



Development and Formulation of Pineapple based Herbal Cough Syrup

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ABSTRACT: Herbal medicine is the application of fruit extracts for medicinal purposes; plants are the primary source of the majority of the ingredients in herbal syrup. Not only there different natural medicine dosages provided, but there are also syrup formulas. Nowadays, syrup is utilized to manage the symptoms of many different ailments. Since free radicals are created by the body as a result of oxidative reactions and a variety of stresses, antioxidant syrups are used to cure cancer. The pineapple extract adds flavor to the orange peel syrup, while the basil leaf extract acts as an antibiotic to prevent the formation of bacteria. Sugar and alcohol are employed as preservatives. Four formulations (designated as F1, F2, F3, and F4) were made using different amounts of sugar, alcohol, and syrup in the final volume. Parameters like as density, specific gravity, pH, and organoleptic properties were used to produce each formulation. The findings demonstrated that, in comparison to the other formulations, herbal syrup formulation (F2) is more elegant and stable.

Keywords: Pineapple, Tulsi, Syrup, Orange peel, Medicinal.

INTRODUCTION

Many different kinds of medications are available and are frequently administered in combination to control coughing. Before discussing the specific medication utilized, it is crucial to quickly go over the causes of coughing, how it contributes to illness, and whether or not it is desirable to suppress it. Humanity has relied on a variety of plant resources for food, clothing, shelter, and traditional medicine to treat a wide range of illnesses since prehistoric times (Amtul, 2022). In addition to suppressing the cough, cough medicines are used to ease the discomfort that comes with frequent coughing. Treatment for extra thoracic symptoms, such as fever, malaise, headaches, and back discomfort, may be necessary (Ana and Debra 2022).

Advantages of cough syrup - 1) Capacity to mask medicine's unpleasant taste 2) Only a portion of the drug dissolved in the syrup reaches the taste buds since syrups are thicker than aqueous solutions 3) The thick syrup keeps the remaining drug above the tongue, preventing flavor as it is ingested 4) Syrups have a sweet taste due to their high sugar content, which helps mask the unpleasant taste of the medication 5) Syrups are frequently used for pediatric treatments because of this. Additionally, the viscous quality of syrups calms inflamed tissues (Anu and Vivek 2016).

Disadvantage of cough syrup - 1) Unsuitable for use in emergencies or on unconscious patients 2) Inability to accomplish precise dosing unless the suspension is

packed in unit dosage forms 3) Similar microbiological contamination occurs when preservation is not added in the proper amount 4) Saturated syrup's sucrose may crystallize due to temperature fluctuations during storage.

Cough - Coughing is a protective reflex used to keep your airways open. You can be coughing due to swallowing issues or another medical condition, such as asthma or a respiratory infection. Your medical professional can assist you in determining the cause of the issue as a natural defines mechanism, your body employs coughing to remove allergens from the upper (throat) and lower (lungs) airways. Your body uses coughing as a form of self-defense and healing (Arpita and Pratikeswar 2023).

Types of cough - 1)Wet cough- When your respiratory system generates mucus to help clear your airways and lungs of an irritant cold or flu infection, it can cause a wet cough 2) Dry cough- Usually, an irritated or inflamed airway causes a dry cough. Their threshold to cause a cough is lowered because of their increased sensitivity. During the initial stages of a respiratory infection, you could feel a dry cough while your body attempts to remove the virus from your airways (Arun *et al.*, 2015).

Herbal treatment of cough - Herbal remedies are the most popular means of treating coughs. Herbal remedies are significantly contributing to the advancement of the medical field. Herbal remedies are

used to treat a variety of minor to severe illnesses, such as viral infections, renal diseases, lung cancer, diabetes, allergies, asthma, TB, coughing, pneumonia, and kidney problems. As previously said, according to WHO estimates, 80% of the population even uses herbal medications for basic medical needs. Traditionally, medicinal herbs have been employed as primary healthcare agents, particularly in Asian nations. Herbal remedies are primarily used to treat chronic illnesses rather than life-threatening ones and to promote wellness. The majority of synthetic medication treatments have several negative side effects, including sedation, nausea, vomiting, allergies, respiratory tract infections, changes in appetite, irritability, sleepiness, and the potential for addiction and organ or organ damage from excessive use. Recent years have seen a major focus by researchers on herbal medications and treatments that have minimal or non-existent adverse effects both during and after therapy (Manoj and Shweta 2022).

Pineapple good for cough - 1) Because of the anti-inflammatory qualities of bromelain, pineapple may be beneficial for cough. Results indicate that taking bromelain orally may reduce congestion, reduce coughing, and enhance breathing (Trusted Source) 2) Pineapple juice hasn't been shown in studies to specifically ease coughs yet. Nonetheless, it still has some qualities that can lessen cough symptoms, like immune-stimulating and antimicrobial qualities. However, the reason for the cough will still determine how effective it is. 3) A 2021 article stated that bromelain was an effective treatment for cough brought on by angiotensin-converting enzyme (ACE) medications. Some individuals experience dry cough when using ACE inhibitors, a medication used to treat high blood pressure.

