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Research Article

FORMULATION AND EVALUATION OF HERBAL BATH SOAP CONTAINING METHANOLIC EXTRACTS OF THREE AYURVEDIC *VARNYA* HERBS

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ABSTRACT

Objectives: The ultimate aim of this study is to formulate and evaluate the herbal bath soap using methanolic extracts of three plants having ethnic and dermatological importance in Ayurveda, namely, *Hemidesmus indicus*, *Cyperus rotundus,* and *Saussurea lappa*.

Methods: The roots of *H. indicus* and *S. lappa* and rhizomes of *C. rotundus* were extracted with ethanol using Soxhlet apparatus. Then, these extracts were used to make soap by reacting oil and lye in a process of saponification.

Results: The soap made was evaluated for physicochemical characters such as total fatty matter, moisture content, and pH and found to be 77, 5.3%, and 8 and for other parameters, good characteristics were observed.

Discussion: The soap also exhibited good cleaning efficiency in removing microbes on hands.

Conclusion: Hence, based on the antimicrobial effects and parameters, the formulated soap can further be standardized and an alternative to commercial medicinal and skin whitening soaps.

Keywords: Herbal bath soap, Ayurvedic varyna herbs, Medicinal soap, Skin whitening

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INTRODUCTION

Human skin, the outer covering of the body constitutes the first line of defense protecting the body against various pathogens [1]. As the skin interfaces with environment, it is constantly exposed to different environmental stimuli. This makes the skin damage prone [2]. Severely damaged skin will often try to heal by forming scar tissue, which is often decolorized and depigmented. Plants have been used in the treatment of human diseases and infections since ages [3]. The active constituents of plants can be formulated as ointment, cream, gel, lotion, soap, or crude/solvent extract [4,5]. Utilization of plant extracts and their derived phytoconstituents have a likely future for controlling hyperpigmentation [6]. Plant-based remedies mentioned in ayurvedic texts are gaining popularity these days in India due to validation of such therapies with respect to their modern counterparts. Soaps are one among the modern-day cosmetics for maintaining and enhancing the vigor of skin. Hence herbs mentioned under *varnya* in Ayurveda are selecetd for formulation [7]. It was the physician Galen who mentions the use of soap for washing and maintaining the body [8]. However, the present chemical soaps quite frequently can cause dryness and irritation of the skin [9]. Interestingly, the popularity of herbal-based soaps is increasing due to their efficacy on topical disorders. The plants *Hemidesmus indicus*, *Saussurea lappa*, and *Cyperus rotundus* are mentioned under *varnya* herbs in Ayurveda and their modern counterpart, i.e., tyrosinase inhibition is also proven.

H. indicus

Common name

Anantamool/Sariva.

Phytoconstituents

The preliminary phytochemical screening of the root extract showed the presence of alkaloids, glycosides, steroids, triterpenoids, carbohydrates, polyphenols, and saponins [10].

Pharmacological activities

The roots of *H. indicus* are commonly employed as blood purifier and for treating skin diseases, venereal diseases, and snake and scorpion string bites. It is also employed as antirheumatic, diuretic, and anti-inflammatory agent [11].

S. lappa

Common name

Kushta/Chengaluva.

Phytoconstituents

Phytochemical evaluation on root extracts of *S. lappa* revealed the presence of alkaloids, flavonoids, carbohydrates, glycosides, phenolic compounds, saponins, and tannins [12].

Pharmacological activities

The roots of *S. lappa* are used in the treatment of dysentery, ulcers, stomach ache, quartan malaria, leprosy, typhoid fever, and asthma and skin disorders. It is also employed as anti-inflammatory, hepatoprotective, and anticancer. Immuno modulant, hypolipidaemic, hypoglycaemic, antimicrobial and central nervous system depressant [13].

C. rotundus

Common name

Mustaka/Nagarmotha.

Phytoconstituents

The preliminary phytochemical screening of *C. rotundus* revealed the presence of alkaloids, carbohydrates, glycosides, steroids, flavonoids, saponins, tannins, and phenols [14].

Pharmacological activities

The rhizomes of *C. rotundus* are commonly employed as astringents, diaphoretics, carminatives, antitussives, and stimulants. It also shows anti-inflammatory, antipyretic, analgesic, hepatoprotective, and anti-spastic, antiemetic, and anticonvulsant activities [15].

Tyrosinase inhibitory activity

Several natural products are known to possess anti-tyrosinase properties, such as arbutin, a naturally occurring – glucopyranoside of hydroquinone, catechins, hydroquinone, and resveratrol [16]. Even though tyrosinase inhibitory properties were proved with a number of benzaldehyde derivatives, none of them were considered to be safe in terms of practical use due to their lower activity and serious side effects [17]. The root extracts of *H. indicus* demonstrated that more tyrosinase inhibition can be used directly as a potent tyrosinase-inhibiting agent [18]. Moreover, root extract of *H. indicus* was also shown to protect DNA from radiation-induced strand breakage [19]. The root extracts of *S. lappa* showed moderate tyrosinase inhibition [20] and *C. rotundus* rhizome extract showed no tyrosinase inhibition [20] but excellent antioxidant activity that suggests its utility in future skin whitening cosmetic products [6].

The objective of the present study was to make soap with ethanolic extracts of *H. indicus, S. lappa*, and *C. rotundus* and to evaluate the physicochemical characters of the formulated soap so that it can be further standardized and produced on a commercial scale.

METHODS

Acquisition of samples

Authenticated samples of *H. indicus*, *S. lappa*, and *C. rotundus* were purchased from the local herb dealer and were again authenticated by the Department of Botany, Andhra University, Visakhapatnam. Coconut oil, palm oil, and castor oil were purchased locally.

