



Preparation and Evaluation of Herbal Antimicrobial Soap from Rose apple Leaves Extract

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Abstract: Rose apples (*Syzygium jambos*) are a tree that produces fruit, originally from Southeast Asia, recognized for various conventional uses and possible health advantages, which include: Antimicrobial, anti-inflammatory, and antiviral characteristics, Antioxidant and free radical scavenging activity, Possible anti-cancer properties, Traditional applications involve treating diabetes, diarrhea, and dysentery. The fruit and seeds consist of flavonoids, volatile oils, and aldehyde derivatives, which help in providing their medicinal qualities. Herbal medicine has seen remarkable growth, with species such as *Syzygium aqueum* (Water Apple) contributing significantly to both traditional and modern medicine. This review emphasizes its: Traditional applications Phytochemical makeup Pharmacological characteristics Investigating its possibilities as a natural treatment. *Syzygium aqueum* (Watery Rose Apple) is a fruit crop that is not widely used but possesses significant medicinal properties, being abundant in antioxidants, phenolics, and flavonoids. This review emphasizes its: Medicinal properties Nutritional advantages Antioxidant properties Possible health benefits as an important fruit for overall health and immunity.

Keywords: *Syzygium aqueum*, antimicrobial activity, Rose apple leaves.

INTRODUCTION

Syzygium aquem is part of the Myrtaceae family and is known by several common names including in English, as well as “Gulaabijamikaayalu” in Telugu.^[1] It is cultivated in various regions of Bengal and South India. Different parts of the plant, including leaves, fruits, seeds, and bark, have been used in traditional medicine.^[2] Phytonutrients, or phytochemicals derived from plants, lead to various health benefits for both humans and the plants themselves. These substances are classified as secondary metabolites, which include alkaloids, terpenoids, steroids, and flavonoids. Flavonoids, also referred to as phenolic compounds, are particularly noted for their antioxidant capabilities, enabling them to provide effects such as anti-inflammatory, antimicrobial, antiallergenic, antiviral, antiaging, and anticarcinogenic properties.^[3] The health advantages of rose apples encompass their capacity to cleanse the liver, enhance digestion, safeguard against diabetes, strengthen the immune system, decrease cholesterol, avert specific cancer types, eradicate fungal and bacterial infections, alleviate fevers, and potentially stop epileptic seizures. The volatile oils extracted through vacuum distillation from *Syzygium* species have a significant amount of terpenoids and γ -terpinene. Additionally, tannins and similar compounds are present in the leaves of these *Syzygium* species.^[4] Aquatic and acetone extracts of the leaf of the *Syzygi* -*Jambos* leaf were tested on the antimicrobial activity of *Invitro* by the method of diffusion of Agar Well in Petri's cups. Both extracts showed some activity against *P. Pseudomonas aeruginosa* and *V. cholera*.^[5] The soap is a mixture of fatty acid sodium salts and when potassium salts are used, this leads to a softer foam. Most commercial soaps contain chemicals that can harm the skin, making plant soaps with a healthier alternative. Plant soaps are made with natural herbs and ingredients and offer benefits such as nutrition, healing, hydration. It also contains glycerin, which helps maintain humidity and is perfect for dry skin. Herbal soaps have therapeutic properties, including anti-bacterial and anti-fungal effects, thanks to plant-based ingredients such as leaves, stems, roots, and fruits. They are available in various forms like soaps, creams, and ointments.^[6] Medicinal plants serve as essential assets for the development of pharmaceuticals, hold cultural importance, and contribute to nutrition. A prominent example

is *Syzygium aqueum*, commonly known as Water Apple, which demonstrates anti-hyperglycemic, anti-inflammatory, and antioxidant properties. Additional research is required to thoroughly investigate its pharmacological capabilities.^[7]

Pharmacology:

Antimicrobial Activity: Histochemical tests, phytochemical analysis, and antibacterial activity against graphic bacteria *Escherichia coli*, *Pseudomonas aeruginosa*; *Staphylococcus aureus*, complete bacteria of subspecies. And *Aspergillus flavus* and *Celivia mushrooms* were made with collected fruits and leaves. Screening for bioactive ingredients shows the presence of side leaves of alkaloids, tannins, glycosides, anti-toxic acids, tartaric acid, and three *S. ethanol* extracts. *Aqueum* has shown that it is effective against the growth of *S. Aureus*, *B. Subtylium*, *E. coli* *Pseudomonas aeruginosa* and inhibition have not been observed for *Aspergillus flavus* of the *Sacharomyces cerevisiaceae*.

