmaceutical dosage forms prepared by compressing or molding herbal powders, extracts, or granules into a convenient and stable form for oral administration. These tablets contain one or more medicinal plant materials along with suitable pharmaceutical excipients such as binders, diluents, lubricants, disintegrants, and flavoring agents. Herbal tablets are widely used in traditional as well as modern systems of medicine due to their therapeutic effectiveness, natural origin, and minimal side effects.Since ancient times, medicinal plants have played an important role in the treatment and prevention of various diseases. Traditional systems of medicine such as Ayurveda, Siddha, Unani, and Traditional Chinese Medicine have extensively utilized herbal preparations for maintaining health and curing illnesses. In recent years, the global demand for herbal medicines has increased significantly because people are becoming more aware of the adverse effects associated with synthetic drugs and are shifting towards safer and natural healthcare products.Herbal tablets provide several advantages over conventional herbal preparations like decoctions, powders, and syrups. Tablets offer accurate dosage, ease of administration, improved patient compliance, portability, better stability, and longer shelf life. They are easy to package, transport, and store. In addition, tablets mask the unpleasant taste and odor of herbal drugs, thereby improving patient acceptability. Due to these advantages, herbal tablets have become one of the most preferred dosage forms in the pharmaceutical industry.

The formulation of herbal tablets involves several important steps including selection and authentication of plant materials, drying, size reduction, extraction, granulation, blending with excipients, compression, and evaluation. Proper formulation techniques are essential to ensure uniformity, stability, hardness, friability, disintegration, dissolution, and therapeutic efficacy of the final product. The quality of herbal tablets mainly depends on the purity of herbal ingredients and the manufacturing process used during formulation.

Herbal tablets are used for the treatment of a wide range of diseases such as cough, cold, fever, diabetes, arthritis, digestive disorders, respiratory infections, liver diseases, and immune-related conditions. Medicinal plants contain various bioactive compounds such as alkaloids, flavonoids, glycosides, tannins, terpenoids, saponins, and phenolic compounds that exhibit pharmacological activities including anti-inflammatory, antimicrobial, antioxidant, antipyretic, analgesic, and expectorant effects.

TYPES OF HERBAL TABLET : Herbal tablets are classified based on their method of preparation, release characteristics, and therapeutic use. The major types of herbal tablets are as follows:

1. Compressed Herbal Tablets :These are the most common types of herbal tablets prepared by compressing herbal powder or granules using a tablet compression machine. They contain active herbal ingredients along with excipients like binders, lubricants, and disintegrants.
2. Sugar-Coated Herbal Tablets : These tablets are coated with a layer of sugar to mask the bitter taste and unpleasant odor of herbal drugs. The coating also improves appearance and patient acceptability.
4. Chewable Herbal Tablets : These tablets are intended to be chewed before swallowing. They are commonly used for pediatric and geriatric patients.
5. Effervescent Herbal Tablets : Effervescent tablets contain herbal ingredients along with acids and bicarbonates that release carbon dioxide when dissolved in water.
6. Buccal Herbal Tablets :These tablets are placed between the cheek and gum where the drug is absorbed through the buccal mucosa.
7. Sublingual Herbal Tablets :These tablets are placed under the tongue for rapid absorption into the bloodstream.
8. Lozenges :These are flavored herbal tablets designed to dissolve slowly in the mouth and provide local action in the throat.
9. Sustained Release Herbal Tablets :These tablets release the herbal drug slowly over an extended period of time.
10. Enteric-Coated Herbal Tablets :These tablets are coated with a special material that prevents drug release in the stomach and allows release in the intestine.

Advantages of Herbal Tablets:

1) Natural Origin :Herbal tablets are prepared from medicinal plants and natural ingredients, making them safer and more acceptable to many patients.
2) Fewer Side Effects :Compared to synthetic medicines, herbal tablets generally produce fewer adverse effects when used properly.
3) Easy Administration :Tablets are convenient to carry, handle, and consume, improving patient compliance.

4) Accurate Dosage :Each tablet contains a fixed quantity of herbal ingredients, ensuring dose uniformity.
5) Better Stability : Herbal tablets have a longer shelf life and better stability than liquid herbal formulations such as syrups and decoctions.Tablets are compact and easy to transport, making them suitable for daily use.

