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Formulation and Evaluation of Herbal Soap

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ABSTRACT: The final goal of this research istocreate and assess herbal bath soap employing a variety of bioactive herbal plant extracts that have varying ethnic and dermatological significance namely Sapindus mukorossi and Moringa oleifera.Different extraction techniques appropriate for the two plant components were used to produce their extracts. After that, the extract was combined with lye and fatty oil to make soap via the cold saponification process.It was determined that the manufactured soap had a nice look, colour, and odour. They were determined to be pH- 9.47, moisture content - 1.041, and foam stability - 30 cm. Studies on antibacterial activity were conducted, indicating that produced soap is an antibacterial source.Based on the study's findings, it is possible to create herbal soap using the cold process method while taking into account a number of factors, including skin condition, herbal potentials, and activity. Since numerous alignment and related defects in other polyherbal or chemical-based formulations may be eliminated, this sought-after herbal formulation has the potential to significantly impact the herbal cosmetics industry.

KEYWORDS: Ethanolic extract, Herbal soap, and Herbal potentials

I. INTRODUCTION

The largest organ in the body, the skin acts as both a barrier to protect internal organs and a collector of sensory information from its surroundings. Different cells and structures can be found in the skin's various layers, including the hypodermis, dermis, and epidermis. Each layer is distinct[1]. It is crucial to protect the skin diseases and alignments as it provides a specialized function to the body's well-being. Skin conditions are a common illness that affects people of all ages, including newborns and the elderly, and do so in multiple ways[2].

For thousands of years, humans have utilized the medicinal properties of plants to treat various ailments, promoting a rich tradition of botanical healing that transcends cultures and continents. From ancient civilizations to modern times, the use of medicinal plants has played a vital role in shaping the course of human health and wellness[3]. In ancient cultures throughout Africa, Europe, the Americas, and Asia, herbal medicines performed the primary medicinal functions. Herbal medicines are the primary medicines used to treat infections in some developing countries. The extracts from herbal materials indicate that there are ongoing efforts to investigate new compounds with potential anti-bacterial activity. Natural materials have become the preferred choice for treating microbial infections because of the potential toxic or harmful effects of many chemical anti-microbial agents[4].A recent WHO report reveals that skin diseases comprise 34% of occupational disorders globally, resulting in 17,857 deaths in India alone in 2020, i.e., 0.21% of total deaths. To address this issue, incorporating herbal potentials into formulations is a viable solution, offering effective treatment options with minimal side effects and enhanced safety. This study focuses on developing a medicated herbal soap that leverages the active potentials of various herbs, resulting in an anti-bacterial and anti-microbial-rich soap suitable for daily use[5]. According to Ayurvedic traditional medicine, the leaves of Moringa oleifera have been used for both preventative and therapeutic purposes, which claim that it can prevent 300 diseases[15].The seeds of Sapindus mukorossi are particularly useful for the skin, where they are used to eliminate freckles and tans. They are also highly valued for its medical properties, which include curing a variety of illnesses like the common cold, constipation, nausea, epilepsy, acne, etc[18].

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II. MATERIALS AND METHODS

Collection of plant materials

A dry to moist tropical or subtropical climate with 760–2500 mm of annual precipitation (less than 800 mm of irrigation is needed) and temperatures between 18 and 28 °C are the unique environmental characteristics that allow Moringa oleifera to flourish in any tropical or subtropical nation. It may grow at elevations of up to 2000 meters in any type of soil, but it prefers thick clay and wet soils with a pH of 4.5 to 8 [16,17]. The leaves of Moringa oleifera and the seeds of Sapindus mukorossi were collected from different matured plants, sun-dried, pulverized, and stored in an airtight bottle for further studies.

Coconut oil, olive oil, and essential oil were collected from the market.

Processing of plant material

The fresh leaves of Moringa oleifera were gathered, disinfected on the surface, dried for a day in the sun, and ground into powder form. The powdered forms (40 g) were extracted in a round-bottom flask in 400 ml of ethanolic solvent at room temperature. The extracts were filtered using Whatman number 1 filter paper to remove extractable substances at every 3-hour interval and stored at room temperature for further testing[6]. The dried powders of Sapindus mukorossi were extracted by using the maceration method, taking water as a solvent[7].

Table 1: Shows the materials and their descriptions.