Diabetes Mellitus: Researchers examined the effects of *Syzygium aqueum* leaf extract on insulin-like and insulin-sensitizing activities. Results: The extract and its 6 bioactive compounds promoted adipogenesis, glucose uptake, and adiponectin secretion. *Myricetin-3-O-rhamnoside* and *europetin-3-O-rhamnoside* showed insulin-like and insulin-sensitizing effects. These compounds out performed *rosiglitazone*, indicating potential antidiabetic properties.^[7]

PLAN OF WORK

Extraction of *S. Jambos* leaves

- The *Syzygium aquem* leaves powder was extracted with propylene glycol by solvent extraction process.
- The *Syzygium aquem* tree leaves are collect and dry then grind into the mortal and pestle.
- Weigh a 10gm leaves powder then mixed into the 100ml propylene glycol.
- Keep mixture 24hr at room temperature.
- Next day keep 3hr on a magnetic stirrer.
- Filter it. Then collect the extract.

Phyto-Chemical screening of isolated Compounds:

Leaves:

Flavonoids: The propylene glycol extract of *S. aqueum* leaves included a total of 87 distinct compounds abundant in flavonoids, such as *myricetin rhamnoside*, *myrigalone G pentoside*, *quercetin galloylpentoside*, and *cryptos robin*, where *myrigalone- B* and *myrigalone- G* constituted the main flavonoid constituent. *Quercetin-3-O-glucoside* and *kaempferol-3-O-glucoside* have been discovered to show antibacterial effects against bacteria like *E. coli*, *S. aureus*, and *S. typhi*.

Phenols: propylene glycol extract of *S. aqueum* leaves contained a few phenolic compounds (eg- *Gallic acid*, *ellagic acid*) *Gallic acid - A* phenolic acid that has demonstrated antibacterial properties against various types of bacteria. *Ellagic acid - A* phenolic acid that has been discovered to demonstrate antibacterial effects against bacteria such as *E. coli*, *S. aureus*, and *P. aeruginosa*.

Tannins: Rose apple leaves have tannins, which have been demonstrated to possess antimicrobial properties.

Terpenoids: α -Pinene, β -pinene, and limonene have been identified in rose apple leaves. β -Caryophyllene and α -humulene have been detected in rose apple leaves. which have been shown to have antimicrobial activity

α -Pinene: A monoterpene that has been discovered to demonstrate antibacterial properties against bacteria like *E. coli*, *S. aureus*, and *B. subtilis*.

β -Caryophyllene: A sesquiterpene that has been demonstrated to show antibacterial properties against bacteria such as *E. coli*, *S. aureus*, and *P. aeruginosa*.

Sr. No	Phytochemical present in leaf	Chemical constituent	Test	Result
1.	Flavonoids	Quercetin	Ferric Chloride test - Extract + few drops of ferric chloride solution Green or blue color indicates	Present
2.	Phenolic Acid	Gallic Acid Ellagic acid	Ferric Chloride test - Extract + few drops of ferric chloride solution Green or blue color indicates	Present
3.	Terpenoids	α -Pinene, β -pinene, limonene	Salkowski Test – Extract + few drops of Salkowski reagent	Present

			Red or pink color indicates	
4.	Alkaloids	Jambosine, Eugenol	Wagner's Test- Extract + few drops of Wagner's reagent brown or reddish-brown color indicates	Present
5.	Glycosides	Jambolin, Kaempferol-3-O-rutinoside	Fehling's Test- Extract + few drops of Fehling's reagent Red or brick-red precipitate indicates	Present

Table No. 2 Phytochemical identification Test



Fig no 4 – Test of isolated compound

- **Test of sample:**

Tested Microorganism: Staphylococcus aureus

Observation & Results:

Microorganism: Staphylococcus aureus

Antimicrobial Agent: Sample-Rose Extract

Zone of Inhibition: 21.33 mm

Interpretation of Results:

The agar diffusion method was utilized to evaluate the antimicrobial efficacy of plant-derived samples against selected pathogenic microorganisms. The antimicrobial potential was determined by measuring the diameter of the zones of inhibition surrounding the sample wells. The results revealed differential inhibitory effects of the tested samples on both bacterial.

The Sample-Rose Extract demonstrated a significant antimicrobial activity against Staphylococcus aureus, producing a zone of inhibition measuring 21.33 mm, indicating strong antibacterial potential.

Results:

- Sample-Rose Extract is found to possess potent antimicrobial activity against Staphylococcus aureus.

