

FORMULATION AND EVALUATION OF ANTIBACTERIAL POLY HERBAL SOAP

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ABSTRACT

Herbal products have become an item of global importance both medicinally and economically. Although usage of these herbal products has increased, their quality, safety and efficiency are serious concerns in industrialized and developing countries. The present research has been undertaken with the aim to formulate and evaluate the pure herbal formulation. The herbal soap was formulated by adding the extract of *Azadirachta indica*, *Curcuma longa*, *Ocimum sanctum*, *rosa extract* in a transparent soap base. The physicochemical parameters of formulations (Physical evaluation, pH, Foaming ability and foam stability, microbiological study) were determined. The results showed that formulations have pH level nearly equal to skin pH,

Foaming index is excellent. Further formulations have studied eye and skin irritation on human models and results showed that there was no skin irritation to humans. Most of the commercial soap and detergents contain chemicals that can be harmful to the skin. Using natural herbal soap and detergents can be a good alternative. They provide relaxation, healing from stress also. In this research, work soap was formulated using four pure herbal ingredients and evaluated for various physicochemical features. Hence, owing to good effect on skin and acceptable parameters, this formulation can be investigated further for curing the infection and nourishing skin.

KEYWORD: Herbal extraction, foam stability, soap formulation, microbiological test.

INTRODUCTION

Most outer part of our body is Skin, and it contains largest surface area and weight. The skin or cutaneous membrane covers the external surface of the body and it provides a first line defense mechanism to the body against various pathogens. As the skin interfaces with the environment, it is constantly exposed to different environmental stimuli. This makes the skin damage prone.^[1] The most common skin disorders are eczema, warts, acne, rashes, psoriasis, allergy, etc. *Staphylococcus aureus* (*S. aureus*) is a Gram-positive bacterium that can live as a commensal organism on the skin and in the nose and throat. Approximately 30% of healthy people are asymptotically colonized by *S. aureus*. A range of infections, from minor skin infections to abscesses, endocarditis, and sepsis. *S. aureus* is also a major cause of food poisoning induced by heat resistant enterotoxin A and is a leading cause of nosocomial infections.^[2] The skin is colonized by a large number of balanced microbes. Infection occurs when there is loss of balance between the microbes and the host.^[3] Utilization of plant extracts and their derived phyto-constituents have a likely future for controlling various skin infections.

Plants with medicinal properties are being used as a traditional medicine from times immemorial. The extract from the leaves, stem and roots of various medicinal plants have been employed as a natural remedy in curing various ailments and diseases. Even though many plant based products have been replaced by synthetic chemicals, the safety and efficacy of ayurvedic products could not find their match. Besides having high nutritional value, many herbals are found to possess antibacterial activity.^[4] The medicinal properties of the plants are being exploited in various formulations both in medical terms and cosmetic series like soap, face washes, shampoos etc.

Most commercial soap available today in the markets is incorporated with chemical agents having antimicrobial activity with potential depilatory properties on skin pathogens. Detergents and soaps are regarded as disinfectants required in daily practices for hygiene. Soaps are cleaning agents, which may be liquid, solid, semisolid or powders. They are used to remove dirt, including dust, microorganisms, stains and bad smells in order to maintain health, beauty and remove bad odor from the body or inanimate objects, including clothes.^[5] Commercial soap usually are made of toxic mercury, aluminum, barium, bis-phenol, plastics and other chemicals, which are absorbed into the body via the internal lungs from vaporization of the chemicals as well as skin absorption with negative side effects.^[6]

Herbal soaps do not contain the artificial colors, flavors or fluoride etc., when compared to the contents of commercial products.^[7] Herbs are the natural products mostly found in the treatment of almost all diseases and skin problems owing to their high medicinal value, cost-effectiveness, availability and compatibility.^[8] Hence it can be used in soap bases.

Azadirachta Indica (Neem) tree contains many natural substances in its different parts, leaves, seeds, bark, and has many biological activities against disease causing organisms, and it contains about 140 chemical compounds. Neem contains azadiractrine having an ability to kill some disease-causing fungi, viruses and parasites^[9], like *Curcuma longa*^[10], *Ocimum tenuiflorum*^[11] *rosa oil*^[12] extract

The main aim of the present study was to prepare herbal soap formulation using *Azadirachta indica*, *Curcuma longa*, *Ocimum tenuiflorum*, *rosa oil* extract and to evaluate stability and phytochemical parameter of the prepared formulation so that the prepared formulation can standardize further and used commercially.

