



FORMULATION AND EVALUATION OF POMEGRANATE PEEL SYRUP FOR COPD

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Article Received on 26/03/2024

Article Revised on 17/04/2024

Article Accepted on 07/05/2024

1. ABSTRACT

The Chronic Obstructive Pulmonary Disease (COPD) or Respiratory Disease are the most common disease face by the today's people. In people with COPD, the lungs can get damaged or clogged with phlegm. Symptoms include cough, sometimes with phlegm, difficulty breathing, wheezing and tiredness. Smoking and air pollution are the most common causes of COPD. People with COPD are at higher risk of other health problems. In present study the syrup dosage form is formulated using pomegranate peel along with honey and other chemical ingredients. Pomegranate peel were extracted and formulated in syrup form at laboratory scale and evaluated for number of parameters such as PH, viscosity, Density. During evaluation formulation found to be stable and ready to use in a COPD treatment.

KEYWORDS: Pomegranate Peel, COPD, Respiratory Disease, Materials & Methods, Advantages, Dis-Advantages, Method of Preparation, Evaluation Test.

2. INTRODUCTION

The pomegranate (*Punica Granatum*) is a Fruit bearing deciduous shrub in the family Lythraceae, that grows between 5 and 10 m (16 and 33 ft) tall. The pomegranate is rich in symbolic and mythological associations in many cultures.^[1]

India was the world's largest pomegranate grower, with a surface area of 234,000 ha and 2.84 million metric tons of production in 2018. In 2017, the world generated an estimated 1.9 million metric tons of peel, which makes up 50% of the pomegranate fruit. Pomegranate peel is a great source of polyphenols, dietary fiber, and vitamins, as well as other bioactive compounds. Numerous *in-vitro* and *in-vivo* studies have demonstrated that these compounds have a wide range of biological activities and

health advantages, including antioxidant, anticancer, and anti-inflammatory properties.^[2]

The utilization of byproducts from pomegranate processing, which are abundant in beneficial bioactive compounds, has the potential to contribute to the development of a wide range of products. These may include industrial enzymes, functional ingredients that improve the quality of food, and additives employed in the food industry to extend the shelf life of products. The current review focuses mainly on the pharmacological effects of bioactive substances found in pomegranate peel, methods for extraction of bioactive compounds, and the utilization and application of pomegranate peel in the development of value-added products.



Young pomegranate tree in Turkey.



Pomegranate Tree in India.

