

FORMULATION AND EVALUATION OF MULTIFUNCTIONAL HERBAL SOAP PAPER STRIPS FROM TULSI, TURMERIC, AND NEEM

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Abstract:

Herbal soaps have gained significant popularity due to their natural ingredients and potential multifunctional benefits. This study aimed to formulate and evaluate herbal soap paper strips utilizing three potent herbs: Tulsi (*Ocimum sanctum*), Turmeric (*Curcuma longa*), and Neem (*Azadirachta indica*). The soap paper strips were developed using a simple and eco-friendly method, and their physicochemical properties, antimicrobial activity, skin irritation potential, and cleansing efficacy were assessed. The results demonstrated that the formulated herbal soap paper strips exhibited promising antimicrobial activity against a range of pathogens, along with minimal skin irritation potential. Moreover, the strips effectively cleansed the skin, leaving it refreshed and revitalized. Overall, the study highlights the potential of herbal soap paper strips as convenient, eco-friendly, and multifunctional alternatives in personal care products.

Keywords: Herbal soap, paper strips, Tulsi, Turmeric, Neem, skin irritation.

1. INTRODUCTION-

Pandemic is one of the problems faced by people in the world from years including India. This pandemic is caused by a virus commonly known as COVID-19. The World Health Organization (2020) stated that people who touch objects that have been contaminated by droplets from sufferers can also be affected with COVID-19. The rapid spread of the virus is due to the large number of cases that are not accompanied by symptoms. One of the prevention efforts is done by washing hands with water and soap, because about 98% of the spread of disease comes from hands. A mixture of sodium or potassium salts with animal oils or vegetable fats can form soap [1]. Human skin is the outer covering of the body constituents the first line of defence against various pathogens. As the skin interfaces the environment, it is constantly exposed to different environmental stimulus a reaction, which make skin damage. Similarly, damage skin will usually form scar tissue mostly hand is a part of body which connects to pathogens even through working in day-to-day life so therefore soap has been made as formulation which is mostly used in our day-to-day life to fight against various pathogens. A soap is the potassium salt (or sodium salt) of a long chain carboxylic acid (fatty acid) which has cleansing properties in water. It is a salt of strong base (NaOH) and a weak acid (carboxylic acid), so a solution of soaps in water is basic in nature [2]. Ever since the earliest times, people have employed medicinal plants as a form of treatment. Various medicinal plants' leaves, stems, and roots have been used as a natural cure to treat a diversity of maladies and afflictions. Even if many plant-based treatments have been replaced by synthetic alternatives, ayurvedic products nevertheless stand out for their effectiveness and safety [3]. The anti-oxidant, anti-bacterial, cytotoxic, anti-microbial, hypotensive, anti-diuretic, anti-inflammatory, anti-spasmodic, anti-diabetic, anti-hemorrhagic, and anti-helminthic qualities of numerous herbs are discovered with high nutritional value. Owing to their high medical value, cost-effectiveness, availability, and compatibility, incorporation of natural products to a preparation helps in treating practically all diseases and skin issues [4]. The active compounds which provide these plants their therapeutic benefits are isolated and used topically in creams, soaps, oils, and ointments to treat skin conditions like acne, eczemas, wounds, and ringworms as well as for cosmetic and anti-microbial purposes. The therapeutic benefits of plants are used in a variety of formulations for both medical and cosmetic purposes [5,6]. Hence present research work is designed to formulate a novel drug delivery system in the form of herbal medicated paper soap strip that will produce good

foam on affected part, deliver the drug at faster rate, will be economic, convenient to use and effectively cure the topical fungal infection.

Advantages of paper soap- [7]

- Light weight
- Ready to use
- Gentle on skin
- Ease of carrying
- Earth friendly
- Low cost
- Biodegradable, compostable

Plant Profile-

Ocimum tenuiflorum- (Tulsi) [8,9,10]

Tulsi (*Ocimum sanctum* L.) in Hindi or Tulasi in Sanskrit (holy basil in English) is an exceptionally adored culinary and restorative fragrant herb from the family Lamiaceae that is indigenous to the Indian subcontinent and been utilized inside Ayurvedic medication over 3000 years. In the Ayurveda framework tulsi is frequently alluded to as a "Solution of Life" for its mending powers and has been known to treat a wide range of basic wellbeing conditions. In the Indian Materia Medica tulsi leaf separates are portrayed for treatment of bronchitis, ailment and pyrexia. It is viewed as a pervasive plant in India.



