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**Priyanka Mandal**  
Bachelor of Pharmacy, Rajiv  
Gandhi University of Health  
Science, Student of Kr College  
of Pharmacy Bengaluru,  
Karnataka, India

**Sourav Kumar Upadhyay**  
Bachelor of Pharmacy, Rajiv  
Gandhi University of Health  
Science, Student of Kr College  
of Pharmacy Bengaluru,  
Karnataka, India

**Bhawna Poudyal**  
Bachelor of Pharmacy, Rajiv  
Gandhi University of Health  
Science, Student of Kr College  
of Pharmacy Bengaluru,  
Karnataka, India

**Mahalakshmi Sampagavi**  
Assistant Professor, Department  
of Pharmacology, Rajiv Gandhi  
University of Health Science,  
Bengaluru, Karnataka, India

**Correspondence**  
**Mahalakshmi Sampagavi**  
Assistant Professor, Department  
of Pharmacology, Rajiv Gandhi  
University of Health Science,  
Bengaluru, Karnataka, India

## Formulation and evaluation of herbal paper soap

**Priyanka Mandal, Sourav Kumar Upadhyay, Bhawna Poudyal and Mahalakshmi Sampagavi**

### Abstract

The main aim of this experiment is to formulate and evaluate herbal soap strip preparation, were Margosa played as essential and most important role as it is the oldest form of medicines which get suggests specially for skin conditions. Paper soaps are biodegradable sheets prepared and evaluated for dermal infections. Which act as a anionic surfactant on application with water helps to maintain the hygiene. These strips are easy to carry, use and portable. Herbal paper strips are free of harmful chemicals which minimize the cause of skin damage which may alter the natural terms of the skin. Non-medicated paper soap strips are easy to use and are cheap which induces less chance of getting attacked by microbes.

Neem, (*Azadirachta Indica*), also called Nim or Margosa tend to show medicinal and cosmetic uses based on its antibacterial and anti-fungal properties. Neem is commonly used in soaps and creams for skin conditions such as acne, psoriasis, and athlete's foot. Neem leaves have long been used as a traditional treatment for many diseases. Neem and Neem oil contains fatty acids, antioxidants, and antimicrobial compounds, which benefits skin in range of ways.

Research shows that these compounds may help fight skin infections, and promote wound healing, and combat signs of skin ageing. Neem preparations are reportedly efficacious against a variety of skin disease, septic sores, and infected burns. This herbal preparation also found to useful for several other skin related issues such as scrofula, indolent ulcers, and even ringworm.

The formulation and evaluation of herbal soap strips were carried out in two phases. Phase 1 studies involve selection of herbal preparation of herbal liquid soap solution, formulation of herbal paper soap strips and evaluations of paper soap strips. Phase 2 includes the several parameters such as organoleptic evaluation. Evaluation of paper soap, physical evaluation of herbal paper soap such as: pH test, Foam retention, Anti-microbial activity test, Foam height, total moisture content, determination of percentage alkali, Stability test. Primary skin irritation test and Saponification test. To facilitates the anti-microbial and anti-fungal actions, or dermal infections and resist towards microbial growth. The result of physiological characters was revealed these steps were carried out and the best result of soap was found.

**Keywords:** Biodegradable paper sheet/soaps, evaluation, Marg

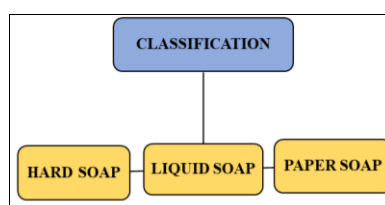
### Introduction

Human skin is the outer covering of the body constituents the first line of defences against various pathogens. As the skin interfaces the environment, it is constantly exposed to different environmental stimulus a reaction, which makes skin damage. Similarly the 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.

Soap is nothing but, substances that, when dissolved in water, possess the ability to remove dirt from surfaces such as the human skin, textiles, and other solids<sup>[17]</sup>.

Soap cannot produce bubbles in hard water and thus condition results in the wastage of soap. Scum is not easily cleaned. It will leave a clear sediment that can be seen on clothes, and causes them to feel hard.