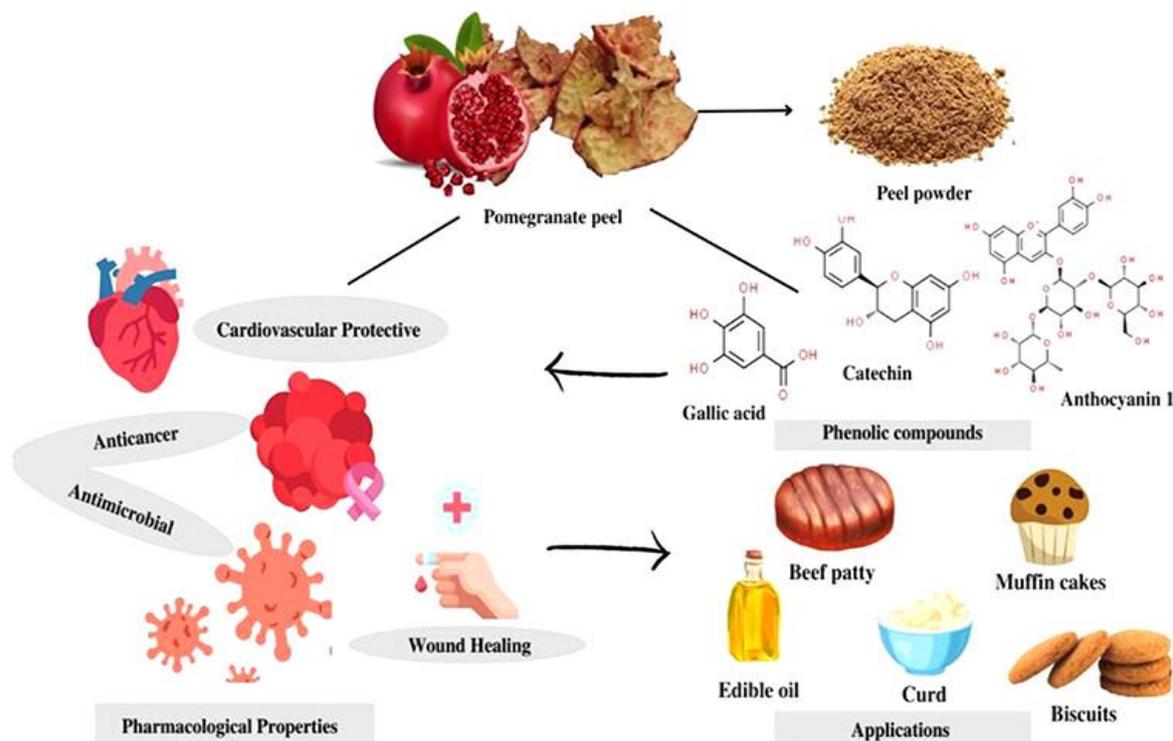


Fig. Pomegranate Peel Extract (4).

3. LITERATURE SURVEY

A) Shaikh Bi Sadiya, Bhandary Yashodhar Prabhakar

Respiratory diseases are the prime cause of death and disability worldwide. The majority of lung-based diseases are resistant to treatment. Hence, research on unique drugs/compounds with a more efficient and minimum side effect for treating lung diseases is urgent.

B) Ismail H.A, Hameed A.M, Refaey M.M, Sayqal A, Aly A.A

Punica granatum L (pomegranate) fruit has been used in the prevention and treatment of various respiratory disorders in recent times. In vivo and in vitro studies have demonstrated that pomegranate fruit, as well as its juice, extract, peel powder, and oil, exert anti-proliferative, anti-oxidant, anti-microbial, anti-inflammatory, anti-cancer, and anti-tumorigenic properties by attenuating various respiratory conditions such as asthma, lung fibrosis, lung cancer, chronic obstructive pulmonary disease (COPD), and alveolar inflammation via modulating various signaling pathways.

C) Abegunde, D. O., Mathers, C. D., Adam, T., Ortegón, M., & Strong, K.

Doum fruit and pomegranate peels are rich in healthy nutrients such as fiber, minerals and antioxidant potentially protect from diet related diseases. This research was conducted to study the influence of ice cream enriched with pomegranate peels powder (PPP) and Doum fruit syrup (DFS) alone or in a combination at different ratios on its physicochemical, rheological, microbiological, and organoleptic properties. Ice cream

enriched with PPP and DFS have high contents of total solids, protein, fat, ash, fiber, antioxidants activity, minerals and gross energy which are raised up with increasing the addition level. However the contents of moisture, pH, carbohydrate and Cu were decreased.

D) Adams, L. S., Seeram, N. P., Aggarwal, B. B., Takada, Y., Sand, D., & Heber, D.

Chronic obstructive pulmonary disease (COPD) is generally associated with progressive destruction of airways and lung parenchyma. Various factors play an important role in the development and progression of COPD, like imbalance of proteases, environmental and genetic factors and oxidative stress. This review is specifically focused on the role of proteases and their imbalance in COPD.

E) Husari, A., Hashem, Y., Zaatari, G., & El, S. M.

Pomegranate juice and syrup has gained great importance due to its health properties and consequently is now a highly demanded product. Effect of processing conditions on the quality of pomegranate syrup was evaluated. Citric acid, sodium benzoate, arabic gum and pomegranate peel extract were mixed with the pomegranate juice. The juice was concentrated until 42° Brix.