Fig 1. Tulsi leaves

It is a fragrant plant in the family lamiaceae. It is an erect, much stretched sub bush 30-60cm tall with furry stems and basic inverse green leaves that are unequivocally scented. Tulsi assumes a crucial job in our regular daily existence and is supposed to be the sovereign of natural plants. It is the most well-known family plant in India and it is hallowed in Hindu custom. Numerous Hindu legends clarify the significance, properties and employments of tulsi. Tulsi is an erect pleasant-smelling bush which develops up to a stature of 3 - 5feet. It is ordinarily developed in gardens and in the outskirts of sanctuaries. it has an impactful taste and fragrant smell.

Phytochemicals- The plant and its oil contain diverse phytochemicals, including tannins, flavonoids, eugenol, caryophyllenes, carvacrol, linalool, camphor, and cinnamyl acetate, among others. One study reported that the plant contains an eponymous family of 10 neolignane compounds called tulsinol A-J. Specific aroma compounds in the essential oil are camphor (32%), eucalyptol (19%), α -bisabolene (17%), eugenol (14%), germacrene (11%) and β -bisabolene (11%). In addition, more than 60 different aroma compounds were found through gas chromatography–mass spectrometry analysis of holy basil.

Uses- Tulsi, also known as holy basil, is a revered herb in Ayurveda and has various uses due to its medicinal properties. Here are some common uses such as medicinal purposes, stress relief, immune booster, respiratory health, antioxidant properties, anti-inflammatory, digestive aid, skincare, oral health, hair care, religious and spiritual practice, purification of air and environment

Azadirachta indica (Neem) ^[11,12,13]

Azadirachta indica, commonly known as neem, margosa, nintree or Indian lilac, is a tree in the mahogany family Meliaceae. It is one of two species in the genus *Azadirachta*. It is native to the Indian subcontinent and to parts of Southeast Asia, but is naturalized and grown around the world in tropical and subtropical areas. Its fruits and seeds are the source of neem oil. Nim is a Hindustani noun derived from Sanskrit nimba. Margosa is a fast-growing tree that can reach a height of 15–20 meters (49–66 ft), and rarely 35–40 m (115–131 ft). It is evergreen, shedding many of its leaves during the dry winter months. The branches are wide and spreading. The fairly dense crown is roundish and may reach a diameter of 20–25 m (66–82 ft). The opposite, pinnate leaves are 20–40 cm (8–16 in) long, with 20 to 30 mediums to dark green leaflets about 3–8 cm (1+1/4–3+1/4 in) long. The terminal leaflet often is missing. The petioles are short.



Fig 2. Neem leaves and twig.

Phytochemical- Margosa fruit, seeds, leaves, stems, and bark contain diverse phytochemicals, some of which were first discovered in *azadirachta* seed extracts, such as azadirachtin established in the 1960s as an insect antifeedant, growth disruptor, and insecticide. The yield of azadirachtin from crushing 2 kg of seeds is about 5 g. In addition to azadirachtin and related limonoids, the seed oil contains glycerides, diverse polyphenols, nimbolide, triterpenes, and beta-sitosterol. The yellow, bitter oil has a garlic-like odor and contains about 2% of limonoid compounds. The leaves contain quercetin, catechins, carotenes, and vitamin C.

Uses- Neem, also known as *Azadirachta indica*, is a versatile tree with numerous practical applications such as medicinal purpose, skincare, hair care, oral health insect repellent, pest control, fertilizer and soil amendment, animal care, water purification, cosmetics.

Curcuma longa (Turmeric) ^[14,15,16]

Turmeric or *Curcuma longa* is a flowering plant in the ginger family Zingiberaceae. It is a perennial, rhizomatous, herbaceous plant native to the Indian subcontinent and Southeast Asia that requires temperatures between 20 and 30 °C (68 and 86 °F) and high annual rainfall to thrive.