MATERIAL AND METHOD

Chemicals - Stearic acid, Propylene glycol, Sodium hydroxide, Glycerine, Sorbitol, Sodium laureth sulphate, Distilled water.

Herbal content of Poly herbal soap

1. NEEM^[9]

Botanical name: *Azadiracta indica*

Part typically used: Leaves

Colour: Green

Description:- Compound alternate, rachis 15-25cm long, 0.1cm thick, leaflet with oblique, serrate, 7-8.5 cm long and 1-1.7 cm wide slightly yellowish green in color.

Constituents:- Flavonoids, Alkaloids, Azadirone, Nimbin, Nimbidin, Terpenoids, Steroids, Margosicacid, Vanilic acid, Glycosides, B-sitosterol, Nimbectin, Kaempeerol, Quercursertin are present in Neem Leaf.

2. Turmeric^[10]

Botanical name: *Curcuma longa*

Part typically used: Root, rhizome

Colour: Yellow

Constituents: Curcumin, curcuminoid, germacrone, bisacurone, curdione, piperidine

3. Tulsi^[11]

Botanical name: *Ocimum sanctum*

Part typically used: Leaves

Colour: Green

Constituents: eugenol, germacrene, terpenes

4. ROSE^[12]

Botanical name: *Rosa sinensis*

Part typically used: Rose pattle

Colour: pink

Constituents: geraniol, citronellol, pheneethyl alcohol, nerol, linalool, nonadocane, monoterpene, eugenol, heneicosane, farnesol, rose oxide, citral, methyl eugenol

5. Coconut Oil^[11]

Botanical name: *Cocos nucifera* L

Colour: Colourless

Constituent: caprylic acid, 2%; capric acid, 50–80%; lauric acid, 3%; and myristic acid about 1%.

Collection of sample

The leaves of *Azadiracta indica*, *Ocimum tenuiflorum*, *Curcuma longa*, *rose petals* were collected from different matured plants. The leaves were dried in a hot air oven, pulverized and stored in airtight bottles for the studies.

Table 1: Formula for poly herbal soap preparation.

Sr.No	Ingredients	Quantity	Use
1	Stearic acid	2 gm	thickening agent
2	Glycerin	10ml	moisturizer
3	Sodium Hydroxide	10gm	Lye, Cleansing agent
4	Propylene glycol	5ml	Moisturizer
5	Sodium laureth sulphate	2 gm	Foaming reagent
6	Sorbitol	5 ml	Pharmaceutical aid
7	Neem	2gm	Antibacterial
8	Turmeric	2gm	Antibacterial
9	Tulsi	2gm	antifungal
10	Coconut oil	2 gm	Soothing agent
11	Distill water	qs	Vehicle

Preparation of extract^[16]

The *Azadiracta indica*, *Ocimum Sanctum*, *Curcuma longa* powder was extracted separately with ethanol by continuous hot percolation process using soxhlet extractor. Obtained extract of *Azadiracta indica*, *Ocimum tenuiflorum*, *Curcuma longa* are concentrated and stored in well closed containers.

Formulation of herbal soap

Oil phase:-10gm of coconut oil and Rose oil added in a beaker and heated in a hot oven then added 2g of stearic acid slowly and stir it in a continuous mode. Dissolve it completely at the temperature of (100-120°C)^[11]

Preparation of lye solution^[14]

Sodium hydroxide (NaOH) pellets were dissolved in distilled water (250 ml beaker) then, was put aside to let them cool down up to (27-38°C).

10 gm of sodium hydroxide taken in a beaker, add distilled water to mix it properly until it get dissolved completely. Then 10gm of glycerine is added in the above solution and stir it well. Mix oil phase and lye solution well until it converts into the solid phase / or the mild translucent look. 5g of propylene glycol added in the above solution. Wait for 2 min. 5ml of sorbitol solution was added, stir it well. Then in the resulting solution 2g of lauryl sulfate solution was added and mix it well. Keep it 10-15 min aside.