4. CLASSIFICATION OF SYRUP^[3]



Simple Syrup

- When Purified Water alone is used in making the solution of sucrose, the preparation is known as "syrup," or "simple syrup"



Medicated syrup

- When Syrup contains medicinal substance is know as medicated syrup – cough syrup



Flavoured Syrup

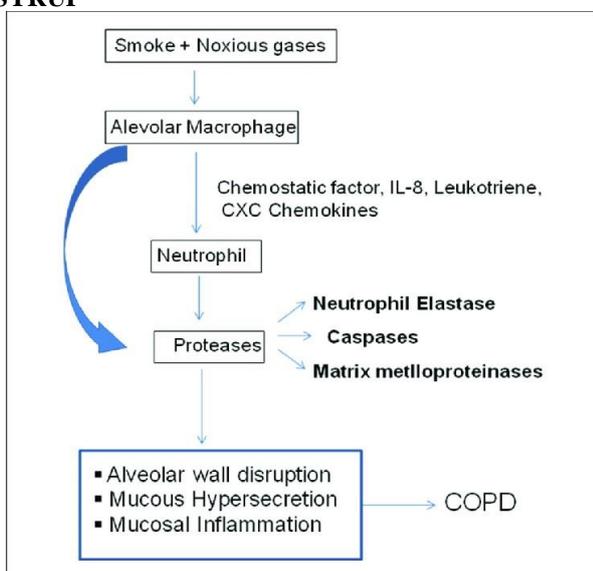
- Containing Aromatic/ Flavoured – Flavoured syrup (Cherry & Raspberry syrup)

❖ Scientific Classification of Pomegranate

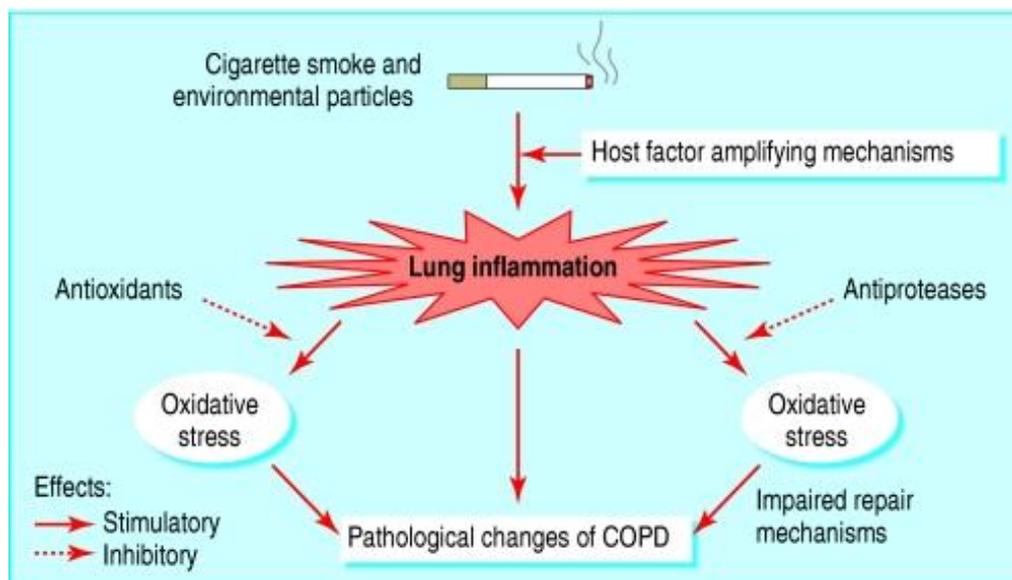
Scientific classification

Kingdom	:	Plantae
Division	:	Magnoliophyta
Class	:	Magnoliopsida
Subclass	:	Rosidae
Order	:	Myrtales
Family	:	Punicaceae
Genus	:	<i>Punica</i>
Species	:	<i>granatum</i>
Binomial name	:	<i>Punica granatum</i>