Fig 3. Turmeric powder

Plants are gathered each year for their rhizomes, some for propagation in the following season and some for consumption. The rhizomes are used fresh or boiled in water and dried, after which they are ground into a deep orange-yellow powder commonly used as a coloring and flavoring agent in many Asian cuisines, especially for curries, as well as for the dyeing characteristics imparted by the principal turmeric constituent, curcumin. Although long used in Ayurvedic medicine, there is no high-quality clinical evidence that consuming turmeric or curcumin is effective for treating any disease.

Phytochemistry- Turmeric powder is about 60–70% carbohydrates, 6–13% water, 6–8% protein, 5–10% fat, 3–7% dietary minerals, 3–7% essential oils, 2–7% dietary fiber, and 1–6% curcuminoids. The golden yellow color of turmeric is due to curcumin. Phytochemical components of turmeric include diarylheptanoids, a class including numerous curcuminoids, such as curcumin, desmethoxycurcumin, and bisdemethoxycurcumin. Curcumin constitutes up to 3.14% of assayed commercial samples of turmeric powder (the average was 1.51%); curry powder contains much less (an average of 0.29%). Some 34 essential oils are present in turmeric, among which turmerone, germacrone, atlantone, and zingiberene are major constituents.

Uses- Turmeric, also known as *Curcuma longa*, is a golden-yellow spice commonly used in cooking and traditional medicine. Its uses are diverse and including Culinary Uses, Anti-Inflammatory Properties, Antioxidant Effects, Digestive Health, Wound Healing, Skin Care, Heart Health, Immune Support, Cancer Prevention, Weight Management

2. MATERIAL AND METHOD- [17,18,19]

2.1. Materials:

- Tulsi (*Ocimum sanctum*) leaves
- Turmeric (*Curcuma longa*) rhizomes
- Neem (*Azadirachta indica*) leaves
- Soap base
- Glycerin
- Distilled water
- Sterile agar plates
- Water soluble paper

2.2. Preparation of Herbal Extracts:

Fresh Tulsi, Turmeric, and Neem leaves were collected, washed, and air-dried. The dried leaves were pulverized into fine powders using a grinder. Herbal extracts were prepared by macerating the powdered leaves separately in distilled water and filtering through Whatman filter paper.

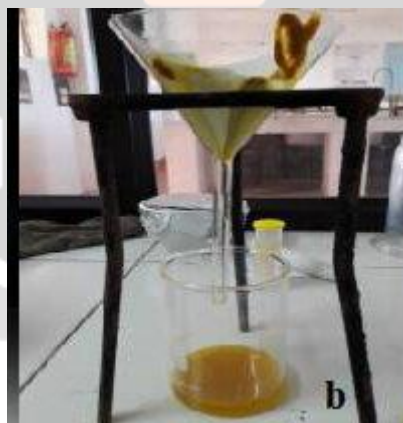


Fig 4. Extraction of herb

2.3. Formulation of Herbal Soap Paper Strips:

The soap base was melted using a double boiler method, and herbal extracts were added to the melted base along with glycerin for moisturizing effects. The mixture was stirred continuously until homogenous. The liquid soap formulation was poured onto the water dissolving paper sheet and allowed to dry at room temperature.

Fig 5. Prepared soap paper.



2.4. Evaluation of Physicochemical Properties: The thickness, weight, pH, and solubility of the soap paper strips were measured using standard methods. ^[20,21,22,23]

A) Evaluation of herbs used

Organoleptic evaluation

A. Colour – Green

B. Oduor – Aromatic

C. Appearance – Good

B) Evaluation of Liquid Soap

Organoleptic evaluation

A. Colour –Brown

B. Oduor – Pleasant, Aromatic.

C. Clarity – The test was done by keeping the liquid soap under the white background

C) Evaluation of paper soap

Organoleptic evaluation

A. Size -7cm.

B. Shape-rectangle

C. Oduor-aromatic, pleasant, sweet.

D) Physical evaluation of herbal paper soap: The herbal paper soap was formulated and was evaluated for following properties

a) pH: The pH was determined before and after the preparation of paper soap. At first the liquid soap was prepared and the pH was detected by using litmus paper the result was red litmus paper turned blue in colour and blue litmus remained unchanged. Then after the production of paper soaps the piece of paper soap was taken and added into water and then Shaked fully then the pH meter was used for testing of pH.

