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Herbal paper soap (Turmeric)

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Abstract

The aim of this experiment is to formulate and evaluate herbal soap strip preparation, where Turmeric plays an essential and most important role as it is the ancient form of medicines which is suggested specially for skin concerns. Paper soaps are biodegradable sheets prepared and evaluated for dermal infection. Which act as an anionic surfactant. Paper soap can be used which helps to maintain the hygiene level palms. These strips are easy to carry, use and portable. Herbal paper strips are free of harmful chemicals which minimize the cause of skin damage as it may alter the skin natural pH. Non-medicated paper soap strips are easy to use and are cheap which induces less chance of getting attacked by microbes.

Turmeric, known scientifically as *Curcuma longa*, is a golden, aromatic spice that is part of ginger family. It has been used throughout ancient history in Southeast Asia, china, and India it tend to show medicinal and cosmetic uses based on its antibacterial and anti-fungal properties. Turmeric is commonly used in soaps and creams for skin conditions such as acne, anti-tan and brightening properties. Regular turmeric powder contains about 3% curcuminoids. Of that 2%, about 77% is comprised of curcumin; therefore regular turmeric powder has about 2% curcumin. Turmeric and its essential oil contain anti-inflammatory and provide antioxidant benefits which defends from free radicals. Turmeric paper soap preparations are efficacious against a skin issues. Based on their mechanism of functions all measuring parameters were studied, by formulating non-medicated paper soap strips.

The formulation and evaluation of herbal soap strips were carried out into phases.

Phase 1 studies involve selection of herbal preparation of 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. 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 got performed. These evaluation test facilitates reduction of the Microbial and Fungal actions, or dermal infections and resistant towards microbial growth. The result of physiological characters was revealed. Carried out and the best results of was found.

Keywords: Biodegradable paper sheet/ soaps, evaluation, Margosa

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 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.

It is any water-soluble salt of whose fatty acid contains eight or more carbon atoms. Hence, soap in its various forms, is a high demand. It depends on its washing action on the fact that its molecules process one ionic (polar, water-attracting or hydrophilic) end and one covalent (non-polar, water repelling or hydrophobic) end which attracts oils and greases (Namiesnik. *et al.*, 2011) [22] thus, soap molecules can make water and oils come into an emulsion which can be washed away. Basically, all soaps are made by saponification hydrolysis of naturally occurring fat and oil by sodium hydroxide (Caustic soda) or potassium hydroxide (caustic potash). Fats and oils are composed of triglycerides; three molecules of fatty acids attach to a single molecule of glycerol. The alkaline solution, which is often called lye (Although the terms "lye soap" refers almost exclusively to soaps made with sodium hydroxide), brings about a chemical reaction known as saponification.

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According to WHO (World health organization, central for disease control and prevention and other trusted health care authorities, until large scale measures to combat proper hygiene in act in a report in medical news today, reaches estimated that just a 40 % increase in proper hand washing and sanitizing measures by those who don't already wash carefully could cut the spread of disease.

Liquid soap are the transparent solution of fatty potash up to 20% of fatty acids and upto 1% of fragrances. Liquid soaps include moisturising agents do that your hand may not dry out as quickly form frequently cleaning your hand. Liquid soap is the most efficient in terms of prices business consumers and also home consumers. It is also popular product among users. There is fewer waste with soap especially liquid soap than it with hard soap. It has also better germ control activity. Ordinary hand soap was prepared with different fragrances and colours. Comparatively newly prepared liquid soap was prepared with good moisturizing property. The better fragrances and germ fighting capabilities make them convenient soap for hand washing.

Plant profile

Turmeric

Synonym: *curcuma longa*, *curcumin*, *halada*, *haldi*, *curcumae longe rhizoma*



Fig 1: Turmeric Rhizomes

Biological source: turmeric is a product of *curcuma longa*, a rhizomatous herbaceous perennial plant belonging to the ginger family *Zingiberaceae*.

The use of turmeric dates back nearly 4000 years to the Vedic culture in India, where it was used as a culinary spice and had some religious significance.

Turmeric also known as haldi is an aromatic plant in the family *Zingiberaceae*. It is widespread as cultivated plant throughout the Southeast Asian tropics. As many as 133 species of *curcuma* have been identified worldwide. The beneficial reason is that they might offer a natural safeguard against the development of certain conditions and treatment for some disease. Turmeric is cultivated for religious and traditional medicine purposes, and also for its essential oil. Ayurveda, according to Sadhguru, turmeric has many healing properties as a purification agent. By helping to purify the body, blood and spiritual energy system. The Hindu religion sees turmeric as auspicious and sacred.



Fig 2: Dried turmeric

Morphology

Curcuma Longa is native throughout the old-world tropics and widely cultivating for its, medicinal uses. The tuberous rhizomes, or underground stems, the rhizome has a pepper like aroma and has a strong staining orange-yellow colour. Turmeric plants reach about 1 meter (3.3 feet) in height and bear long simple leaves with long petioles (leaf stems). The leaves emerge from the branching rhizomes that lie just below the soil surface. Older rhizomes are somewhat scaly and brown in colour, while young rhizomes are pale yellow to brown orange.

