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Formulation and Evaluation of Gummies for Cough

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ABSTRACT:
One of the most prevalent medical conditions impacting the general public is cough. Cough can be hard to treat, even when the cause is identified, and it can lower a patients quality of life. After seasonal change, cough and cold are the main problem that occurs mostly. People have taken a lot of artificially manufactured antitussive medication that may cause side effects. Cough can be soothed by liquids, lozenges, cough drops, vaporisers and hot showers. Cough medicine may also be helpful but it'srecommend to consult a doctor before giving it to child younger than 6 years old. Coughing is a reflexive defensive mechanism that clears fluids and foreign objects from the airways' bronchi and bronchioles. Antitussive medicines primarily treat dry, unpleasant, and bothersome coughs in patients; when administered as directed, they solely treat a single symptom and have no effect on the underlying cause. Vasaka (Justicia adhatoda) eases congestion in the chest, improves phlegm discharge, calms bronchial inflammation and open airways. Vasaka also functions as an expectorant (get rid of cough) and bronchodilator (open the lungs airways). Tulsi's (Ocimum santum) antitussive that is cough relieving and antiallergic qualities help to relieve and soothe the symptoms of cough and cold. Gummies are the chewable candies, when paired with clean, nutritious, well balanced diet they are an easy method to stay motivated towards wellness and health benefits. Therefore, the creation of gummy cough release products with the organic vasaka leaves (Justicia adhatoda) along with tulsi leaves (Ocimum santum) compounds as an antitussive is a solution to this disease .

Keywords: Cough, Bronchial inflammation, Antitussive, Phlegm discharge, Vasaka (Justicia adhatoda), Tulsi(Ocimum santum),Anti-allergic, Gummies, Chewable candies, bronchioles, reflexive defensive mechanism, lungs airways, lozenges, cough drops, vaporisers, hot showers.

I. INTRODUCTION:

Cough is a common health concern worldwide, affecting people in both developed and developing nations. Conditions like upper airway cough syndrome, GERD, asthma, and eosinophilic bronchitis are common causes, though in up to 42% of cases, no cause is identified. Chronic cough affects 3% to 40% of the population**.(1)** Though synthetic antitussive medications are widely used, they often lead to side effects. As a safer alternative, herbal remedies such as Vasaka (Justicia adhatoda), Tulsi (Ocimum sanctum), ginger (Zingiber officinale), black pepper, and Behada are gaining popularity due to their natural antitussive, expectorant, antibacterial, anti-inflammatory, and immune-boosting properties**.(2)** These herbs help relieve cough, clear mucus, reduce nasal discharge, and improve overall respiratory health. Chewable gummy formulations incorporating these herbs offer advantages over traditional preparations—being easy to consume, quick to act, and pleasant in taste**.(3)** The soft gel matrix dissolves easily in saliva, enhancing bioavailability. Additional ingredients like sweeteners, flavors, and honey serve as demulcents and improve palatability. These gummies present a convenient, effective, and natural alternative to manage cough and cold symptoms safely**.(4,13)**An attempt has been made to formulate gummy.

Gummies

Every age group finds gummies to be interesting, chewable, colorful, and flavorful. They are appealing to most people and easy to eat. Its vibrant appearance is primarily due to the use of artificial coloring, water, sugar, gelatin, and corn starch as its main ingredients(5,6). Orange, lemon, raspberry, and cherry are among the most widely used and well-liked flavors. Gummies have emerged as a recommended source of multivitamin supplements in recent years.(14,15) Since many

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vitamin syrups and tablets are unpalatable to both adults and children, they have emerged as a substitute source of multivitamins.(7,8) The newest craze in wellness supplements is gummies. Those who have trouble swallowing pills or find syrups to taste bad are particularly likely to experience it(11,12). Gummies have become more and more well-liked in the wellness and cosmetics sector. Multivitamins found in gummies can now be used to promote skin and hair regeneration.(9,10)

Materials And Methodology

One significant ayurvedic medication that is prescribed as an antitussive is the leaf of **Adhatoda Vasica (L.) (Acanthaceae)**, often known as **Vasaka**. The leaves contain quinazoline alkaloids, which have been shown to be active ingredients.

Collection of plant material

The leaves of **Adhatoda Vasica** were collected from the plants growing on our campus of Aiktc at Panvel Maharashtra (India). Extractions were made using the tender and fresh leaves of vasaka plants. Other plants were also procured from nearby market.