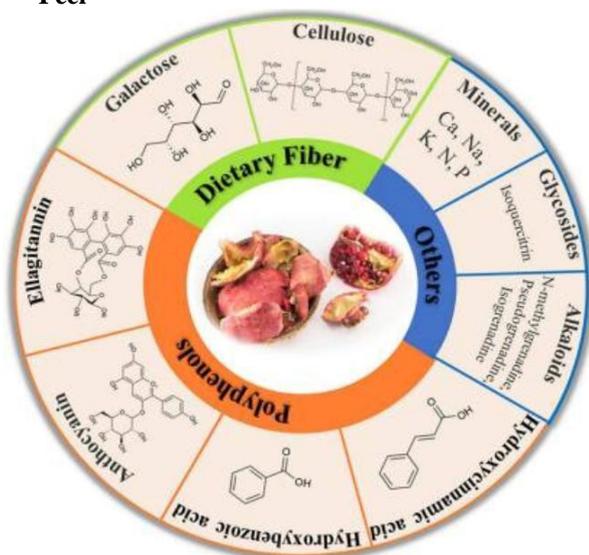
5. MECHANISM OF POMOGRENATE PEEL SYRUP



Inflammation is present in the lungs, particularly the small airways, of all people who smoke. This normal protective response to the inhaled toxins is amplified in COPD, leading to tissue destruction, impairment of the defence mechanisms that limit such destruction, and disruption of the repair mechanisms. In general, the inflammatory and structural changes in the airways increase with disease severity and persist even after smoking cessation. Besides^[21] inflammation, two other processes are involved in the pathogenesis of COPD—an imbalance between proteases and antiproteases and an imbalance between oxidants and antioxidants (oxidative stress) in the lungs.^[6]



➤ Chemical Constituent Present in Pomegranate Peel



6. ADVANTAGES & DISADVANTAGES OF THE SYRUP

➤ Advantages

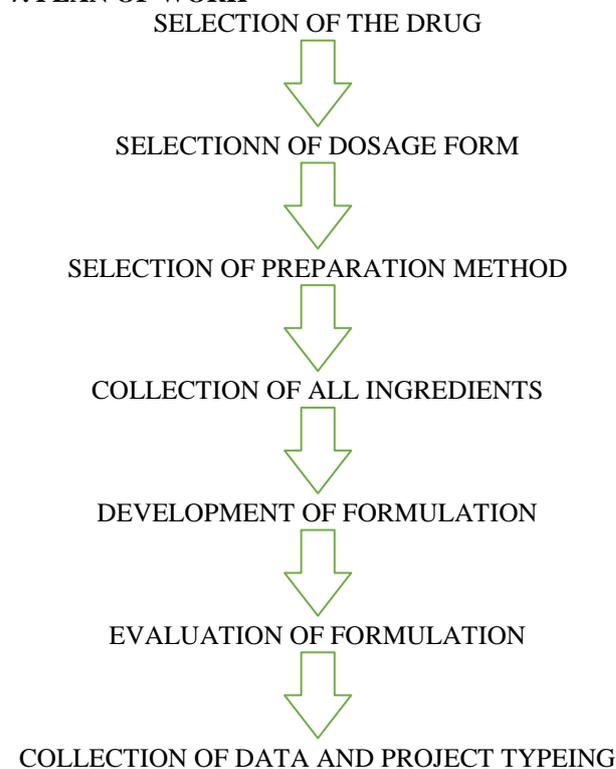
- May reduce the risk of chronic diseases.
- Lowers cholesterol levels.
- Reduces oxidative stress.
- Restores heart health.
- Maintain blood pressure.
- Pomegranate can act as a potential treatment for COPD.^[20]
- These helps reduce cough symptoms.
- Cure sore throat and coughs.
- May improve brain function.
- May have cancer fighting properties.
- Has antibacterial properties.^[7]

➤ Dis-Advantages

- Itching, swelling, runny nose, and difficulty breathing

- Some people can have allergic reactions to pomegranate fruit.^[19]
- Drinking pomegranate peel syrup does not seem to improve symptoms or breathing in people with this condition
- Obesity. Most research shows that taking pomegranate products doesn't help with weight loss.
- High levels of cholesterol or other fats (lipids) in the blood (hyperlipidaemia). Taking pomegranate peel syrup doesn't seem to lower cholesterol in people with or without high cholesterol.^[8]

7. PLAN OF WORK



8. MATERIAL AND METHODS

1. Pomegranate Peel

- Category: Active Ingredient

2. Honey

- Category: Sweetening Agent

3. Raspberry Syrup

- Category: Flavouring Agent

4. Amaranth Solution

- Category: Colouring Agent

4. Sodium Benzoate

- Category: Anti-microbial Agent

5. Propylene Glycol

- Category: Thickening Agent

6. Propyl Paraben

- Category: Preservative^[9]

INSTRUMENTS

- Mortar Pestle
- Weighing Balance

- Measuring Cylinder (10,50,100ml)
- Round Bottom Flask
- Funnel
- PH Paper
- Beaker (50, 100ml)
- Heating Mantle
- Ostwald Viscometer, Density Bottle, Sieve No. 40 (10)