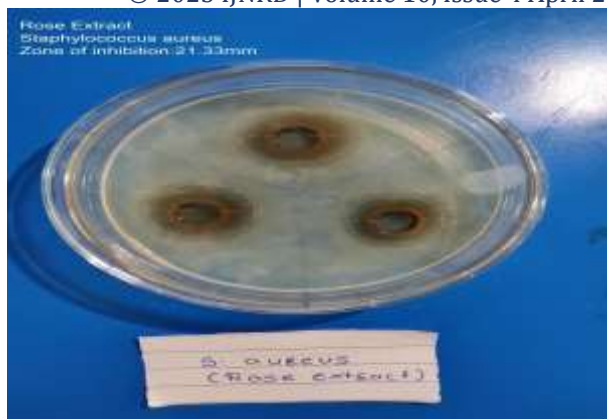


Fig no 5. Antimicrobial activity against Staphylococcus aureus.

FORMULATION AND MATERIALS:

Formulation of herbal soap:

Sr. No	Ingredients	Quantity	Uses
1.	NaOH	6.8 gm	Saponify oils
2.	Propylene glycol	5 ml	Penetration enhancer
3.	Glycerin	6.5 ml	Humectant
4.	Sodium lauryl sulphate	2 gm	Surfactant
5.	Distilled water	13.2 ml	Solvent

Table No. 3 Formulation of Lye

Sr. No	Ingredients	Quantity	Uses
1.	Steric acid	5 gm	Hardening
2.	Coconut Oil	35 ml	Cleansing / Moisturizing
3.	Castor Oil	8 ml	Anti-inflammatory / Cleansing
4.	Lemon Oil	1 ml	Antioxidant
5.	Rose Water	2 ml	Skin Toning
6.	Menthol	0.5 gm	Perfume / cooling agent

Table No. 4 Formulation of Soap

Sr. No	Material	Quantity	Source
1.	Rose apple Extract	5 ml	Plant
2.	Neem	5 ml	Plant

Table No. 5 Main chemical constituent

Procedure of herbal soap:**Step 1 Preparation of lye**

- ✓ Weigh 13.2g water in a heat-safe container.
- ✓ Slowly add 6.8g NaOH into the water while stirring.
- ✓ Allow the lye solution to cool to around 40–45°C.

Step 2 Melt Oils

- ✓ In another container coconut oil, Castor oil, Stearic acid, Neem oil are mix.
- ✓ Then let cool to 40 – 45°C.

Step 3 Add Extras

- ✓ Add remaining ingredient such as propylene glycol, Glycerin, Rose apple leaves extract, lemon oil, menthol, Sodium lauryl Sulphate. Then mix thoroughly

Step 4: Combine Lye + Oils

- ✓ Pour the cooled lye solution into the oils.
- ✓ Blend with a stick blender or whisk until “trace”

Step 5: Mold & Cure

- ✓ Pour into a silicone or plastic mold.
- ✓ Let sit for 24–48 hours.
- ✓ Remove from mold and cure for 4–6 weeks in a dry, cool place.

**Fig no. 6 Prepared Soap****Evaluation of the Herbal Soap:**

1] Determination of pH: 1 gm of herbal soap sample should be combined with 10 ml of distilled water. Ensure the soap is fully dissolved in the water by vigorous stirring. Assess the pH of a sample by comparing the color change of a pH paper strip to the standard pH scale.

**Fig no. 7 Determination of pH**

2] Moisture Content: weigh accurately 5 gm herbal soap (W1). take empty petriplate and note down the weight(W2). transfer the measured herbal soap into the petriplate and record the weight (W3). keep the petriplate with herbal soap sample into the hot air oven for 2-3 hour by adjusting the temperature at 105°C. After the 2-3 hours removed the sample and allow it to cool in a desiccator. note down the weight of petriplate with sample after removing moisture content (W4). calculate the moisture content using the formula.

$$\text{Moisture content} = \frac{W3-W4}{W3-W2}$$

$$\% \text{Moisture content} = \frac{\text{Initial weight} - \text{Final weight}}{\text{Final weight}} \times 100$$

3] Foam height: Take three measuring cylinder with 100ml capacity. Add 5 gm herbal soap and dissolve in distilled water and make up the volume up to 50ml. Shake continuously and heat gently if necessary. Keep stable for 5 min. Measured & record the height of the foam.