Table 1: Scientific classification

1	Kingdom	Plantae
2	Division	Magnoliophyta
3	Order:	Zingiberales
4	Family	Zingiberaceae
5	clade	Angiosperms
6	Genus	Ocimum
7	Species	Longa.

Chemical composition

The main active components of the rhizome are the non-volatile curcuminoids and volatile oil. Curcuminoids (curcumin, demethoxycurcumin, and bis-demethoxycurcumin) are nontoxic polyphenol derivatives of curcumin that exert a wide range of biological activities.

Extraction

- Dried rhizomes (turmeric) collected.
- Then washed properly to avoid any foreign particles in the preparation.
- Dried form of rhizomes was crushed or grind to the finest with amount of aqueous solution.
- Boiled for half to one hour to receive Phyto constituents.
- The obtained content then filtered with the use of muslin cloth.
- And the extract can be used for other properties.

Mechanism of action (Turmeric)

The mechanism of action of turmeric on these parameters believed to be largely due to the rhizomes potent anti-inflammatory effect. Turmeric protective action is due in part, too its free radical scavenging effect. This also reduces oxidative cellular and chromosomal damage from radiation. These actions ultimately help reduce end-organ damage and improve post-radiation recovery. Limited clinical studies have shown promise with being able to deliver higher doses of therapeutic radiation in patients' taking turmeric. it's an anti-bacterial and anti-inflammatory properties and its herb

that gives gorgeous skin in just few days using it. This also reduces oxidative cellular and chromosomal damage from radiation.

Curcumin shows anti-bacterial activity due to presence of eugenol and linalool which increase the permeability of plasma membrane, inhibit the microbial respiration which causes the death of bacterial cell due to massive ion leakage. Antipyretic activity is due to prostaglandin inhibition. Anti-histamine effect is due to this reason that it affects the histamine H2 receptor causing histamine intolerance and inflammation is not produced.

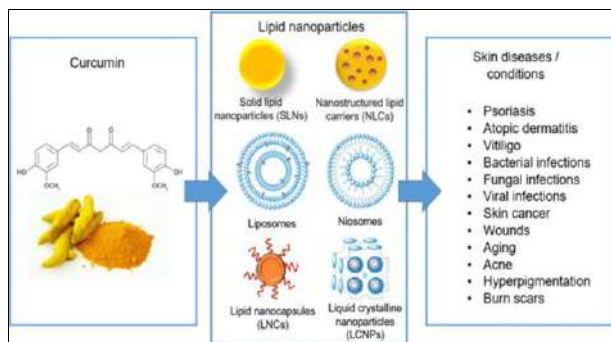


Fig 3

USES- it may help with a range of dermatological conditions.

- It contains properties that contribute to natural glow
- It can be effective towards psoriasis
- It's been linked to scabies treatment
- It can heal wounds.

Materials and method

Table 2: 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	Lemon grass oil	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

Steps in involved

- Saponification
- Glycerine removal and purification
- Finishing

Saponification

It 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 molecule called triglycerides. An ester is a molecule that is formed from an alcohol and an acid. The case of fats, glycerine is the alcohol, and the acids are fatty acids like stearic, oleic, and palmitic acid. 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 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 every oil or fat has what is called a saponification number, which is determined by the amount of alkali need to completely saponify the fat.

Glycerine removal

The excess amount of glycerine is removed from soap and remaining glycerine is left in a soap that helps to avoid the shrinkage of skin.

Purification and finishing

After complete saponification has occurred the “neat soap” is precipitated from the solution by adding common salt. The fully boiled process on an industrial scale, the soap is further with salt. Then the soap is mixed with additives.

- The liquid soap is then combined with fragrance’s 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 to protect our hand from harmful chemicals.
2. Nose mask is required because the chemicals used such as lye might be irritant to nose.
3. Turning stick a log spatula is required for adding and stirring of chemicals.
4. The filtration process is done by using the funnel.
5. Plastic bowls a glassware’s i.e., measuring cylinder, beaker, conical flask etc.
6. Towel for cleaning purpose.
7. Distilled water about plenty amount.
8. Thermostat and water bath for heating a saponification process.
9. Bunsen burner for boiling.

Method for preparation of liquid soap

1. Prepare glycerine

Measure 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 affect to nostrils and throat. Avoid breathing the dust or fumes when mixing KOH solution.

Mix Soap

- Gently pour KOH / water solution into glycerine. Heat

the soap and maintain Temp 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 heating. 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 stir 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 slightly damped 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.