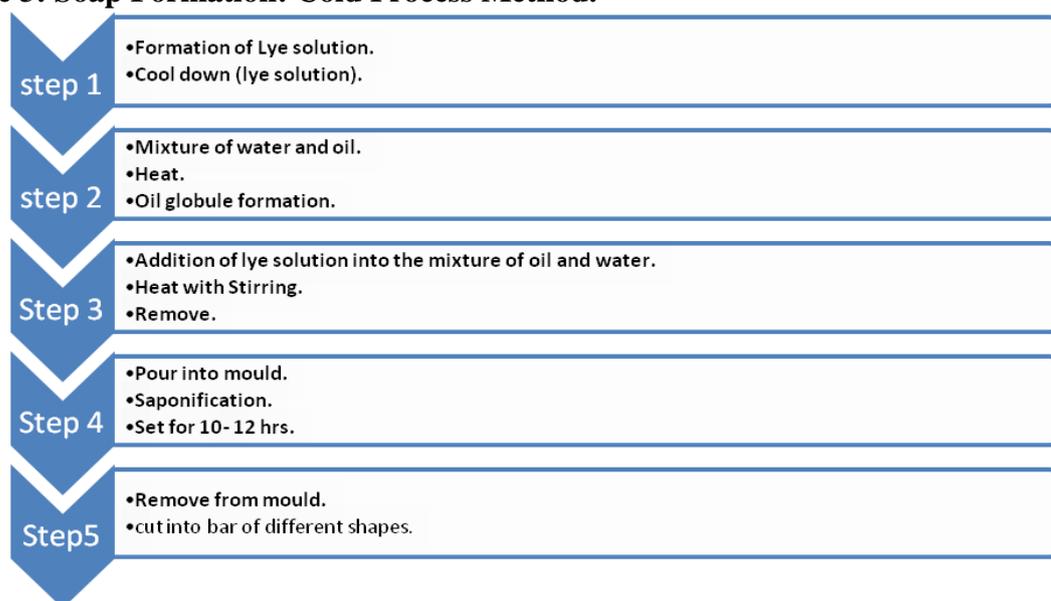
Experimental procedure for preparation of polyherbal soap^[15]

1. Previously prepared lye solution was heated and cooled sufficiently, and then the mixture of oil and water in a 500ml beaker is heated to 82°C on a hot plate. Oil globules that formed were remains suspended in the water in the water until the next step.
2. Heating process was stopped, and then the lye solution was drizzled into the mixture of oil and water and gently stirred to blend and then add the prepared the extract of the *Azadirachta indica*, *Curcuma longa*, *Ocimum sanctum* in resultant mixture and gently stirred to blend.
3. The beaker was placed back on a hot plate and was set on to medium heating until the temperature of the mixture creped back up towards 82°C. Then it was stirred continuously but gently to create the uniform mixture. Initially the mixture looks like water shimmering with unsaponifiable oil, but after 10-15 minutes, it gradually becomes thick and uniform. Temperature of the soap was monitored so it did not exceed 82°C or

fall below 71°C; then the beaker was removed from the heat occasionally and returned to the hot plate as needed.

4. Apply glycerin to the mould.
6. Pour the mixture into a suitable mould and cover it. It was placed aside for 18-24 hours for complete saponification reaction.
7. Finally after complete saponification, cover was removed and set aside for another 10-12 hours. Then by using rubber gloves the soap was cut into bars of different shapes.

Table 3: Soap Formation: Cold Process Method.



Evaluations^[12,13]

The Poly herbal soap formulated was evaluated for the following parameters:

1. **Organoleptic Evaluation** - Prepared herbal soap evaluated for colour, odour, and Appearance.

2. **Physical evaluation^[14]**

The herbal soap formulated was evaluated for the following properties:

a) **pH:** The pH was determined by using pH paper and pH meter.

b) **Thickness determination:** The thickness was determined with the help of “screw gauge” which is precalibrated. The thickness was measured by observing thickness at three different parts of the soap bars. Then take the average of three readings.

c) **Size and Shape Determination:** The Poly herbal soap bases of size of 5.0 cm x 3.0 cm with thickness of 0.5 cm, which is a rectangular shape, was chosen for preparation of

Soap Bars. This was chosen, as this size was ideal in regular usage to apply on the affected skin parts of the body.