### Classification of soap



### Paper soap

The main focus of our research is manufacture of the paper soap sheet. Paper soap is a thin soap sheet. It is an anionic surfactant that is used in conjunction with water for washing and cleaning. The soap includes a substrate, a cleaning composition, and a holder. The cleaning composition is impregnated in the substrate so as to form a dry cleanser impregnated substrate is laid on to hold on to prevent exposure and evaporation of cleansing composition, since the cleanser impregnated substrate is dry. The holder removable holds at least one stacked dry and cleanser impregnated substrate is dry and cleanser impregnated substrate is removed from a holder and subjected to water, substrate dissolves leaving the cleansing composition dissolve in water for cleansing. It is portable, cheap and easy to use. The paper use in paper soap is environmentally friendly. By dissolving paper in water even if the paper is thrown away, the paper is biodegradable a disposable one. Hand washing with soaps is important because it is proven to clean hands from germs and bacteria. The paper soaps were made from and glycerine as a plasticizer.

The aims of this research were to determine both formulation of paper soap using coconut oil and castor oil and based with addition of glycerine, and determine the quality of the paper soaps which is disposable hand soap. Soap shell lets you wash your hand by effectively eliminating 99.9% bacteria by just adding water just before wash. Each travel pack comes with 10-20 thin sheets with each sheet with one hand washing session simple a convenient.

This research used laboratory experimental method using descriptive analysis. These biodegradable sheets are advantageous to utilize. The paper soap is little and simple to carry, few paper soap tablets can wash their hands, disinfecting, cleaning is a decent accomplice for healthy self. Paper soaps are surprisingly ideal for travellers. Intended to suit your travel needs, these soaps are very compelling and convenient. For brisk hand wash at any spot whenever carry these global mart paper soaps for a sterile journey. These paper soaps come in adorable packs and shape sand are stuffed in travel-friendly, simple to carry tubes. Light and dainty soaps in the warm water.

The paper soap is very easy to use, the addition of moisture to avoid dry hands, its scent and it also helps the sink area tidy and makes its more demandable for urban areas especially for children, but in rural areas they don't mostly prefer these products.

### Literature review

#### Plant profile

##### Neem

**Synonym:** Arishth, Margosa, Nim tree, Neem tree

A large tropical Asian tree (*Azadirachta indica*) of the mahogany family having a bitter bark used as a tonic and leave and seeds that have insecticidal and antiseptic properties and yields a medicinal aromatic oil<sup>[37]</sup>. It is native to the Indian subcontinent and most of the countries in Africa topically grown and semi-tropical regions. Neem trees also grow on the islands in southern Iran. Its fruits and seed are the source of Neem oil.



**Fig F:** Fresh neem leaves

**Synonym:** Melis Azadirachta.

**Biological source:** it consists of leaves and other aerial parts of *Azadirachta Indica*.

#### Chemical constituent

- ✓ The active ingredients are Azadirachtin, salaninin and meliantriol Neem leaves contain Nimbosterol and Quercetin.
- ✓ Seeds contain Azadirachta, salaninin, Meliantriol and Melanin.
- ✓ The trunk bark contains Nimbin, Nimbinin, Nimbodin, Nimbosterol and a bitter principle called Margosine.
- ✓ Neem oil contains chiefly glycerides of oleic (50%) and stearic (20%) acids.

#### Mechanism of action of Neem (*Azadirachta Indica*)

Neem (*Azadirachta Indica*) a member of the Meliaceae family, has therapeutics implication in the disease's prevention and treatment. But the extract molecular mechanism in the prevention of pathogenesis is not understood entirely. It is considered that *Azadirachta Indica* shows therapeutic role due to the rich source of antioxidant and other valuable active compounds such as Azadirachtin Nimbinin, Nimbin, Nimbodin, Nimbodin, salaninin, and Quercetin.

Possible mechanism of action of *Azadirachta Indica* is presented as follows Neem (*Azadirachta Indica*) plants parts shows antimicrobial role through inhibitory effect on microbial growth /potentiality of cell wall breakdown.

1. Tumour suppressor genes (e.g., p53, pten), angiogenesis (vegf), transcription factors (e.g., Nf- kb); and apoptosis (e.g., bcl2, bax).
2. Neem also plays role as anti-inflammatory via regulation of pro-inflammatory enzymes activities including cyclooxygenase (cox), and lipoxygenase (lox) enzyme.<sup>[36]</sup>
3. The content (filtered Neem extract) then collected and stored. For further uses.

#### Medicinal uses

- All parts of Neem tree used as anti-helminthic, antifungal anti diabetic, antibacterial, antiviral, contraceptive and sedative.
- Neem is used in many medicinal treatments like skin disease, healthy hair, improve liver function detoxify control, fever reduction, dental treatments, cough, asthma, ulcers, piles, intestinal worms, urinary disease etc.
- Anti- inflammatory, analgesic and antipyretic activities.