Disadvantages of Herbal Tablets :

1) Slow Onset of Action :Herbal tablets may act more slowly than synthetic medicines because natural compounds often require longer absorption time.
2) Variation in Herbal Ingredients :The chemical composition of medicinal plants may vary depending on climate, soil, harvesting, and storage conditions.
3) Difficulty in Standardization :Standardizing herbal formulations is challenging due to the presence of multiple active constituents.
4) Large Dose Requirement :Some herbal drugs require higher quantities to produce therapeutic effects, resulting in larger tablet size.
5) Poor Taste and Odor :Certain herbal ingredients possess bitter taste or strong odor which may affect patient acceptance.
6) Delayed Therapeutic Effect :Herbal medicines often require prolonged use to achieve noticeable results.

LITERATURE REVIEW (with Author & Year)

1) Khatune et al. (2003) reported that Nyctanthes arbor-tristis leaves exhibit significant anti-inflammatory and antipyretic activity, supporting its use in respiratory disorders like cough.
2) Rathee et al. (2007) demonstrated that Parijatak contains flavonoids and glycosides responsible for its antitussive and bronchodilatory effects.
3) Gautam and Goel (2014) reviewed polyherbal formulations and concluded that combining medicinal plants provides synergistic effects and enhanced therapeutic efficacy in cough management.
4) Kumar et al. (2011) studied herbal cough tablets and reported that solid dosage forms offer better stability, accurate dosing, and improved patient compliance compared to liquid formulations.
5) Dhuley (1999) found that Adhatoda vasica (Vasa) has strong expectorant and bronchodilator activity, making it a key component in cough remedies.
6) Sharma et al. (2010) reported that Glycyrrhiza glabra (Mulethi) exhibits demulcent and anti-inflammatory effects, which help soothe irritated respiratory mucosa.
7) Prakash and Gupta (2005) highlighted that Ocimum sanctum (Tulsi) possesses antimicrobial and immunomodulatory properties, beneficial in treating cough due to infections.
8) Aulton (2007) emphasized the importance of pre-compression parameters like angle of repose and bulk density in ensuring proper flow properties for tablet formulation.
9) Lachman et al. (2009) described evaluation parameters such as hardness, friability, and disintegration time as essential quality control tests for tablet dosage forms.
10) ICH Guidelines (2005) recommend stability studies under controlled conditions to ensure the safety, efficacy, and shelf-life of pharmaceutical formulations, including herbal tablets.
11) Nadkarni (2002) documented that Nyctanthes arbor-tristis leaves are traditionally used in Ayurveda

for chronic cough, bronchitis, and asthma due to their therapeutic properties.

12) Khandelwal (2008) reported that phytochemical constituents like alkaloids, tannins, and flavonoids present in medicinal plants contribute significantly to antitussive activity.

13) Trease and Evans (2009) explained that herbal drugs containing saponins and glycosides exhibit expectorant properties, useful in clearing respiratory tract mucus.

14) Harborne (1998) highlighted the role of flavonoids as potent anti-inflammatory and antioxidant agents, helping in reducing cough caused by irritation.

15) Kokate et al. (2010) emphasized the importance of standardization of herbal formulations

16) Chopra et al. (2006) described the use of various medicinal plants in Indian traditional medicine for respiratory ailments and cough suppression.

Aim and Objectives :

Aim : "To formulate and evaluate Parijatak based herbal cough tablets."

Objectives :

1) To prepare herbal cough tablets using Parijatak leaves powder/extract.
2) To evaluate preformulation parameters.
3) To evaluate post-compression parameters.
4) To study effectiveness and stability of formulation.
5) To formulate herbal cough tablets using Parijatak leaves powder/extract.
6) To prepare a safe, effective, and stable herbal dosage form for cough management.
7) To study the medicinal and antitussive properties of Parijatak leaves.
8) To evaluate the preformulation parameters of the herbal powder blend such as:
9) To evaluate the post-compression parameters of prepared tablets including:
10) To determine the physical stability and quality of the herbal tablets.
11) To improve patient compliance by developing an easy-to-administer herbal tablet dosage form.
12) To develop an economical herbal formulation with minimal side effects compared to synthetic cough medicines.
13) To analyze the therapeutic potential of Parijatak in respiratory disorders such as cough and throat irritation.
14) To standardize the formulation and evaluation parameters for herbal cough tablets.