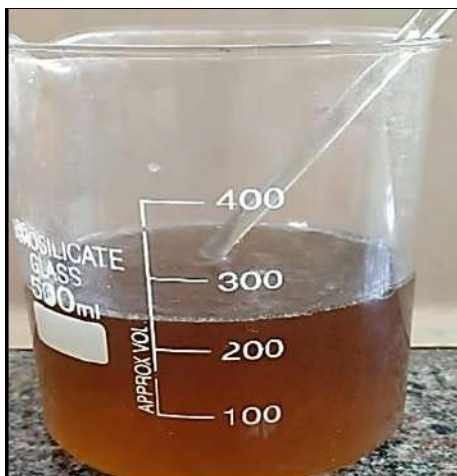


Fig 4: Liquid soap preparation



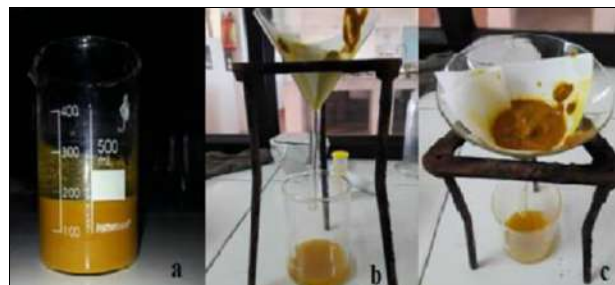
Fig 5: Extraction

Collection, identification and processing

The rhizomes were collected kept in airtight bottles for studies. It involves two processes

- **Preparation of herbal extract**
400g of fresh rhizomes were crushed or grinded. Then the crushed were filtered through muslin cloth a then filter paper. The crude extract was complete to use.

Extraction process of turmeric



(a) Maceration of turmeric, (b) Filtration, (c) Obtained turmeric paste

Note

When turmeric is found to be soluble in basic solution, for example if it is dipped in basic solution like sodium hydroxide, then the turmeric turns red, this change in colour is due to the changes in pH.

Addition of crude extract to liquid soap preparation

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

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

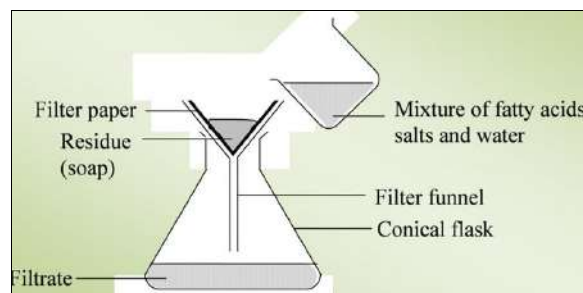


Fig 6: Filtration of soap

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 dry paper soap, some string, tape, clips, can be used.

1. **Phase-I** 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-II** 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 $37 \pm 2^\circ\text{C}$. 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 were taken.

Evaluation of herbal paper soap

A) Evaluation of herbs used organoleptic evaluation

- A. **Colour**-Orange, brown, yellow or reddish-yellow in color
 B. **Odour** – Earthy-mustard odour
 C. **Appearance** – rhizomes

B) Evaluation of liquid soap organoleptic evaluation-

- A. **Colour** –Brown
 B. **Odour** – 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** -3/5cm.
 B. **shape**-rectangle
 C. **Odour-aromatic**, pleasant, sweet.

Dphysical 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 an added into water a then Shaked fully then the pH meter was used for testing of pH.
- b) **Foam retention:** The soap strips was 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.

- c) **Anti-microbial activity of turmeric:** There was various study conducted on antimicrobial activity of paper soap conducted using tulsi plant as a herbal extract. Microbial study was done using microorganisms. For checking the effectiveness of the herb uses the fungi a virus was grown in the culture media the soap strip was placed in the surface of the agar media then it was placed in the incubator for about 24 hrs at 30 c The herb diffuses out of the strip into the agar an the microbials activity was recorded.
- 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 $= 3.5 - 1.5 = 2\text{cm}$

- 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:

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

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

Therefore

$\% \text{Moisture content} = \frac{0.110 - 0.190}{0.190} \times 100$. 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 80°C . Sample was withdrawn on interval and analysed for visual appearance, clarity, pH and drug content.
- h) **Primary skin irritation test:** For this at least three volunteers was 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 Glycerine actually does not contain ant surface active agents and don't have significant effect on foam

stability.

- j) **Saponification test:** The saponification test was done by taking 3 ml of sample i.e., different kind of fats (oil) mixed well with 25 ml of KOH solution and mix well put the mixture into water bath for 30 min and cool add phenolphthalein indicator and triturate it against 0.5 N HCL. Then perform blank titration without taking the sample.

The saponification was done by taking both castor oil a coconut oil as fat.

The formulae used for calculation of saponification value is –

Saponification value = (A-B) * N*56.1/W

- A-H₂SO₄ for blank.
- B-H₂SO₄ for sample.
- N-normality i.e., 0.5NHCL.
- 56.1 – equivalent weight of KOH.

A. For coconut oil –

➤ Saponification value = $40 - 12 \times 0.5 \times 56.1 / 3$ I.e., 261.8

B. For castor oil –

➤ Saponification value = $31 - 12 \times 0.5 \times 56.1 / 3$ I.e., 178.28

Results and Discussion

Organoleptic evaluation of herbal paper soaps showed that the herbal paper soap was slightly reddish in color and lemon grass 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 for the interval of 10 sec and the stability of the 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 the turmeric powder: Turmeric 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 24 hrs. 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 %)
	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 changes 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, and easy to use and due to herbal extract of neem was therapeutically effective under various bacterial infections.

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 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 (lemon grass essential oil) it 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 molded 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.

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