Material	Description	Figures
Moringa	**Botanical name**: Moringa oleifera **Kingdom**: Plantae **Order**: Capparales **Family**: Moringaceae **Genus**: Moringa **Species**: oleifera **Part used**: leaves **Uses**: As a moisturizer, conditioner, hair growth promoter, cleanser, anti-wrinkle, anti-aging, anti-acne, scar removal, pigmentation, and control for skin infection, sores, as well as sweating, it has also been utilized in a range of cosmeceuticals[8].	
Reetha	**Botanical name:** Sapindus mukorossi **Kingdom:** Plantae **Order:**Sapindales **Family:**Sapindaceae **Genus:**Sapindus; L. **Species:**Sapindus saponaria **Part used:**Seeds **Uses:**used as the main ingredient in soaps and shampoos for washing hair, removing lice from the scalp, used for the treatment of eczema, psoriasis, and for removing freckles[9].	

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Olive oil	**Botanical name:** Olea europaea **Kingdom:** Plantae **Order:** Lamiales **Family:** Oleaceae **Genus:** Olea **Species:**European olive **Part used:** Seeds **Uses:** dry skin, itch, and inflammation, as well as disorders such as rosacea, wound healing and protecting against the damage incurred from ultraviolet radiation exposure[10].	
Coconut oil	**Botanical name**: Cocus nucifera **Kingdom:** Plantae **Order**: Commelinids **Family**: Arecaceae **Genus**: Cocus L **Species**: C. nucifera **Parts used**: oil **Uses**: Treats skin conditions like eczema and psoriasis reduces stretch marks, relief from sunburn[11].	
Sodium hydroxide	**IUPAC name**: Sodium hydroxide **Other names**: lye, caustic soda **Molecular formula**: 39.997 g/mol **Chemical formula**: NaOH **Appearance**: white, waxy, opaque crystals **Boiling Point**: 1388 °C **Odor**: odorless **Melting point**: 318 °C **Solubility**: Soluble in water and glycerol, negligible in ammonia, and insoluble in ether. **Uses**: Use as lye in soap formulation. NaOH, when combined with fats/oils, produces a saponification reaction[5].	

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Stearic acid	**IUPAC name**:Octadecanoic acid **Other names**: Cetylacetic acid, Stearophanic acid. **Molecular formula**: 284.48 g/mol **Chemical formula**:CH3(CH2)16CO2H[14]. **Appearance**: a white, waxy solid that can also appear as crystals, powder, flakes, or crystalline powder. **Boiling Point**: 361 °C **Odor**: odorless **Melting point**: 69.4 °C **Solubility**:slightly soluble in water and soluble in many organic solvents. **Uses**: Used in the production of detergents, soaps and cosmetics.	
Other chemicals	Essential oil, Methyl paraben, Soft paraffin.	

III. FORMULATION OF HERBAL SOAP

Cold saponification was used in the formulation of soap that contained active plant potentials. Soap is made up of a number of naturally occurring fatty acid salts, such as potassium or sodium[12]. 10.0 ml of coconut oil and 10.0 ml of olive oil were taken in the beaker. In a separate beaker, 7 g of alkali (NaOH) was dissolved with 30 ml of ethanol and distilled water with continuous stirring.The solution is then added to the beaker that has been filled with oil. The resultant mixture was kept in a water bath at low heat with continuous stirring until the smell of oil or fat disappeared and led to the formation of a homogeneous solution. 2 ml of Moringa oleifera extract and 2 ml of Sapindus mukorossi extract were added along with 1 g of steric acid, 0.7 g of soft paraffin, 0.1 g of Methyl paraben, 1ml of glycerin, a few drops of spirulina extract, and lavender oil was added as a fragrance and mixed properly. The resulting homogenous semisolid slurry was poured into a mold, allowed to harden at room temperature, and then examined physically for any changes in its properties.

Table 2: Shows components of formulation

Ingredient	**Quantity**	**Uses**
Coconut oil	10 ml	Natural fat
Olive oil	10 ml	Natural fat
NaOH	7 g	Lye
Ethanol	30 ml	Solvent
Moringa leaf extract	2 ml	Anti-bacterial, anti-microbial
Reetha seed extract	2 ml	Surfactant or detergent
Stearic acid	1 g	Thickening agent
Soft paraffin	0.7 g	Soothing agent
Methyl paraben	0.1 g	Preservative
Glycerin	q.s.	Humectant
Lavender oil	q.s.	Fragrance
Spirulina powder	q.s.	Colorant
Distilled water	q.s.	Vehicle

IV. EVALUATION OF HERBAL SOAP

The following physico-chemical properties were used to assess the created formulation's quality in relation to herbal soap that is sold commercially.

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Physical parameters

To make its color and clarity visible to the unaided eye, the prepared soap was set against a white background. The smell of the soap indicated its odour.

pH

The pH of the produced soap was measured using a digital pH meter. The generated formulation was dissolved in 100 milliliters of distilled water and then allowed to sit for two hours. The pH of the solution was measured using a pH meter that had been previously calibrated.