MATERIAL AND METHODS :

INGREDIENTS	ROLE
Parijatak Leaves Powder	Antitussive , Anti inflammatory
Tulsi Powder	Expectorant ,Antimicrobial and immunity booster
Mulethi Powder	Soothing Agent , Cough Supressant
Ginger Powder	Antioxidant , Anti inflammatory
Piper Longum	Expectorant , Respiratory Stimulant
Acacia	Binder
Lactose	Diluent
Talc	Glidant
Magnesium Stearate	Lubricant

1. **Selection of Raw Materials:** Select dried, mature, authenticated leaves of herbs. Ensure all raw drugs comply with identity, purity, and quality standards.
2. **Cleaning:** Remove foreign matter like dust, dirt, stones, fibers, or insect-damaged parts as per API standards.
3. **Drying:** Shade-dry each fruit separately to preserve heat-sensitive constituents .Moisture content should be within pharmacopoeial limit (<10%).
4. **Size Reduction:** Break fruits into small pieces.Grind each fruit separately to obtain a coarse powder.

1) PARIJATAK LEAVES : Parijatak is a well-known medicinal plant widely used in Ayurveda and traditional medicine. It is commonly called Night-flowering Jasmine or Harsingar. The leaves of Parijatak possess significant medicinal properties and are extensively used for the treatment of cough, fever, arthritis, asthma, and various inflammatory disorders.

MACROSCOPIC CHARECTERS OF PARIJATAK LEAVES :
Shape : Ovate to elliptic
Colour : Dark green
Margine : Slightly Serrated
Odour : Mild
Taste : Bitter
COMMON NAME :
Botanical Name : Nyctanthes arbor- tristis
Marathi Name : Prajakta / Parijatak
Hindi Name : Harsingar
English Name : Night -Flowering Jasmine
Chemical Constituents Present in Leaves:
Parijatak leaves contain several bioactive phytochemicals such as:
Alkaloids ,Flavonoids, Glycosides,Tannins,Saponins,Phenolic compounds ,Essential oils ,Iridoid glycosides .These constituents are responsible for the therapeutic activities of the plant.

Pharmacological Activities of Parijatak Leaves :
1. **Antitussive Activity :**Helps reduce cough and throat irritation.
2. **Anti-inflammatory Activity :**Reduces inflammation and swelling.
3. **Antimicrobial Activity :**Acts against bacteria and microorganisms causing infections.
4. **Antioxidant Activity :**Protects cells from oxidative stress and free radical damage.
5. **Antipyretic Activity :** Helps reduce fever.
6. **Analgesic Activity :** Provides relief from pain and body ache.
7. **Immunomodulatory Activity :** Supports and improves immune function.

2) TULSI : Tulsi is a highly valued medicinal and aromatic herb in Ayurveda. It is considered the "Queen of Herbs" because of its wide therapeutic uses. Tulsi is commonly grown in Indian households and temples due to its medicinal as well as spiritual importance.
It is mainly used for:Cough and cold ,Fever ,Respiratory disorders ,Immunity boosting ,Stress relief ,Digestive problems

MACROSCOPIC CHARECTERS OF TULSI LEAVES:
Shape : Ovate
Colour : Green to purple green
Margine : Slightly Serrated **Odour :** Strong , pleasant, aromatic **Taste :** Bitter

COMMON NAME :
Botanical Name : Ocimum Sanctum / tenuiflorum
Marathi Name : Tulas
Hindi Name : Tulsi
English Name : Holy basil / sacred basil

PHARMACOLOGICAL ACTIVITY OF TULSI :
1) Antitussive Activity : Helps relieve cough and throat irritation
2) Expectorant Activity : Helps remove mucus from respiratory tract
3) Antimicrobial Activity : Active against bacteria, fungi, and some viruses
4) Anti-inflammatory Activity : Reduces inflammation and swelling
5) Antioxidant Activity : Protects cells from oxidative stress and free radicals **6)Immunomodulatory Activity :** Enhances body immunity and resistance **7)Antipyretic Activity :**Helps reduce fever
8) Analgesic Activity : Provides mild pain relief
9) Antiasthmatic Activity : Useful in asthma and bronchial disorders **10)Adaptogenic Activity :** Helps body cope with stress **11)Antidiabetic Activity :** Helps in lowering blood glucose levels **12)Cardioprotective Activity :**Supports heart health

13) **Hepatoprotective Activity :**Protects liver from toxic damage
14) **Antiulcer Activity :** Helps prevent gastric ulcers
15) **Anticancer Activity :** Shows potential anticancer properties due to antioxidants

TYPES OF TULSI :

1) **Rama Tulsi – Green leaves**
2) **Krishna Tulsi – Purple leaves**
3) **Vana Tulsi – Wild variety**

3) **MULETHI :** Mulethi is a well-known medicinal herb widely used in Ayurveda, Unani, and traditional medicine systems. It is mainly used for cough, sore throat, gastric ulcers, and respiratory disorders due to its soothing and expectorant properties.