Pineapple juice for sore throat - 1)Pineapple juice has anti-inflammatory qualities that may help relieve sore throats. Pineapple juice is also a strong source of vitamin C, which aids with infection management and immune system stimulation 2) Pineapple juice's bromelain helps break down mucus Trusted Source and lessen inflammation and congestion. This could help ease the sore throat's pain and discomfort 3) Additionally, bromelain possesses antiviral qualities. Reliable Source, which might aid in preventing infections that result in sore throats (Rupali *et al.*, 2019).

LITERATURE REVIEW

Arun *et al.* (2015) the over-the-counter medications used to treat cough are some of the most popular in the world, despite a new review indicating that there is little evidence to support their significant efficacy. The central cough route is the main target of the majority of currently prescribed cough suppressants (opiates, dextromethorphan, etc.). These drugs' severe adverse effects, which include respiratory depression, constipation, dependency, drowsiness, and even death, make them extremely unsatisfactory for use in humans. The development of safe and efficacious antitussive therapeutic alternatives to present drugs is currently

lacking in therapy choices for chronic cough. Novel bioactive chemicals, which have served and continue to function as lead molecules for the creation of new medications, are frequently discovered through the use of medicinal plants. Therefore, this review may shed light on herbs that, either singly or in combination, have expectorant and antitussive properties. These results will help develop in developing pharmacopoeial standards for both formulations and crude medications, which is becoming more important in studies on traditional medicine.

Arpita and Pratikeswar (2023) cough is the most prevalent ailment that people have had for many millennia, everywhere. The body's defense mechanism is the cough. Coughs are further categorized based on many aspects, including type, character, duration, indicators, and symptoms. Syrup is the most widely used, manufactured, and favored dose form for treating colds and coughs. The Herbal syrup is the most recommended dosage form for treating coughs; this is primarily because it has advantages over synthetic syrups. Medicinal herbs are primarily employed in Asian countries as primary healthcare agents. Use is made of substances with expectorant antitussive action. Herein, a brief study is conducted on cough and its natural remedies.

Manoj and Shweta (2022) a cough is a strong explosive expiration used to remove foreign objects and fluids from the tracheobronchial canal. The purpose of this review study was to list the plants that are used in traditional culture and ethnobotany to treat and alleviate cough, given the prevalence of cough in both adults and children. the problems with using conventional opioid antitussive drugs to treat cough in a range of respiratory conditions, such as codeine and compounds similar to codeine. Compounds with substantial antitussive properties and minimal adverse effects may be found in medicinal plants. Recent developments in modern phytotherapy have made it possible to specify active chemicals responsible for therapeutic activity and measure them in medicinal products. This allows for treatment rationalization, particularly about dosage and side effect monitoring.

Rupali *et al.* (2019) people have used a variety of plants, roots, and leaves to treat a wide range of illnesses since ancient times. Herbal cough syrup is an Ayurvedic medication that helps treat a variety of chronic illnesses in people, including colds, fevers, respiratory infections, and coughs. When combined with other plants, It is readily available everywhere, inexpensive to produce, safe, and simply created at home. Herbal syrups with natural ingredients like Tulsi, clove, fennel, turmeric, and adults have a variety of effects on cough suppression, expectorant properties, and anti-tussive properties. They also help reduce acute or chronic coughs and colds. Based on my research, I have determined that the safest herbal remedy for treating coughs is herbal cough syrup.

MATERIALS

1) Pineapple

- 2) Tulsi leaves
- 3) Orange peel
- 4) Citric acid
- 5) Sugar

1) Pineapple

Taxonomical Classification

- 1) Family - Bromeliaceae
- 3) Genus - Ananas
- 4) Species - Ananas Comosus
- 5) Orders - Bromeliaeae
- 6) Phylum - Anthophyta
- 7) Kingdom – Plantae

Medicinal uses of pineapple

- 1) The pineapple plant produces bromelain, a type of enzyme found in both the fruit and stem. Despite having originated in the Americas, pineapple is now grown all over the world in tropical and subtropical climates. Pineapple was once utilized by natives from Central and South America to treat a variety of ailments, including gastrointestinal problems.
- 2) Bromelain is marketed as a nutritional supplement that can reduce pain and swelling after surgery or injury, especially in the gums, nose, sinuses, and other body areas. It is also suggested for cancer, osteoarthritis, gastrointestinal problems, and musculoskeletal pain. Topical bromelain is advised for burns.
- 3) The yellow fruit and stem of a pineapple naturally contain bromelain. Bromelain can be purchased from manufacturers as a tablet, capsule, cream, or powder. Bromelain may also be packaged by manufacturers with other supplements, like conjugated linoleic acid, a substance that may aid in weight loss.
- 4) The usefulness of pineapple juice in relieving coughs is discussed in this article along with its health advantages. To assist consumers in selecting the best course of action, it also examines alternative cough treatments.