Homogeneity

Visual inspection was performed on each soap formulation to check for homogeneity and the presence of flocculates and aggregates.

Washability

After applying the prepared herbal soap formulation to the skin, the degree and simplicity of washing with water are routinely assessed.

Foam stability

50 milliliters of distilled water were used to completely dissolve 2 grams of soap sample. The combination stayed motionless for half an hour. After 30 minutes, the height of the foam was measured above the volume of water.

Moisture content

A 10-gram sample of soap was directly weighed and recorded as the "wet weight of the sample." This wet sample was dried to a constant weight at a temperature of no more than 115°C using hot air oven. The material was weighed again after cooling to determine its "dry weight." The moisture content of the sample was determined using the following formula.

% Moisture = (w-d) / w * 100

Where; % Moisture = % of moisture in sample, w = weight of wet

Sample (g), d = weight of dry sample (g).

Anti-bacterial property

The Kirby-Bauer disc diffusion method was used to evaluate the herbal soap's antibacterial effectiveness against two test organisms. Escherichia coli and Streptococcus aureus were the clinical isolates that were utilised as test organisms. Using a sterile cotton swab, the test organisms were distributed throughout the entire agar surface after 20 millilitres of Mueller-Hinton (MH) medium had been added to sterile petriplates and allowed to harden. After being impregnated with 6µml AgNPs, standard filter paper discs were aspectically placed onto the dry MH agar plate and let to stand for a few minutes. For twenty-four hours, the plates were incubated at 37°C.Following incubation, the clearance zone around the disc was noted.

V. RESULT

The results of the biological and physico-chemical analyses are given in the tables below.

Table 3: Physiochemical parameter of formulation.

Parameters	**Prepared herbal soap**
Physical parameters (Color, Clarity and odor)	Color - Off white Odor – Pleasant Smoothness - Smooth
pH	9.47
Moisture content (%)	1.041
Foam stability	30 cm
Homogeneity	Excellent
Washability	Easily washable

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Antibacterial property

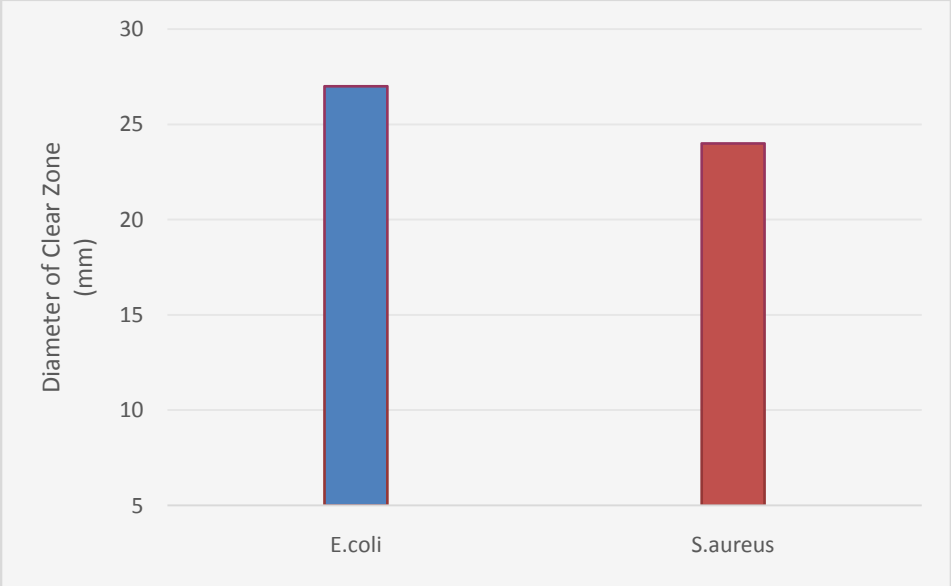

Table 4: Zone of inhibition of the formulations.

Zone of inhibition GM–ve bacteria (S. aureus)	Zone of inhibition GM+ve bacteria(E. coli)
24	27

VI. DISCUSSION AND CONCLUSION

The prepared soaps physico-chemical and biological characteristics were examined. The composition had a pleasing colour and odour, and it looked good. The pH was discovered to be within the designated range, which is 7–10. Additional factors, including moisture content, foam stability, and others, were identified as representing the typical soap values. A study on biological parameters, such as antibacterial activity, was carried out, demonstrating the produced soap's strong antibacterial properties. The study's findings suggest that the cold process method can be used to create herbal soap while taking into account a variety of factors, including skin condition, herbal potentials, and activity. Since various polyherbal or chemical-based formulations have numerous alignment and related defects that can be eliminated, this sought-after herbal formulation has the potential to significantly impact the herbal cosmetics industry.

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