MACROSCOPIC CHARECTERS OF MULETHI :

Shape : Cylindrical
Colour : Yellowish brown externally
Margine : Serrated **Odour :** Charecteristic **Taste :** Sweet

COMMON NAME :

Botanical Name : Yashtimadhu
Marathi Name : Jesthamadh
Hindi Name : Mulethi
English Name : Licorice

PHARMACOLOGICAL ACTIVITY OF MULETHI :

1) **Antitussive Activity :** Helps suppress cough and relieves throat irritation
2) **Anti-inflammatory Activity :**Reduces inflammation and swelling
3) **Antioxidant Activity :** Protects cells from oxidative stress and free radicals
4) **Antimicrobial Activity :** Active against bacteria and fungi
5) **Demulcent Activity :**Produces soothing effect on mucous membranes
6) **Antiallergic Activity :** Helps reduce allergic reactions
7) **Antispasmodic Activity :**Relieves muscle spasms.

4) GINGER POWDER : Sunth powder is the dried powder obtained from ginger rhizomes. It is widely used in Ayurveda and herbal medicine for treating cough, cold, indigestion, sore throat, nausea, and respiratory disorders. Sunth possesses warming, stimulant,expectorant,and anti-inflammatory properties.

MACROSCOPIC CHARECTERS OF GINGER :
Shape : Irregular powder form **Colour :** Light yellow to pale Brown **Texture :** fine and dry powder
Odour : Strong , aromatic , spicy smell
Taste : Pungent and warm
COMMON NAME :
Botanical Name : Zingiber officinale
Marathi Name : sunth
Hindi Name : Sonth
English Name : Dry ginger powder
PHARMACOLOGICAL ACTIVITY :

1. **Digestive Activity :**Helps improve digestion and relieves indigestion, bloating, and gas.
2. **Anti-inflammatory Activity :**Reduces inflammation and pain in arthritis and muscle disorders.
3. **Antitussive Activity :** Useful in cough and throat irritation.
4. **Antiemetic Activity :** Prevents nausea and vomiting.

5) PIPER LONGUM : Pippali is an important medicinal herb used in Ayurveda since ancient times. It is known for its strong rejuvenating, respiratory, and digestive properties. The dried spike-like fruits of the plant are mainly used in herbal medicines.It is one of the ingredients of the famous Ayurvedic formulation Trikatu, along with black pepper and dry ginger.

MACROSCOPIC CHARECTERS OF PIPPALI :

Shape : Cylindrical

Colour : Greyish black after drying **Texture :** fine and dry powder **Odour :** Aromatic , slightly spicy **Taste :** Pungent , hot spicy

COMMON NAME :

Botanical Name : Piper longum linn

Marathi Name : Pimpli

Hindi Name : Pippali

English Name : Long pepper

PHARMACOLOGICAL ACTIVITY OF PIPPALI

1. **Antitussive Activity :**Helps relieve cough and throat irritation.
2. **Expectorant Activity:** Removes mucus from respiratory tract.
3. **Antiasthmatic Activity :**Useful in asthma and breathing disorders.
4. **Digestive Stimulant :**Improves appetite and digestion.
5. **Antimicrobial Activity:**Acts against bacteria and fungi.

PREPRATION OF METHOD :

1. **Collection of Plant Materials :** The leaves of Nyctanthes arbor-tristis, Ocimum tenuiflorum, Piper longum and Zingiber officinale were collected from local market/herbal garden.

2. **Drying of Plant Materials :**

Fresh leaves were washed with distilled water.Materials were shade dried for 3–4 days at room temperature.Drying was continued until constant weight was obtained.Direct sunlight was avoided to prevent loss of active constituents.