Preparation of extracts

The roots of *H. indicus* and *S. lappa* and rhizomes of *C. rotundus* were dried and powdered to #40 mesh size and stored. The powder was then extracted with ethanol. The extracts were concentrated and stored for further use.

Formulation of herbal soap

Saponification values of three oil samples were determined as per standard protocol. 166.5 g coconut oil, 166.5 g palm oil, and 145.2 g castor oil were taken in a beaker and mixed together. In another beaker, 70.8 g lye was dissolved in 166.5 g of water. The lye solution was then transferred to the beaker of oils. After stirring for a while, add three ethanolic extracts of *H. indicus* (1 g), *S. lappa* (0.5 g), and *C. rotundus* (0.5 g). Then, the beaker was heated on low heat and stirred well for about 20–30 min where the smell of oil disappears and a homogenous solution is formed. The mixture was poured into the soap molds and allowed to solidify at room temperature [21].

Assessment of physicochemical properties of the formulated soap

Various physicochemical parameters were tested to confirm the quality of the formulated soap [22].

Determination of clarity, color, and odor

Color and clarity were checked against a white background by naked eyes and odor was checked by smelling.

pH

The pH of the prepared soap was assessed by touching a pH strip to the freshly formulated soap and conjointly by dissolving 1 g in 10 ml water with the help of digital pH meter.

Determination of percentage free alkali

About 5 g of sample was added to 50 ml of neutralized alcohol and was boiled for 30 min under reflux on a water bath, then cooled and to it 1 ml of phenolphthalein solution was added. It was then titrated immediately with 0.1 N HCl [22].

Foam height

0.5 g of sample of soap was dispersed in 25 ml distilled water. Then, transferred it into 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 [22].

Foam retention

About 1% soap solution was prepared and from this, 25 ml was taken in a 100 ml measuring cylinder. The cylinder was covered with hand and shaken for 10 min. The volume of foam at 1 min intervals for 4 min was recorded [22].

Alcohol-insoluble matter

In a conical flask, 5 g of sample was taken. To this, 50 ml of warm ethanol was added and it was shaken vigorously, until the sample was dissolved completely. The solution was filtered through a tared filter paper along with 20 ml warm ethanol and dried it at 105°C for 1 h. The weight of dried paper was noted [22].

Total fatty matter (TFM)

TFM was estimated by reacting soap with acid in the presence of hot water and calculating the fatty acids obtained [21]. 10 g of the formulated soap was dissolved in 150 ml distilled water and heated. To this, 20 ml of 15% H_2SO_4 added while heating until a clear solution was obtained. Fatty acids that are present on the surface of the resulting solution are solidified by adding 7 g beeswax and heated again. Then, it was allowed to cake. Cake was removed and blotted to dry and weighed to obtain the TFM using the formula [21].

% TFM=(Weight of the cake–Weight of the wax) in g/Weight of the soap in g×100.

Moisture content

The moisture content was used to estimate the percentage of water in the soap by drying the soap to a constant weight. The soap was weighed and recorded as "wet weight of sample" and was dried from 100 to 115°C using a dryer [21]. The sample was cooled and weighed to find the "dry weight of sample." The moisture content was determined using the formula [22]:

% Moisture content=Initial weight–Final weight/Final weight × 100

Cleaning efficiency by thumb impression test

Thumbs of hands exposed to environments were placed gently placed on a sterile nutrient agar medium plate by maintaining proper distance. Then, the impression of one thumb washed with the medicinal soap and the other thumb washed with the control soap was placed on the same nutrient agar medium plate separately and carefully without convergence of thumbprints. The behavior of microbial growth on the plates was observed after an incubation period of 24 h at 37°C [23,24].

RESULTS

The physicochemical parameters such as color, odor, appearance, and pH were tested. The pH of the soap was found to be 8 with pH strip and 9 with pH meter. Remaining parameters such as foam height, foam retention, percentage free alkali, TFM, moisture content, and alcohol-insoluble matter were also determined and the results are tabulated in Table 1. In addition, thumb impression test was carried out to investigate the effectiveness of the formulated soap taking a commercial soap as standard.

Color was determined by comparing with standard color charts, odor by smelling, and remaining parameters as per standard methods.

DISCUSSION

The present work is concerned with the formulation of soap using ethanolic extracts of ayurvedic *varnya,* namely, *H. indicus*, *S. lappa*, and *C.*

Table 1: Physicochemical properties of the formulated herbal soap

Color	Odor	Appearance	pH	Moisture content (%)	Foam height	Foam retention	% free alkali	Alcohol-insoluble matter	Total fatty matter
Penny brown	Fragrant	Clear	8	5.3	9	7.5	0.25	21.4	77

rotundus. The formulated 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 causes no irritation when tested on 10 volunteers. Based on the estimated TFM (77%), the soap was characterized as Grade 1 soap. Results revealed that the bacterial colonies formed on the unwashed thumbprints are higher than those formed on the washed thumbprints. The formulated herbal soap showed better efficiency in cleaning microbes from washed thumbs which is evident by the reduced number of colonies formed on the agar plate.

CONCLUSION

The formulated 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 must be standardized and can be used as a promising alternative to commercial chemical containing skin whitening soaps.

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AUTHORS' CONTRIBUTIONS

Conception and design of the work done by Mr. Balakrishnaiah P and Mrs. Gana Manjusha K. Laboratory experiments were done by Ms. Syamala, Mr. Mounik, and Ravi Chandra under the supervision of Mrs. Gana Manjusha K. Data compilation and drafting of the manuscript were done by Mrs. Gana Manjusha K and Mr. Ravichandra. The final critical review of the article was done by Mr. Balakrishnaiah P.

CONFLICTS OF INTEREST

The authors declared that they have no conflicts of interest.

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Nil.

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