❖ METHOD

- **Method of Making Pomegranate Peel Powder**

Take sufficient amount of pomegranate peel



Dry the pomegranate peel until it breaks into pieces



Then crush that peel into the mortar pestle



Then take that powder and pass through the Sieve no. 40

Finally, we get the fine powder^[11]



➤ Method of Extraction of Pomegranate Peel Powder

10 gm of pomegranate peel powder

Mixed with sufficient quantity of water in RBF

Place the RBF in the Heating Mantle

Boil that mixture until we get the 1/4th of the total solutionAfter the heating, cool that liquid and then filtered it^[12]

Final Pomegranate Peel Syrup for (50ml)

➤ Formula No. 1:

Sr. No.	INGREDIENT	QUANTITY	CATEGORY
1.	Pomegranate Peel Extract	10.0ml	Active Ingredient
2.	Honey	4.0ml	Sweetening Agent
3.	Sodium Benzoate	2.5ml	Antimicrobial Agent
4.	Methyl Paraben	3.0gm	Preservative
5.	Raspberry Syrup	1.5ml	Flavouring Agent
6.	Amaranth Solution	Q.S.	Colouring Agent
7.	Propylene Glycol	2.5gm	Thickening Agent
8.	Water	Q.S. To make up Volume	Solvent

➤ Formula No. 2:

Sr. No.	INGREDIENT	QUANTITY	CATEGORY
1.	Pomegranate Peel Extract	10.0ml	Active Ingredient
2.	Honey	4.0ml	Sweetening Agent
3.	Sodium Benzoate	2.5ml	Antimicrobial Agent
4.	Propyl Paraben	3.0gm	Preservative
5.	Raspberry Syrup	1.5ml	Flavouring Agent
6.	Amaranth Solution	Q.S.	Colouring Agent
7.	Water	Q.S. To make up Volume	Solvent

➤ Formula No. 3:^[13]

Sr. No.	INGREDIENT	QUANTITY	CATEGORY
1.	Pomegranate Peel Extract	20.0ml	Active Ingredient
2.	Honey	5.0ml	Sweetening Agent
3.	Sodium Benzoate	2.5ml	Antimicrobial Agent
4.	Propylene Glycol	2.5gm	Thickening Agent
5.	Raspberry Syrup	1.5ml	Flavouring Agent
6.	Propyl Paraben	2.5gm	Preservative
7.	Amaranth Solution	Q.S.	Colouring Agent
8.	Water	Q.S. To make up Volume	Solvent

9. PROCEDURE**Step 1: Preparation of flavor solution**

1.5 ml Raspberry Syrup in 2.5 ml of propylene glycol was prepared separately.

Step 2: Preparation of simple syrup with Honey

Mix 3.3gm of Honey with small quantity of distilled water to prepare a solution, and added to mixing vessel and mix it well.

Step 3: Preparation of final syrup

Filtrate was taken and added to mixing vessel containing simple syrup, and stir it thoroughly and the add excipients like propyl paraben (2.5gm) Sodium Benzoate (2.5gm) Propylene Glycol (2.5gm) and add the flavour solution to the mixing vessel and finally add a colouring agent Amaranth solution (Q.S), and then finally make up the value up to 50 ml with purified water.

10. RESULT AND DISCUSSION❖ Evaluation Test^[14]

Formulation	Colour	Odour	Test
1.	Dark Brown	Aromatic	Slightly Pungent
2.	Light Brown	Aromatic	Slightly Pungent
3.	Brown	Aromatic	Slightly Pungent