3. **Prepration of powder :**

1. **Grinding of Herbs:** Grinding is the process of reducing the size of dried herbal materials into smaller particles or powder using mechanical force. Common Equipment Used Mortar and pestle ,Cutter mill ,Hammer mill ,Ball mill ,Pulverize**r**

Types of Grinding

1. Coarse grinding – Produces large particles
2. Moderate grinding – Produces medium-sized particles
3. Fine grinding – Produces very small particles or fine powder

Sieving : it is the process of separating powdered material into different particle sizes using sieves.Particles smaller than the sieve opening pass through the mesh, while larger particles remain on the sieve. Standard sieve set ,Mechanical sieve shaker

FORMULATION TABLE : The formulation was done by following the wet granulation process and further compression by tablet punching machine.

SR. NO	**INGREDIENTS**	**FORMULA 1** (500 mg)	**FORMULA 2 (400 mg)**	**FORMULA 3 (300 mg)**
1	Parijatak leaves powder	200 mg	160 mg	120 mg
2	Tulsi powder	75mg	60 mg	45 mg
3	Mulethi Powder	50 mg	40 mg	30 mg
4	Ginger powder	30 mg	24 mg	18 mg
5	Pippali powder	10 mg	8 mg	6 mg
6	Acacia	60 mg	48 mg	36 mg
7	Lactose	60 mg	48 mg	36 mg
8	Talc powder	10 mg	8 mg	6 mg
9	Magnesium Stearate	5 mg	4 mg	3 mg

PREPRATION OF HERBAL COUGH TABLET:

WET GRANULATION : Wet granulation is a tablet manufacturing process in which fine powder particles are converted into larger granules by using a granulating fluid or binder solution. The formed granules improve flowability, compressibility, and uniformity of tablets.In wet granulation, a binder solution is added to powder particles. The binder creates adhesion between particles and forms moist masses. These masses are converted into granules, dried, lubricated, and compressed into tablets.

1)WEIGHING THE INGREDIENTS : All herbal powders and excipients are weighed accurately according to formulation requirements.

2. DRY MIXING : All dry ingredients except lubricant and glidant are mixed thoroughly to obtain uniform distribution.

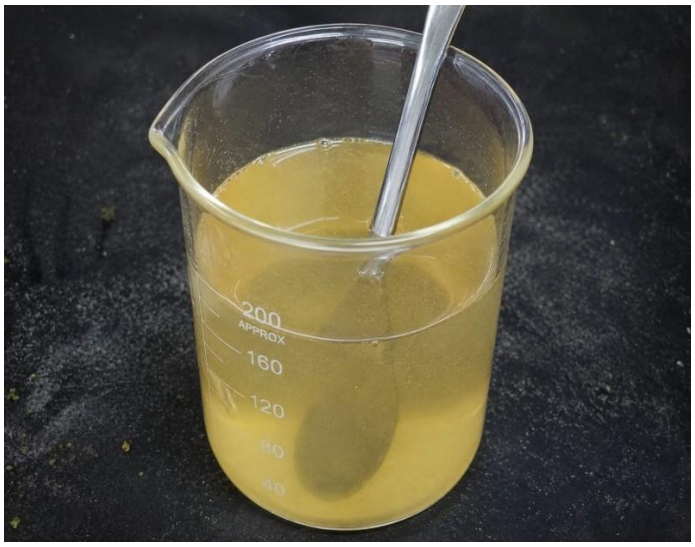
Procedure:

Pass powders through sieve no. 60. Transfer powders into mixing bowl. Mix for 10–15 minutes.

3. PREPRATION OF ACACIA SOLUTION :

Measure Water : Take about 70–80 mL of purified water in a clean beaker.Add Acacia Powder Slowly add the weighed acacia powder into the water with continuous stirring to avoid lump formation.

Stirring : Stir continuously using a glass rod or magnetic stirrer until the acacia disperses uniformly.



4. WET MASSING : The binder solution is added slowly to the dry powder mixture with continuous mixing until a cohesive damp mass is formed.

The mass should not be:

Too dry → weak granules Too wet → sticky granules

End Point of Wet Massing : A proper wet mass should form a ball when pressed in hand and should break easily.

5. SCREENING /WET SIEVING : The damp mass is passed through sieve no. 10 or 12 to produce wet granules .

6. DRYING OF GRANULES : Collect the wet granules obtained after passing the wet mass through sieve no. 10 or 12. Spread the wet granules uniformly on a clean stainless steel tray lined with butter paper or aluminum foil. Dry the granules in a hot air oven at 45–60°C for about 30–60 minutes or until the reuired moisture content is achieved.