b) Foam retention: The soap strips were taken and added in water solution in a measuring cylinder the cylinder was covered with hand and was shaken for 10 times. The volume of the foam was checked in 1 minute interval. The foam height was found to be 60%.

d) Foam Height: The sample was dispersed in 20 ml of distilled water and then transferred into the measuring cylinder and then it was Shaked for a min and immediately its foam height was calculated as F1 and then after 10 – 15 min measure the foam height and the foam height were measured and noted as F2 it should be 2 cm. Foam height calculation – F1 – F2

- F1 -3.5cm
- F2- 1.5cm

Therefore, the foam height was =3.5-1.5 = 2cm)

e) Total moisture content: The moisture content was estimated by measuring the weight of water content in soap and the difference in the weight after the paper soap is fully dried in 100 to 115 c or by using dryer. The formulae used to find the moisture content is

%Moisture content = $\frac{\text{initial weight} - \text{final weight}}{\text{final weight}} \times 100$

- Initial weight = 0.110gm
- Final weight = 0.190gm

Therefore, %Moisture content = $\frac{0.110-0.190}{0.190} \times 100$. I.e. = 0.00421

f) Determination of % free alkali: One piece of sample was added and boiled in alcohol for 30 min under reflux water bath, then cooled and phenolphthalein was added and then titrated in 0.1 N HCL solution.

g) Stability Test: Short term stability studies was done in the period of 8 days for the formulations. The sample was stored in different storage temperature i.e., room temperature 37°C and at refrigerator 2 to 8°C. Sample was withdrawn on interval and analyzed for visual appearance, clarity, pH and drug content.

h) Primary skin irritation test: For this at least three volunteers were selected and prepared soap strips was given an applying in hand the amount of irritation was been checked.

i) Foam stability test: Foam stability is the consistency of the amount of foam produces by paper soap. The resulting foam on paper soap is smoother than the regular soap. The foam can be stable in the presence of foaming agent solution containing surface active agent will produce stable foams, when mixes with water Glycerin actually does not contain any surface active agents and don't have significant effect on foam stability.

3. RESULT AND DISCUSSION-

Formulation of herbal soap paper was successfully done and evaluated for various parameter to ensure the quality, safety and standard of formulated product.

Table No.1 Evaluation of herbal soap paper-

Sr No.	Test	Result
1.	Size	7cm
2.	Shape	Rectangle
3.	Odour	Aromatic, Pleasant
4.	pH	9
5.	Foam retention	60%
6.	Foam Height	2cm
7.	Stability test	Stable
8.	Primary skin irritation test	No irritation
9.	Foam stability test	Stable

The formulated herbal soap paper strips exhibited uniform thickness and weight, with a pH suitable for skin application. Furthermore, the soap paper strips showed minimal skin irritation potential, as observed in the patch test. Most volunteers did not experience any adverse reactions, reaffirming the safety of the formulation for topical use. The sensory evaluation revealed that the strips effectively cleansed the skin, removing dirt and impurities while leaving it feeling refreshed and moisturized.

4. CONCLUSION-

Soaps are one of the most essential things that are being used every day. It is used for cleaning and washing the body and it ensures that the microbes in the external parts, such as the skin, would be removed. Literatures have shown that presence of thick foam on the infected par causes hydration of stratum corneum and results in better penetration of drug. Thus, to overcome the disadvantages of soap bars, herbal paper soap strips are formulated. These herbal soap strips are simple, convenient to use, economical and can be used by patients of all ages and sex. The addition of main herbal ingredient in paper soap such as Tulsi is advantageous because of their anti-bacterial properties beneficial for dermatitis, psoriasis, eczema and other skin related disease or issues is found to be more effective for bacteria and fungi. No medication has been added which shows non-irritant functions on skin, maintains the skin natural pH without destruction or peeling-off of palm skin and fragrances are added at the last (lavender, peppermint and lemon essential oils) it shows anti-bacterial, anti-fungal which gives proper odour an also have therapeutic action. Paper soap itself is soap product innovation which is molded as thin paper. The paper soap is easy to carry and therefore is used mostly by travelers.

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