**Literature of neem leaves (*Azadirachta Indica*)**

Biswas k, Chattopadhyay I, Banerjee Rk, Bandyopadhyay; Biological activities and medicinal properties of Neem (*Azadirachta Indica*).

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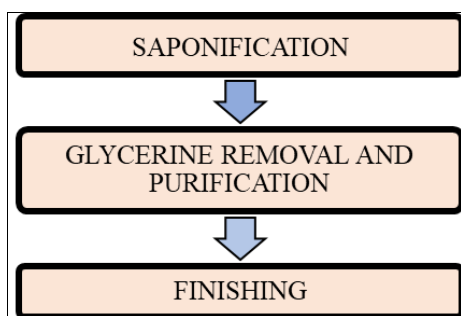
Alzohairy MA: Therapeutics role of *Azadirachta Indica* (Neem) and their active constituent diseases prevention and treatment. Evidence based complementary and Alternative medicine, 2016.

Rahmani A, Almatroudi A, Alrumaihi *et al*: Pharmacological and therapeutic potential of Neem (*Azadirachra* indica) Pharmacognosy Reviews.2018 [19-23].

**Table 1:** Materials and method for manufacturing of paper soap formulation of paper soap

SL/NO	Ingredients	Amount
1	Liquid soap was prepared by hot process	-
2	KOH	15gm
3	Citric acid	2ml
4	Distilled water	300 ml
5	Lavender	3ml
6	Glycerine	30ml
7	Castor oil	10ml
8	Coconut oil	50ml
9	Nacl	16gm
10	Sorbitol	2:1
12	Any paper (eg- Watts Mann filter paper, butter paper)	Required amount
13	Neem extract	3ml

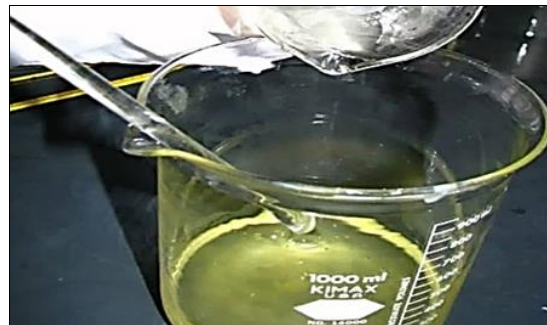
**Steps involved are**



**What is saponification?**

Saponification is a type of chemical reaction between a strong alkali or base (such as sodium or potassium hydroxide) and fat. Animal and vegetable fats and oils are made of ester molecules called triglycerides. An ester is a molecules that is formed from an alcohol and an acid. In the case of fats, glycerin is the alcohol, and the acids are fatty acids like stearic, oleic, and palmitic acids. When the alkali solution is thoroughly mixed with the oils, a reaction called saponification begins. What this means is that the glyceride of the triglyceride breaks off to form glycerine and the sodium or potassium bond with the fatty acid to form soap. With potassium, you get liquid soap. Every oil or fat has what is called a saponification number, which is determined

by the amount of alkali needed to completely saponify the fat.



**Fig N:** Saponification process

**Glycerine removal**

Glycerine is more valuable than soap so it must be removed from soap and some of the glycerine is left in sap that help to make it soap and avoid the shrinkage of skin. The salt is added to the wet soap causing it to separate out into soap and spent lye and avoid bunch formation. The product is then collected which is in pure form.

**Purification and finishing**

After complete saponification has occurred the “neat soap” is precipitated from the solution by adding common salt. In the fully boiled process on an industrial scale, the soap is further purified to remove any excess KOH, glycerol and other impurities are removed by boiling the soap and precipitating it with salt. Then the soap is mixed with additives.

- The liquid soap is then combined with fragrances i.e., essential oils.
- To make herbal soap the fresh herbs are extracted and added to it in convenient amount.

**Part A:** Materials and method for liquid soap preparation

**Materials required**

1. We require hand gloves for protecting our hand from harmful chemicals [31].
2. Nose mask is required because the chemicals used such as lye is irritant to nose.
3. Turning stick a long spatula is required for adding and stirring purpose of chemicals mixing.
4. Measuring soon a funnel is required for filtration purposes.
5. Plastic bowls glassware’s i.e., measuring cylinder, beaker, conical flask etc.
6. Towel for cleaning purpose.
7. Distilled water plenty amount.
8. Thermostat and water bath for heating a saponification process.
9. Bunsen burner for boiled.

**Method for preparation of liquid soap**

**1) Prepare glycerin**

Measure of glycerine into beaker of required size and heat it on 60 °C, stir glycerine gently a check temperature with thermometer.