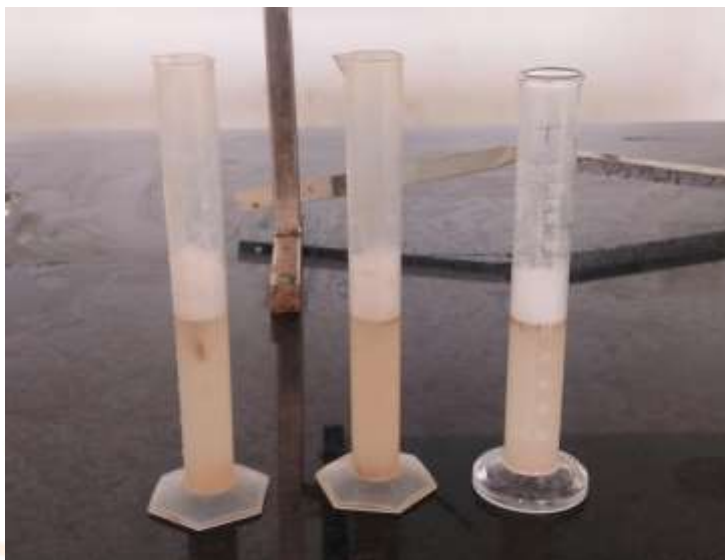


Fig no. 8 Foam height

4] Foaming index:- Take three measuring cylinder with 100ml capacity. Add 5 gm herbal soap and dissolve in distilled water and make up the volume upto 50ml. Shake continuously and heat gently if necessary. Keep stable for 5 min. Measured the height of the foam and calculate the foaming index using the formula

$$\text{FOAMING INDEX} = \frac{\text{FOAM HEIGHT AFTER 5 MIN}}{\text{FOAM HEIGHT AT 0 MIN}} \times 100$$

5] Skin irritation: Applying the soap straight to the skin for ten minutes is the method used to test for skin irritation. The product is considered non-irritating if there is no irritation during this period. This method helps examine the potential detrimental effects of the soap on the skin and is a typical practice in testing the safety of skincare and cosmetic items. [8]

6] pH Stability: weigh accurately 5 gm of soap sample. Dissolve the soap into the 50ml water. keep the beaker or prepared sample at different temperatures condition like 2-8°C (fridge), 25°C (room temperature), 40°C(oven). After specific time period check the pH of the sample and compare with the standard pH scale.

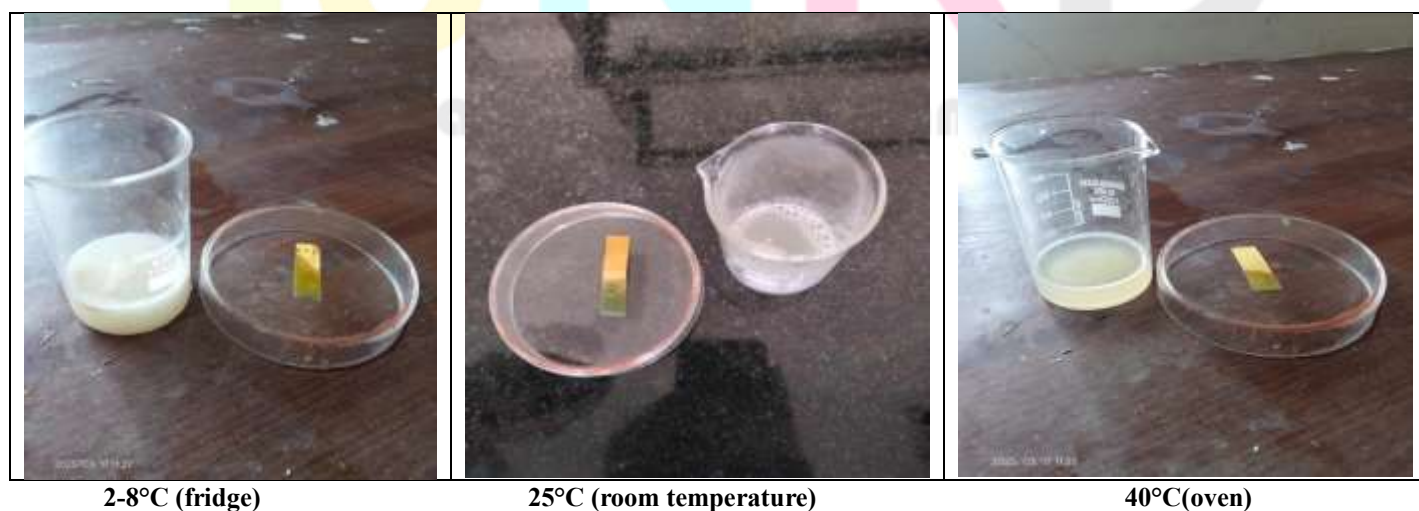


Fig No. 9 pH stability

7] Washing capability: We evaluated the soap's cleaning ability by rinsing it under flowing water. This likely includes watching how effectively the soap froths, distributes, and eliminates dirt or materials from a surface when combined with water. The cleaning ability is a crucial factor in soap efficacy, particularly in contexts like personal cleanliness and sanitation. If you possess more precise information regarding the evaluation or if there are certain elements you wish to explore, don't hesitate to share further details.