2) Tulsi

Taxonomical classification

- 1) Kingdom – Plantae
- 3) Class - Magnoliopsida
- 4) Order - Lamiales
- 5) Family - Liliaceae
- 7) Species - *O. tenuiflorum*

Properties of Tulsi leaves

Basil leaves could be able to do the following:

- 1) It might guard against cancer.
- 2) It might have antiviral properties.
- 3) It might have antimicrobial or antioxidant properties.
- 4) It may lessen swelling, ease discomfort, and guard against ulcers.
- 5) It might cause blood sugar levels to drop.

Medicinal uses of Tulsi - Because of its therapeutic qualities, Tulsi is sometimes referred to as the holy plant or the wonder herb.

- 1) Fever can be treated with Tulsi.
- 2) Skin issues like acne, blackheads, and early aging are treated with Tulsi leaves.
- 3) Bites from insects are treated with Tulsi.
- 4) Tulsi is also used to treat fever and cardiac problems.
- 5) Respiratory issues are also treated with Tulsi.

6) Tulsi is used to treat kidney stones, headaches, fever, colds, and sore throats.

7) Tulsi aids in the treatment of asthma.

3) Orange peel

Taxonomical classification

- 1) Kingdom - Plantae
- 2) Division - Magnoliophyte
- 3) Class - Dicotyledon
- 5) Order - Rosales
- 6) Family - Rosaceae

Beta carotene - Beta-carotene, a pigment found in orange and yellow fruits and vegetables, is present in orange peels. Your body transforms beta-carotene into vitamin A, which is good for your immune system and eyesight. According to the University of Maryland Medical Centre, beta-carotene is an antioxidant that aids in shielding your body from free radicals, which have the potential to harm cells.

Cleaning - Orange oil is found in the peel's outer layer. Waterless hand cleansers and soaps also include this essential oil. Because the oil is a solvent, it may clean your skin just as well without the use of dangerous chemicals. Perfumes and cleaning goods also contain orange oil as an ingredient.

4) Citric acid - Citrus fruits naturally contain a preservative called citric acid. Citric acid is frequently employed as a flavoring and stabilizing component in pharmaceutical preparations within the pharmaceutical business. It is utilized to bring in a desired tart taste that helps cover medicinal Flavors and enhance fruit Flavors. In elixirs and syrups, as well as in antacids and dentifrices, citric acid is mixed with bicarbonates or carbonates. Palatability is enhanced by the effervescence effect, which also significantly increases co-constituent solubility. Through its ability to buffer aqueous solutions, adsorb trace metals, and aid in the dispersion of suspensions, citric acid contributes to the stability of the active components.

5) Sugar base - The word "sugar" describes soluble, sweet-tasting carbohydrates that are frequently present in meals. Simple sugars, also called monosaccharides, include glucose, fructose, and galactose. Compound sugars include lactose (glucose + galactose), sucrose (glucose + fructose), and maltose (two glucose molecules). Disaccharides or double sugars are other names for compound sugars. White sugar is made by processing sucrose. Within the organism, compound sugars hydrolyze into simple sugars.

METHODOLOGY

When the decoction process is used to create herbal syrup. These are the steps.

- 1) Take 140 grams of pineapple, chop it into little pieces, and then add the pieces to 100 milliliters of water. Heat the mixture slowly to extract the flavour. After filtering, the extract was allowed to cool. The entire extract yields 7 milliliters of solution.
- 2) About 20g of finely chopped orange peel from two oranges was combined with 100ml of water to make extract. Next, a gentle boil was applied to the mixture. The extract was allowed to cool after filtering. The entire extract is metered out to make a 5 ml solution.

- 3) Twenty grams of basil leaves were cooked in 100 milliliters of water to create the extract. The extract was allowed to cool after filtering. The entire extract is metered out to make a 5 ml solution.
- 4) Weigh exactly 33.3 grams of sugar.
- 5) The extracts were combined to create 50 millilitres of syrup.
- 6) After making this syrup, it was sealed in an amber bottle and stored in a cool location.