Fig. 1: Chemicals used for Gummies formulation

Preparation of crude plant extract

- **Preparation**: To get rid of dust and grime from the surface of the tender leaves of vasaka plants, they were taken off the plant and rinsed under running water.
- **Chopping**: Washed leaves were chopped into fine pieces.
- **Drying**: In order to preparation of extract from leaves, the chopped leaves were first dried in a hot air oven at 55°.
- **Grinding**: Then chopped dried leaves were crushed into a fine powder using motar and pestle.
- **Sieving**: To get uniformly sized sample powder, The powdered samples were passed through a sieving machine fitted with a 75 µ mesh size. Since smaller particles can release more extract, the powder was filtered by utilizing 75 µ mesh then used for the extraction procedure.
- **Decoction**: Place the powdered vasaka leaves in a beaker and add water. Use a ratio of about (1:10) 1 part of powder to 10 parts water.
- **Boiling**: Mixture was subjected to heat at 121° (15 lb pressure). After bringing the mixture to a boil, lower the heat and simmer it for an extended period of time usually 30 to 60 minutes. This allows the active compounds, including vasicine, to be extracted into the water.
- **Filtration**: After simmering, filter the liquid to remove the solid material. This can be done using a muslin cloth and squeezed in order to obtain juice out of it.
- **Concentration:** The filtrate can be further concentrated to reduce the volume of the solvent and increase the concentration of vasicine.
- **Storage:** Store the extracted liquid in a clean, airtight container, preferably in a cool, dark place.

Qualitative confirmation

To confirm that alkaloids were present in the extract, a qualitative examination of the samples was conducted. Alkaloid testing, Wavelength scan analysis, and TLC analysis were performed on each eluted sample. For various extract fractions, the kind of functional groups included in vasicine was determined using Fourier-transform infrared spectroscopic (FT-IR) analysis. The Mayer's and Wagner's tests were used to qualitatively evaluate the extract (vasicine) for the presence of alkaloids.

Fig 2: Drying of vasaka leaf

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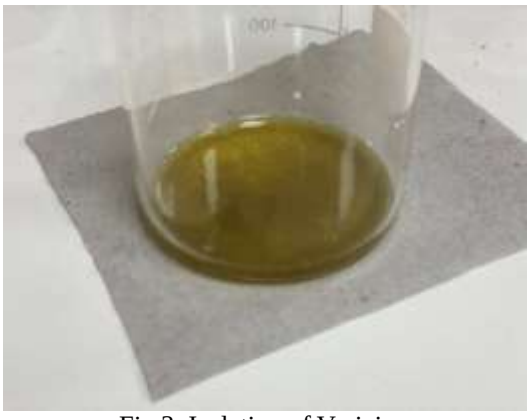

Fig 3: Isolation of Vasicine

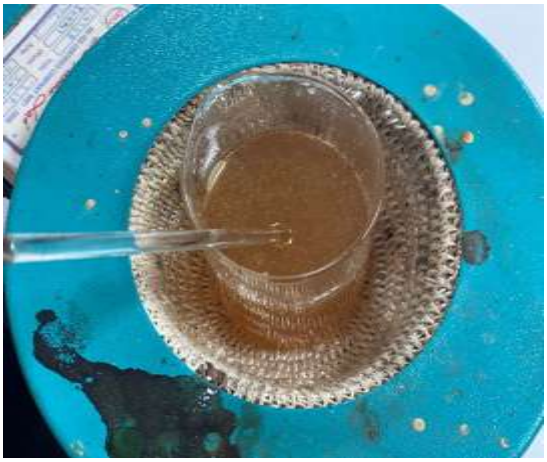

Fig 4: Mixing of ingredients

Fig 5: Pouring mixture in the mould for gummies

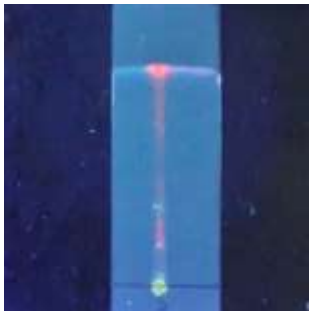

Fig 6: TLC of Vaska extract taken

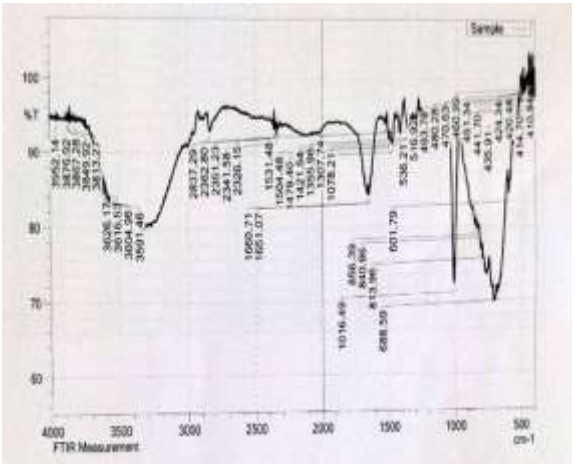

Fig 7: FT-IR spectrum of Vasaka extract taken

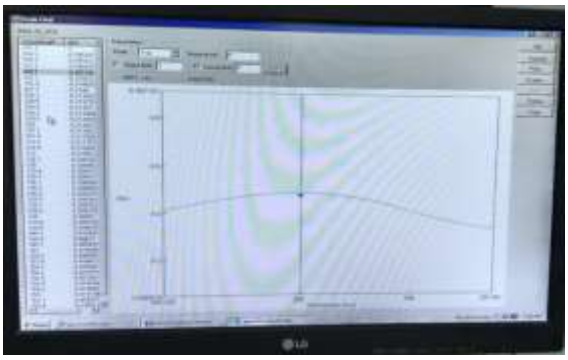

Fig 8: UV spectrum of Vasaka extract taken

FORMULATION OF GUMMIES:

Weighed quantities of selected ingredients were taken and extraction process was carried out. All phytoconstituents were mixed to get homogenous mixture. Additionally selected excipient solution was prepared and both mixtures were mixed by continuous stirring. And finally, solution was poured into the mould.**(16).**

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Batch 1

Sr. No.	Ingredients	Quantity	Formulation Challenge	Remark
1	Vasaka	6 g	Improper binding, Over fragile High moisture content	
2	Tulsi	2 g		
3	Behada	1.5-2 g		
4	Ginger	1.5-2 g		
5	Black Pepper	1.5-2 g		
6	Senna	0.9 g		
7	Agar	1 g		
8	Citric acid	0.25 g		
9	Honey	q.s		
10	Distilled water	q.s		

Table 1: Formulation design of Batch 1

Batch 2

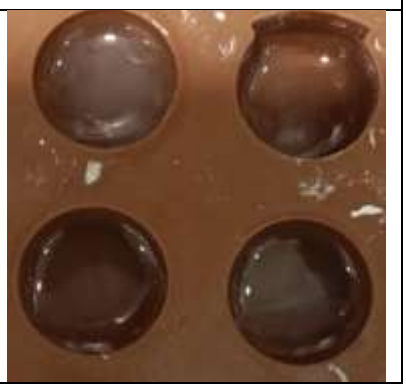
Sr. No.	Ingredients	Quantity	Formulation Challenge	Remark
1	Vasaka	6 g	Melting of gummies at room temperature and body temperature. Not completely vegan Improper shape formation	
2	Tulsi	2 g		
3	Behada	1.5-2 g		
4	Ginger	1.5-2 g		
5	Black Pepper	1.5-2 g		
6	Senna	0.9 g		
7	Gelatin	2 g		
8	Citric acid	0.25 g		
9	Honey	q.s		
10	Distilled water	q.s		

Table 2: Formulation design of Batch 2

Batch 3

Sr. No.	Ingredients	Quantity	Formulation Challenge	Remark
1	Vasaka	6 g	Hard texture Over binding Not easily chewable and breakable	
2	Tulsi	2 g		
3	Behada	1.5-2 g		
4	Ginger	1.5-2 g		
5	Black Pepper	1.5-2 g		
6	Senna	0.9 g		
7	Agar	4 g		
8	Citric acid	0.25 g		
9	Honey	q.s		
10	Distilled water	q.s		

Table 3: Formulation design of Batch 3

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Batch 4

Sr. No.	Ingredients	Quantity	Formulation Challenge	Remark
1	Vasaka	6 g	Sedimentation of turmeric powder After gummy formation, improper color distribution Bitter taste	
2	Tulsi	2 g		
3	Behada	1.5-2 g		
4	Ginger	1.5-2 g		
5	Black Pepper	1.5-2 g		
6	Senna	0.9 g		
7	Agar	4 g		
8	Turmeric	1 g		
9	Citric acid	0.25 g		
10	Honey	q.s		
11	Distilled water	q.s		

Table 4: Formulation design of Batch 4

Batch 5

Sr. No.	Ingredients	Quantity	Formulation Optimization	Remark
1	Vasaka	6 g	Proper gummy formation Easily chewable No bitter taste Uniformity in texture was observed Not fragile	
2	Tulsi	2 g		
3	Behada	1.5 g		
4	Ginger	1.5 g		
5	Black Pepper	1.5 g		
6	Senna	0.9 g		
7	Agar	2.5 g		
8	Starch	1 g		
9	Citric acid	0.25 g		
10	Honey	q.s		
11	Distilled water	q.s		

Table 5: Formulation design of Batch 5

II. RESULTS:

A stable gummy formulation was prepared and evaluated for various parameters as mentioned in the result table.

Sr. No.	Parameters	Result
1	Colour	Brownish
2	Shape	Round
3	Texture	Soft and smooth
4	Taste	Mild sweet
5	Moisture content	4.83%
6	pH	5.9 slightly acidic
7	Weight variation	4.77-5.49 g (within range)
8	Syneresis	Passed
9	Stability Studies	Passed

III. CONCLUSION:

The development of oral medicated gummies, which are easily absorbed by children, elderly patients, and patients with dysphagia, has led to the preference for patient-compliant dose forms over conventional ones.The current global interest in traditional medicine has sped up the development and study of numerous treatments used by different ethnic groups worldwide. Compared to brewed preparation, chewable gummy preparation of vasaka leaves and tulsi leaves have many advantages. They are convenient to use, easy to swallow, have acceptable and decent flavor and aroma and start working quickly. Formulation of

herbal gummies containing vasaka for the antitussive effect is the novel creation.

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