**2) Prepare coconut oil and castor oil mixture**

Weigh 50 ml of coconut oil in required amount of beaker, heat coconut oil gently to melt the oil, and take 10ml of

castor oil and pour to coconut oil and mix the oils by continuous stirring.

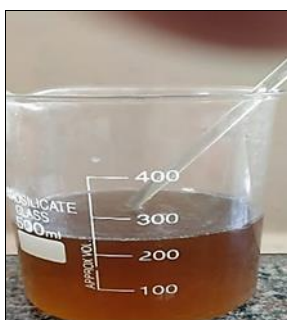
**3) Prepare koh solution**

- The 50 ml of water and 15gm of Potassium Hydroxide solution added to the flask. The mixture stirred by using stirring rod to mix the contents of the flask. Then keep KOH covered.
- As KOH dust can be effective to nostrils and throat. Avoid breathing the dust or fumes when mixing KOH solution.

**4) Mix soap**

- Gently pour KOH / water solution into glycerine. Heat the soap and maintain temperature of 60-70 °C. The mixture was stirring continuously during the heating process to prevent the mixture from foaming. If the mixture should foam to the point of nearly overflowing, the flask removed from the boiling-water bath until the foaming subsides, then continue heated. The mixture heated for 2-3hours until it undergoes complete saponification.
- Then add Nacl solution on the mixture with continuous stirring. The Nacl solution was prepared by adding 16gm of Nacl into 200ml of water and stirs it properly until the Nacl salt dissolves properly then the mixture of alkali, fats an oil, glycerine and salt were heated in thermostat until it goes proper saponification.
- The mixture was removed from the boiling-water bath and the flask cooled in an ice bath for 10-15 minutes.
- While the flask is cooling assemble the vacuum filtration apparatus, the vacuum flask secured to a ring stand with a utility clamp to prevent the apparatus from toppling over.

A piece of filter paper weighted to the nearest 0.001 g and recorded. The filter paper placed inside the Buchner funnel. The filter paper was moisture with water so that it fits flush in the bottom of the funnel, The 150 ml of saturated, Nacl solution added to the flask to salt out the soap once the flask has cooled.



**Fig O:** Liquid soap prepared

**5) Collection, identification and processing of plant**

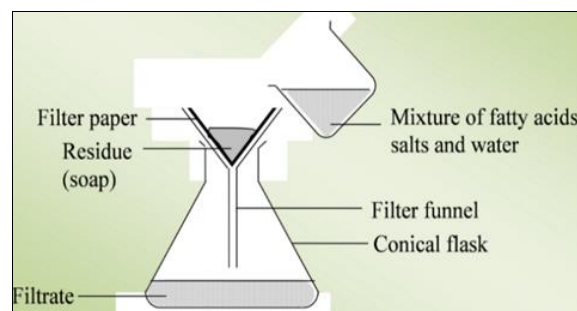
The leaves of *Azadirachta Indica* collected from different matured plant. The leaves were dried and kept in airtight bottles for studies. It involves two processes.

**Preparation of herbal extract-**300g of fresh tulsi leaves were crushed or grinded then the crushed leaves were filtered through muslin cloth a then filter paper. The crude extract was complete to use.



**Fig P:** Extraction method

**Addition of crude extract to liquid soap preparation**



**Fig P:** Filtration of soap

Then the needed amount herbal extract was added to fully saponified soap preparation by continuous stirring until it dissolves properly.

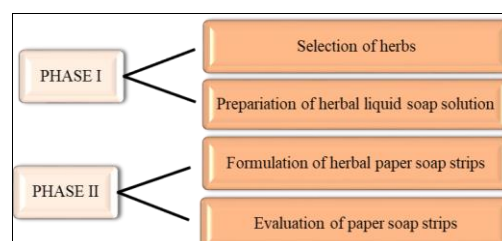
**6) Optional**

At this point we can add few grams of essential oil for scent of soap. Concentrated essential oil is strong and goes long way

**Part 2: Materials and method of preparation of paper soap**  
**Materials required**

1. To start your paper soap, you will need few sheets stock of papers i.e. watts man filter paper, butter paper and 3 point face stock paper.
2. You will need ruler or scissors and a few paints brushes a tray
3. Prepared amount of liquid soap
4. Small storage containers and a way to hang a dry paper soap, some string, tape, clips, can be used.
5. For storage old mint containers or any small handmade paper books can be use.