7. LUBRICATION : Talc and magnesium stearate are added to the dried granules and mixed properly.

8.

11. COMPRESSION OF TABLET : The lubricated granules are compressed into tablets using a tablet punching machine.

EVALUATION TESTS :

1. Pre-compression Parameters (Granule Evaluation) :-

Performed before tablet compression.

a) Angle of Repose : Indicates flow property of granules. Formula: theta = tan -1 (h/r)

h =5.4 cm , r = 10cm

then, theta = tan -1 (5.4 /10) = 28.3 (good flow) (F1)

b) Bulk Density (Vb) : Ratio of mass to bulk volume. Formula:Mass of powder /bulk volume

M= 25g , Vb = 50 cm3 then , 25/ 50 = 0.50 cm3 (F1)

c) Tapped Density (Vt) : Measured after tapping the cylinder. Formula:Mass of powder /tapped volume

M=25g , Vt= 40 cm3 then ,25/40 = 0.625 g/cm3 (F1)

d) Carr's Index (Compressibility Index) : Indicates compressibility. Formula:Tapped density -bulk density / tapped density * 100

5–15% → Excellent ,25% → Poor

Then , 0.625-0.50 /0.625 *100 = 20% pass (F1)

e) Hausner's Ratio : Indicates flowability. Formula:Tapped density / Bulk density

<1.25 → Good flow ,1.5 → Poor flow Then, 0.625/0.50 =1.25 (good flow) (F1)

1. Post-compression Parameters :-

a) Appearance : Color, odor, shape, and surface texture. Important for herbal tablets due to natural variability.

b) Size and Thickness : Measured using vernier caliper,Ensures uniformity.

c) Weight Variation Test :20 tablets weighed individually.% deviation calculated.As per IP standards: ±5% for tablets >250 mg

Avrage tablet weight = 500 mg

Then,5% of 500 = 5*500/100 =25mg Upper limit: 500+25= 525mg

Lower limit : 500-25=475mg (pass) (F1)

d) Hardness Test : Measured using Monsanto or Pfizer hardness tester. Ideal: 4–8 kg/cm² (depends on formulation).

Take hardness of 5tablets

Average hardness = 4.5+5.0+5.5+5.2+4.8/5

=5.0 kg/cm2

e) Thickness Test : measure the of 5 tablets 3.2+3.3+3.5+3.4+3.3/5

=3.34mm

e) Friability Test : Done using Roche friabilator. Formula*: % Friability = W1-W2/ W1 *100 =6.50-6.45/6.50*100=0.76% pass*

Disintegration Test : Time taken for tablet to break into particles. For uncoated tablets: ≤ 15 minutes (IP)

f) Dissolution Test : Measures drug release in dissolution medium.Important for bioavailability.

PRE-FORMULATION PARAMETERS FOR HERBAL TABLET :

Sr.no	Parameters	Formula1	Formula 2	Formula 3
1	Angle of repose	28.3 (good flow)	26.2 (good flow)	23.8 (excellent)
2	Bulk density	0.50 g/cm3	0.526 g/cm3	0.543 g/cm3
3	Tapped density	0.625 g/cm3	0.641 g/cm3	0.667 g/cm3
4	Carr's ratio	20% (pass)	17.9%(good)	18.6%(good)
5	Hausner's ratio	1.25 (good flow)	121 (good)	1.23 (good)

POST-FORMULATION PARAMETERS FOR HERBAL TABLET :

Sr.no	Parameters	Formula 1	Formula 2	Formula 3
1	Weight Variation test	475-525mg (pass)	380-420mg (pass)	285-315mg (pass)
2	Hardness (kg/cm2)	4.5-5.5 kg/cm2	4.0-5.0 kg/cm2	3.5-4.5 kg/cm2
3	Thickness (mm)	3.2-3.5 mm	2.8-3.2mm	2.5-2.8 mm
4	Friability test	0.76%(pass)	0.66%(pass)	0.54%(pass)
5	Disintegration test	8-10 min	7-10 min	6-9 min
6	Dissolution test	45-50 min	30 min	25 min

STABILITY STUDY :

Stability studies evaluate how the quality of a polyherbal cough tablet changes with time under environmental factors like temperature, humidity, and light. Since herbal formulations contain multiple active phytoconstituents, they are more prone to degradation compared to synthetic drugs. Purpose:To ensure that the tablet maintains its:Identity,Strength (potency),Quality ,Purity ,Safety throughout its shelf life.