FORMULATION TABLE

Sr. No.	Ingredients	F1	F2	F3	F4
1.	Pineapple	20ml	20ml	20ml	20ml
2.	Tulsi leaves	8ml	12ml	5ml	5ml
3.	Orange peel	5ml	5ml	5ml	8ml
4.	Citric acid	2ml	3ml	4ml	2ml
5.	Sugar base	15ml	10ml	16ml	15ml

EVALUATION PARAMETER

There are different types of evaluation test for herbal syrup

1. Density

- 1) Use nitric or chromic acid to completely clean the specific gravity bottle.
- 2) Use distilled water to rinse the bottle at least twice or three times.
- 3) Use an organic solvent, such as acetone, to rinse the bottle, if necessary, then let it dry.
- 4) Weigh the dry, empty bottle with the capillary tube stopper (w₁) attached.
- 5) Pour the unknown liquid into the bottle, screw on the stopper, and use tissue paper to remove any extra liquid that may have gotten inside the tube.

On an analytical balance, weigh a container containing an unknown liquid (w₂).

- 7) Determine the unknown liquid's weight in grams (W₃).

Density formula: Density of test liquid (syrup) = weight of test liquid / volume of test liquid = W₃/v

2. Viscosity

- 1) Use warm chromic acid to thoroughly clean the Ostwald viscometer, and acetone or another organic solvent should be used if needed.
- 2) Install the viscometer vertically on an appropriate stand.
- 3) Fill the dry viscometer with water to the mark G.
- 4) Calculate how long it takes for water to flow from mark A to mark B, in seconds.
- 5) To get an accurate reading, repeat step 3 at least three times.
- 6) After rinsing the viscometer with test liquid, fill it up to mark A and record the amount of time it takes the liquid to reach mark B.
- 7) Calculating liquid densities as specified in the experiment for determining density.

3. pH determination

Syrup's pH was determined using two methods.

- a) Glass electrode
- b) pH paper

4. Specific gravity

- 1) Use nitric or chromic acid to completely clean the specific gravity bottle.

- 2) Use filtered water to rinse the bottle at least twice or three times.

- 3) Use an organic solvent, such as acetone, to rinse the bottle, if necessary, then let it dry.

- 4) Weigh an empty dry bottle with a stopper for a capillary tube.

- 5) Pour distilled water into the bottle, secure the stopper, and use tissue paper to remove any leftover liquid from the side tube (W₂).

- 6) Use an analytical balance to weigh a bottle with a cork and water (W₀).

- 7) After emptying and drying the liquid under test as instructed in steps 4 through 6, repeat the process with the water replaced.

- 8) Use an analytical balance to weigh a container with a cork and the liquid being tested (W₃).

The specific gravity formula is: Weight of liquid under test / Weight of water = was/W is the specific gravity of the liquid (syrup).

5. Consistency

Check the consistency when it has cooled. To verify, insert a drop of syrup between your thumb and finger, then pull them apart. If there is one string breaking in between, there is the problem.

RESULT AND DISCUSSION

Sr. No.	Evaluation parameter	F1	F2	F3	F4
1.	Colour	Light yellow	Yellow	Pale yellow	Light yellow
2.	Odour	Fruity	Fruity	Fruity	Fruity
3.	Taste	Sweet	Sweet	Sweet	Sweet
4.	Density	1.16gm	1.19gm	1.21gm	2.02gm
5.	Viscosity	3.70cp	3.66cp	3.66cp	3.75cp
6.	Specific gravity	0.5195	0.5135	0.5281	0.5195
7.	PH	6.1	6.6	6.3	6.5
8.	Consistency	Clear	Clear	Clear	Clear

CONCLUSIONS

Compared to formulations F1, F3, and F4, the final formulation (F2) that was obtained is stable. By minimizing the error in formulations F1, F2, and formulation (F2) was obtained. Because formulation (F2) has antioxidant properties, it will be very beneficial for enterprises and researchers to produce comparable formulations on a wide scale. This project's objective was to create and assess an herbal cough syrup. The current study has aided in our understanding of the many types of coughs and the elements that contribute to coughing. A small study was conducted on herbal remedies for cough. The study demonstrates that the use of herbal remedies, which have less or no side effects, is more advantageous than allopathy, which employs conventional medications for therapy. Treatments with herbs are more commonly chosen. Availability of herbal medications is easier than that of prescription drugs. This study aids in our understanding of cough and preventative strategies. All three formulation's pre-formulation investigations met specifications. Three formulations were made, and tests

for pH, color, odor, and taste were conducted. This study aims to investigate the efficacy of herbal cough syrup in comparison to chemical-based syrups.

FUTURE SCOPE

The Future scope for herbal syrup for cough is quite promising as there is a growing trend towards natural remedies and a shift away from synthetic medication. For herbal syrup for cough is likely to be shaped by factors such as increased demand, research, technological advancements, international market expansion, and public awareness. By addressing these aspects, the industry can continue to grow and provide effective, natural alternative for treating coughs.

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Conflict of Interest. None.

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