**Preparation of paper soap**



**1. Phase 1:** Selection of soap solution soaps were prepared and coded as X and Y. Soap solution of varied concentration (5, 10, 15, 20% w/v) were prepared. Formation of foam was avoided during solution preparation. Foam test was the criteria for selection of good soap. The soap capable of producing maximum foam was selected. Selection of paper Six different branded papers (Whatman filter paper no. 41 and 42, filter paper, bond paper and butter paper) were selected and coded as A, B, C, D, E, and F. They were evaluated for their absorption capacity and weight gain. The paper showing maximum absorbing capacity was considered as the best paper.

**2. Phase 2:** Formulation of herbal paper soap strips the herb was incorporated in the selected formulation which showed good absorption capacity in phase-I studies. Accurately weighed was mixed with 15% soap powder and distilled water was added under constant and continuous stirring until a uniform soap-herb solution was formed. Then paper soap strips were prepared.

#### Formation of herbal paper soap strips

The paper soap strips were prepared by Dipping technique using modified disintegration apparatus and air dried overnight at  $37 \pm 2$  °C. For this purpose, different papers were dipped one after another into the soap solution and air dried overnight. Evaluation of herbal paper soap strips the prepared strips were subjected for determination of size, shape, weight variation, pH and foam test by a reported standard method and an average of 20 strips was taken.

#### Results and Discussion

- ✓ Organoleptic evaluation of herbal paper soaps showed that the herbal paper soap was transparent in color with the flavor of lavender having pleasant odour.
- ✓ pH test was determined with the help of litmus paper. The result was red litmus turned into blue which showed the resultant pH as;

pH	8.5
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The paper soap is suitable for human skin.

- ✓ **Foam retention & Foam height:** The soap strips were tested with dilution of water and the foam height was measured and found to be 2.3 in cm. Then the foam retention test was done by keeping the foam for the interval of 10 sec and the stability of foam was noted and was found to be 1.5cm.

Sl.no	Name of the test	RESULT
I	Foam test	2.3 Cm
II	Foam retention test (after 10 sec)	1.5 Cm

- ✓ **Anti-microbial activity of tulsi leaves:** Neem plant is herbal plant and it contains anti-bacterial properties. The analysis is done by using gram positive bacteria staphylococcus and lactobacillus aureus on the agar medium placing the sample in incubator for about 24hrs at 30 degrees. The herbal soap paper strips show the deduction of microbial growth on the agar medium by disk plate method.

- ✓ **Total moisture content:** The moisture content was estimated by the weight variation analysis and was not more than 2%.
- ✓ **Determination of % alkali:** The % alkali content was determined by using titration process. The resultant alkali was found to be:

Sl/no	Method	Observation (in %)
I	Sample + 10 ml KOH solution + phenolphthalein indicator was titrated against 0.1 N HCl.	0.0008175%

- ✓ **Primary skin irritation test:** Paper strips were rubbed with little amount of water and after 5 min no irritation was observed.
- ✓ **Stability test:** The paper soap was exposed to moisture for one week and no fungal growth, no physical, chemical, microbial change were observed.
- ✓ **Saponification value:** Saponification number represents the number of milligrams of potassium hydroxide required to saponify 1-2 gm of fat under the specified conditions. Here coconut and castor oil were taken as the fatty component for saponification procedure.

#### The saponification value was found to be 105.655%

The results of all parameters were performed which was appropriate for the use in human skin. In this research among the various soaps, paper soap seems to be economical, safe, convenient, easy to use, and due to herbal extract of Neem was therapeutically effective under various bacterial infections<sup>[30-40]</sup>.

#### 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. In terms of hygienic measures, soap is a prominent cleanser that helps people eradicate germs and bacteria that made contact with the skin, as well as maintain body's health and sanity. Literatures have shown that presence of thick foam on the infected part 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 Neem is advantageous because of their anti-bacterial properties beneficial for dermatitis, psoriasis, eczema and other skin related disease or issues it found to be more effective for bacteria and fungi. No medication has added which shows non-irritant functions on skin maintain 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) shows anti-bacterial, anti-fungal which gives proper odour an also have therapeutic action. Today hand washing soap is practical to carry everywhere. Paper soap itself is soap product innovation which is moulded as thin paper. The paper soap is easy to carry and therefore is

used mostly by travellers. They are completely assembled with covered paper strips and can be carried anywhere. They are undoubtedly outstanding amongst other travel cleansers. The paper soap has vegetable oil which added together with cleansers with handcrafted paper sheets. The coconut oil and castor oil which profoundly purifies skin. It leaves hand brilliantly cleaned and leaves hand with invigorated scent.

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