RESULT :

The dissolution study indicated that F3 showed faster drug release (within 25 minutes), followed by F2 (30 minutes) and F1 (45–50 minutes), demonstrating that drug release rate increases with decrease in tablet weight.

All formulations complied with pharmacopoeial standards for both pre-compression and post-compression parameters. Among the three, F3 (300 mg) showed comparatively better flow properties and faster drug release, making it a promising formulation for immediate cough relief.

DISCUSSION :

The present study focused on the formulation and evaluation of a Parijatak (Nyctanthes arbor-tristis) based cough tablet using suitable herbal excipients and conventional tablet manufacturing techniques.

The results obtained from pre-compression and post-compression parameters indicate that the developed formulation is pharmaceutically acceptable and therapeutically promising.

The pre-compression studies revealed that the prepared granules exhibited satisfactory flow properties, as indicated by the angle of repose, bulk density, tapped density, Carr's index, and Hausner ratio. The angle of repose values were found within acceptable limits (<30°), suggesting good flowability, which is essential for uniform die filling during compression.

The Carr's index and Hausner ratio further confirmed the compressibility and flow characteristics of the granules, indicating that the wet granulation method was effective in improving powder handling properties.The post-compression evaluation demonstrated that the tablets complied with pharmacopoeial standards. The weight variation test confirmed uniformity in tablet weight, indicating consistent die fill and proper granule flow. The hardness of the tablets was within the acceptable range, ensuring adequate mechanical strength to withstand handling, packaging, and transportation.

The disintegration time of the tablets was within the prescribed limit, ensuring that the tablet breaks down efficiently after administration, which is crucial for the prompt release of active constituents. The dissolution study further supported this observation, showing satisfactory drug release, which is important for achieving the desired therapeutic effect in cough management.The presence of Parijatak as a primary active ingredient contributes significantly to the therapeutic efficacy of the formulation due to its well-documented antitussive, anti-inflammatory, and antimicrobial properties. The incorporation of other herbalingredients such as Tulsi, Ginger, and Mulethi may have provided a synergistic effect, enhancing the overall effectiveness of the formulation in relieving cough and associated symptoms.

CONCLUSION:

The present study successfully focused on the formulation and evaluation of a Parijatak (Nyctanthes arbor-tristis) based cough tablet using suitable excipients and standard pharmaceutical techniques. The prepared tablets demonstrated acceptable pre-compression parameters such as angle of repose, bulk density, and compressibility index, indicating good flow properties of the granules. Post-compression evaluation showed that the tablets complied with pharmacopeial limits for hardness, friability, weight variation, and disintegration time, confirming adequate mechanical strength and uniformity.

The formulation exhibited satisfactory in vitro drug release, suggesting effective availability of the active herbal constituents. Stability studies indicated that the tablets remained physically and chemically stable under specified storage conditions, with no significant changes in appearance, hardness, or drug release profile.

Overall, the study highlights that Parijatak can be effectively formulated into a stable and efficient cough tablet with potential therapeutic benefits due to its traditional antitussive, anti-inflammatory, and antimicrobial properties. The developed formulation can serve as a promising alternative to synthetic cough remedies, with better patient compliance and fewer side effects. Further clinical studies are recommended to validate its efficacy and safety in human subjects.

FUTURE SCOPE:

The formulation and evaluation of Parijatak-based cough tablets open several avenues for further research and development. Future studies can focus on extensive clinical trials to establish the safety, efficacy, and dosage regimen in human subjects, which will strengthen its acceptance as a standardized herbal formulation.

Advanced research may explore optimization of formulation using novel techniques such as direct compression, nanoformulations, or sustained/controlled release systems to enhance bioavailability and therapeutic effectiveness. Standardization of the herbal extract using modern analytical techniques (HPLC, GC-MS) can also be carried out to ensure batch-to-batch consistency and identification of active constituents.

There is also scope for development of other dosage forms such as syrups, lozenges, or effervescent tablets to improve patient compliance, especially in pediatric and geriatric populations. Scaling up the formulation for industrial production and conducting cost-effectiveness analysis can help in commercialization.

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