8]Weight determination: A digital weighing balance was used to determine the weight

Evaluation of soap:

Sr.no	Parameter	Std Result Acc to IP	Practical Result
1.	Color	-	Dark brown
2.	Odor	-	Pleasant
3.	Appearance	-	Smooth
4.	Shape	-	Round
5.	Foam Height (cm)	0.5 to 5	2.66 cm
6.	pH	5 to 6	6
7.	Foaming index	151%	150.66 %
8.	Moisture Content (%)	1.01-83.75%	6.8%

Table no 6 Evaluation Parameter

RESULT:

The herbal soap formulated with Rose apple leaves extract exhibited significant antimicrobial activity against a range of microorganisms, including: Bacteria: Staphylococcus aureus. The antimicrobial features of herbal soap are especially beneficial, providing not just cleanliness but also defense against harmful bacteria and microbes. This might render the polyherbal soap a favored option for individuals who prioritize hygiene and skin wellness. The formulations in table 1, 2, 3 good result. The physicochemical parameters such as color, odor, appearance, and pH were tested. The pH of the soap was found to be 6 with pH strip show in fig 7. Remaining parameters such as foam height, foam retention moisture content, and were also determined. Foam Height was found to be:- 2.66cm Moisture Content in soap is:- 6.8%

DISCUSSION:

The current research sought to develop and assess the antimicrobial effectiveness, physicochemical characteristics, and user preference of an innovative herbal soap that includes Rose apple leaves extract. The findings of this research revealed the capability of Rose apple leaves extract to serve as a natural antimicrobial substance in soap formulation.

CONCLUSION:

In summary, the current research illustrated the capability of Rose apple leaves extract as a natural antimicrobial substance in soap formulation. The herbal soap created with Rose apple leaves extract showed considerable antimicrobial effectiveness, favorable physicochemical characteristics, and strong user approval. These results imply that the herbal soap may serve as a practical substitute for traditional antimicrobial soaps, providing a natural and sustainable option for personal cleanliness.

REFERENCE:

1. Rose apple: A systematic review by K Santhi Sirisha and K Shreeja
2. A review on the potentials of antioxidant activity, phenolic and flavonoid content of Syzygium aqueum by Balasasi rekha Ramanujam: <https://www.researchgate.net/publication/367095684>
3. Comparative Study of Phytochemical, Antioxidant, and Cytotoxic Activities and Phenolic Content of Syzygium aqueum by Afrizal Itam , Mutia Siska Wati , Vina Agustin , Nursal Sabri Rafika Aris Jumanah , and Mai Efdi <https://doi.org/10.1155/2021/5537597>
4. Analysis of the Radical Scavenging Activity of the Ethanolic Leaf Extracts of Watery Rose (Syzygium aqueum) Using DPPH Assay <https://www.researchgate.net/profile/Dona-Ligutom?tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uIiwicGFnZSI6InB1YmxpY2F0aW9uIn19>
5. ROSE APPLE FRUIT: A PHARMACOLOGICAL REVIEW by A. Ramakrishna Shabaraya, Satish S. <http://dx.doi.org/10.20959/wjpps20214-18707>
6. Formulation and Evaluation of Antimicrobial Herbal Soap by Dr.A.Seetha Devi, D.V.Sivani, D.Anusha, G. Sarath, Syed Meraj Sultana <http://dx.doi.org/10.47583/ijpsrr.2021.v7i1i02.019>
7. OVERVIEW OF PHYTOCHEMISTRY AND PHARMACOLOGY OF SYZYGIUM AQUEUM by Manuvarthi Sushma, Atluri Bhavana and K. Padmalatha
8. Preparation and evaluation of herbal antimicrobial soap Rajesh D Mokate, Jayashree S Kokat, Puja B Aher, Amruta Kakade, Shraddha Patil and Dnyaneshwari Darade DOI: <https://doi.org/10.22271/phyto.2024.v13.i5d.15089>