1. Colour

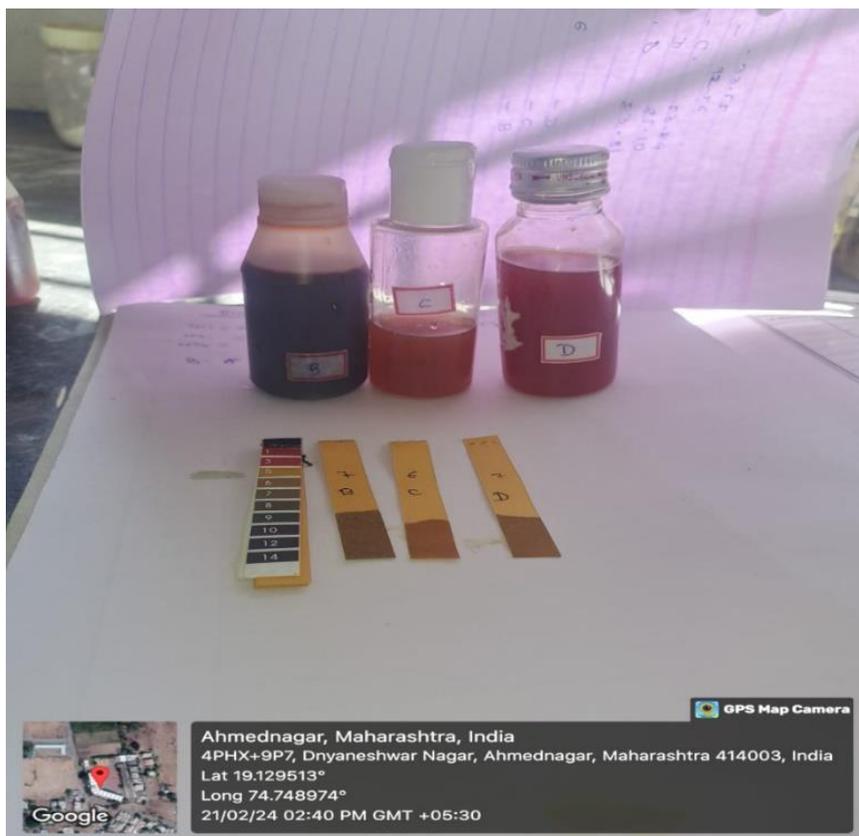
Table shows the result obtained for colour of formulated batches of syrup. The colour of Formulation was found to be Brown for the optimized batch. The colour of the formulation ranges from Light-Brown to Dark-Brown for A, B, C batches respectively.^[18]

2. Odour

Table shows the results obtained for odour of formulated batches of syrup. The odour of formulation was aromatic for A, B, C batches respectively.

3. Taste

Table shows the results obtained for taste of formulated batches of syrup. The taste of formulation was slightly pungent for A, B, C, batches respectively.^[15]



❖ Quantitative Evaluation of Pomegranate Peel Syrup.^[16]

Sr. No.	Parameter	A.	B.	C.
1	PH	7	6	7
2	Viscometer	25.81	29.36	27.56

1. PH

Table shows the results obtained for pH of formulated batches of syrup. The Specific Gravity of formulation was found to be 6.0 for the optimized formulation B. The value was found to be in the range of 6.0 to 7.0 for all three formulations.

2. Viscosity



Table shows the results obtained for Viscosity of formulated batches of syrup. The Viscosity of formulation was found to be 29.36 for the optimized formulation B. The value was found to be in the range of 25.81 to 29.36 for all three formulations.^[17]

11. CONCLUSION

- For the treatment of disease like COPD or respiratory disease we used three formulas to formulate syrup as per above discussion. Among them formulation with Formula No.3 was found to be more stable and evaluation test like colour, odour, taste, PH, were found to be satisfactory.
- Within the all specification, it has proper concentration of honey as per IP and also a good preservative.
- The present study helps to develop effective and safe syrup.

12. FUTURE SCOPE

- The increasing use of pomegranate peel extract in the food and beverage industry as a natural food additive and flavouring agent presents significant growth opportunities. The rising demand for clean label and natural food products is expected to drive market growth in this segment.
- Expansion of distribution channels and penetration into new geographical regions presents an opportunity for market players to broaden their customer base and increase market presence. Collaborations with local distributors and retailers can aid in exploiting the untapped potential of these regions.
- The growing trend of using natural and organic ingredients in personal care and cosmetic products is creating opportunities for the integration of pomegranate peel extract into skincare formulations. The demand for anti-aging and antioxidant-rich products is expected to drive market growth in this segment.
- Research and development activities focused on enhancing the efficacy and multifunctional properties of pomegranate peel extract offer opportunities for the development of innovative products with diverse applications, further expanding the market landscape.

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