- d) **Foam retention:** 25 ml of the one percent soap solution was taken into a 100 ml graduated measuring cylinder the cylinder was covered with hand and Poly herbal soap shaken 10 times. The volume of foam at the 1 minute's interval for 5 minutes was recorded.
- e) **Foam height:** 0.5 g of sample of soap was dispersed in 25 ml distilled water. Then, it was transferred into a 100 ml measuring cylinder and the volume was made up to 50 ml with water. Twenty-five strokes were given and allowed to stand till aqueous volume measured up to 50 ml and the foam height above the aqueous volume was measured.

3. Antifungal Evaluation^[17]

- **Materials:** Poly herbal soap, fungi.
- **Media:** Sabouraud dextrose agar (65g), and Nutrient Broth (28g).
- **Sample:** Poly herbal soap, *candida albicans*.
- **Standard:** Fluconazole

RESULT

1. The size of 5 cms x 3 cms was an optimum size of the soap bar selected for this study
2. Uniform thickness was seen in Soap Bars 4.5 mm varying only $\pm 0.5\%$.
3. The Soap Bars showed uniform weight 20gm varying only $\pm 0.5\%$.
4. The pH of the soap was found to be 8 with pH strip and 9 with pH meter.
5. Determination of foam height (ml) of soap bars. Initial 10ml, and final (after 5 minutes) 3.5ml.
6. The growth of *candida albicans* was inhibited about 8 mm i.e. zone of inhibition.

Table 3: Results of Poly herbal soap.

Sr. No.	Evaluation Parameter	Results
1	Colour	Buff yellow to creamish (Fig 1)
2	Appearance	Good
3	Size and Shape	5cm X 3 cm (Fig1)
4	Thickness	4.5 mm
5	pH	8
6	Foam Retention	3.5 cm (Fig.2a)
7	Foam Height	10 ml (Fig 2b)
8	Antifungal Activity	Zone of inhibition 8 mm (Fig 3)



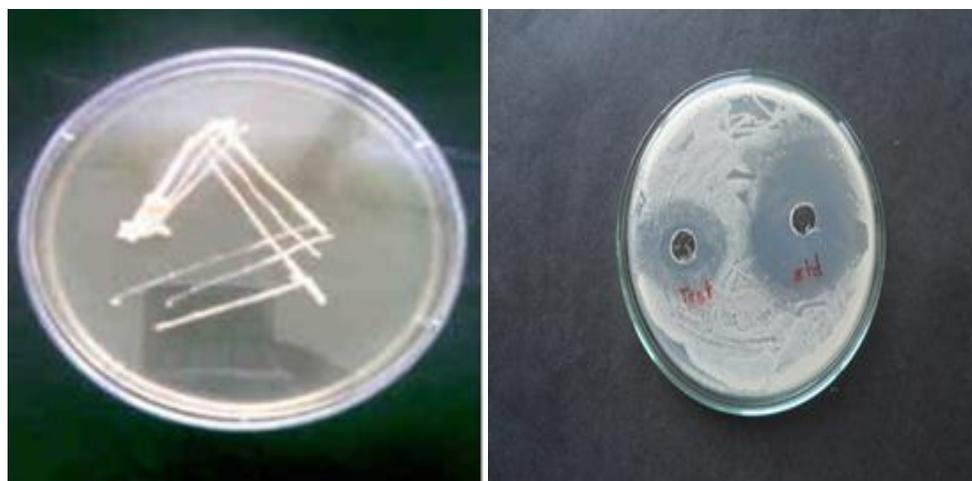
Fig. 1: Poly herbal Soap.



a. Foam height - 10ml

b. Foam retention (after 5minute)-3.5cm

Fig. 2: Foam height and Foam Retention.



Candida albicans

Zone of Inhibition

Fig. 3: Antifungal activity of plant extracts on organism.

DISCUSSION

The formulated Poly herbal soap was a dry, stable solid showing no color change and good appearance and is foamy in nature without any added surfactants. It showed good skin compatibility and caused no irritation when tested.

CONCLUSION

The formulated herbal soap showed considerable antibacterial activity as the commercial standard and all the other parameters were good, and hence, it can be concluded that the formulated herbal soap standardized and can be used as a promising alternative to commercial chemical containing skin whitening soaps.

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