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DEVELOPMENT AND FORMULATION OF ANTIBACTERIAL POLYHERBAL SOAP

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ABSTRACT

One of the most important aspects of human health is the skin, which is the largest organ in the body. A variety of bacteria that cause infection are deposited on the skin's surface from the dust in the surrounding environment. People are more likely to get bacterial skin infections, which necessitate intensive care both for treatment and to preserve healthy skin. The purpose of the current study is to Develop and formulate antibacterial polyherbal bath soap using *Curcuma longa*, *Azadirachta indica*, *Melalleuca alternifolia*, *Ocimum tenuiflorum*, *Rosmarinus officinalis*, & *Lavendula aungustifolia*. The antibacterial soap was prepared by using a cold process method. The formulation was assessed for a number of physicochemical parameters in order to determine whether it had positive characteristics. Plants are easily accessible, effective, and provide manufacturers with benefits that are both cost-effective and have little or no side effects. The soap's antibacterial effectiveness was tested using the cup plate method and it showed action against *Staphylococcus epidermidis* and *Escherichia coli*. The herbal soap has antibacterial property since it can inhibit the growth of pathogenic microbes.

Keywords: Skin diseases, Polyherbal soap, Essential oils, Cold Compression Technique

INTRODUCTION [1]

The skin is the largest organ in the body, making up to 1.5 to 2 m² of surface area exposed to the environment and 15% of the adult body weight [1]. As the integument or

dermal layer, it has additional names. The skin and its related tissues make up the integumentary system, structures with derivatives. The epidermis, dermis, and hypodermis are its three constituent layers, and each has a distinctive architecture and function. Herbal soaps are also useful for treating certain skin conditions. Additionally, these soaps include glycerine, which is typically absent from conventional soaps. Glycerin assists in manufacturing these soaps for dry skin problems by keeping the moisture in the skin. Herbal soap preparations are medications that employ anti-bacterial and antifungal property and mostly used plant components including leaves, stems, roots, & fruits to cure injuries, treat diseases, or promote good health. These medications are used topically, have anti-microbial qualities, and come in a variety of forms such as creams, gels, soaps, solvent extracts, or ointments. *Azadirachta indica* and essential oils were utilized in the

current study to make the anti-bacterial herbal soaps, and their physicochemical properties were assessed.

Types of skin [2]

Several criteria are used to classify the various types of skin. For instance, Fitzpatrick's classification system, which is based on skin colour and how exposure to sunlight affects it, was first presented in 1975. It is employed, among other things, in determining the appropriate type of sunscreen or estimating the risk of getting skin cancer. From a balancing standpoint, three aesthetic characteristics are utilised to classify skin: sebaceous secretion, moisture, and sensitivity degree. Because of this, the traits and needs of each variety of skin will vary. The kind of skin is determined by heredity, yet it will also be impacted by other factors and may change over time. There are five types of healthy skin: normal, dry, oily, (both oily and dry skin) and sensitive.



Figure 1: Oily skin

Skin diseases

Compare to other organs of the body, skin is susceptible to certain diseases.

These include



Figure 2: Dry skin

- **Atopic dermatitis:** Also known as eczema, this is an inflammatory skin disease characterize by dry, red, itchy patches of skin.

- **Acne:** This is perhaps the most common skin disorder. It occurs when hair follicles become clogged with dead skin cells and oil.
- **Melanoma:** A type of skin cancer caused by exposure to excess sunlight.
- **Rosacea:** A common rash found in middle-aged people. They have a tendency to flush and have small red bumps on the center of the face.
- **Psoriasis:** This is an auto-inflammatory skin disease. It causes red, flaky patches to appear on the skin.
- **Scabies:** An itchy skin condition caused by the human scabies mite.
- **Shingles:** Also called herpes zoster, it is a painful, blistering rash caused by a virus.
- **Lichen planus:** An itchy non-infectious rash. The bumps have flat shiny tops.



Figure 3: Bacterial infections

MATERIALS AND METHODOLOGY

Materials: Almond oil, Castor oil, Cocoa butter, Coconut oil, Olive oil, Palm oil, Teatree oil, Tulsi oil, Rosemary oil, lavender oil, Neem oil, Aloe vera extract, Sodium hydroxide, Glycerine, Water

Procedure for preparation of antibacterial poly herbal soap: [3]

Preparation of medicated herbal soap: (cold process method)

METHODOLOGY: [3]

The main methodology used in the preparation of soap is cold process technique. Firstly the aqueous extract of *Azadirachta indica* is prepared. Gel of Aloe vera was taken out and blended properly in order to get a pure aloe liquid later liquid was filtered to remove the impurities present. All the oily phase ingredients such as castor oil, almond oil, coconut oil, jojoba oil, olive oil, palm oil along with cocoa butter were weighed and taken in a beaker. Then the main essential oils were made up

according to their percentages. All the oil phase ingredients were heated till uniformity in their state was achieved. Sodium hydroxide, an alkali base was weighed and dissolved in suitable amount of water with frequent stirring in cold conditions. At last the oil phase and aqueous phase were mixed together in a cold condition for the saponification process to occur; until the uniform colour of the mixture was obtained. Add perfume or fragrance to the mixture in order to get a

good aroma. Glycerine was applied to the soap moulds and the mixture was poured immediately into the soap moulds and kept aside for a period of 24 to 48 hours. To get hardening, the soap is kept aside for 2 weeks. Microbial cultures of *Staphylococcus epidermidis* is grown to test the activity of polyherbal soap. After the growth of microorganisms, Zone of Inhibition was observed for the culture and compared with standard antimicrobial marketed soap.



Figure 4: Prepared Anti-bacterial soaps

Table 1: Formulation of Anti-Bacterial Soap

S. No.	INGREDIENTS	QUANTITY	PURPOSE
1.	Almond oil	0.5g	Treat dryskin and sunburn
2.	Castor oil	12.5g	Anti inflammatory activity, Humectant
3.	Cocoa butter	1.25g	Moisturizer, improve elasticity
4.	Coconut oil	12.15g	Moisturizer, wound healing
5.	Almond oil	0.625g	Smoothering effect, moisturizer
6.	Olive oil	6.25g	To treat itching, antiageing, antioxidant
7.	Palm oil	28.12	Nourish areas effected by skin infections
8.	Teatree oil	0.1g	Antibacterial, itching, antifungal, wound healing
9.	Curcuma oil	0.1g	Antimicrobial, antioxidant
10.	Tulsi oil	2g	Inhibits MRSA
11.	Rosemary oil	0.1g	Improves skin tone
12.	Lavender oil	0.5	Treat acne, skin whitening
13.	Nem oil	2.5	Anti-inflammatory, antimicrobial, treat skin diseases
14.	Aloe vera extract	1.25	To treat sunburn
15.	Sodium hydroxide	9.24	pH modifier
16.	Glycerine	1%	Humectants
17.	Water	23.75	Vehicle

Evaluation tests [4]

1. **Identification of organoleptic properties:** Clarity and colour were assessed using the human eye in comparison to a white backdrop, and the odour was detected.
2. **Selection of Size and Shape:** Specific sizes and shapes, such as round or oval, were chosen for the production of soap bars. The ideal dimensions were 8.4 cm in diameter and 2.6 cm in thickness.
3. **Thickness measurement:** A screw gauge that has been calibrated was used to measure thickness. By comparing the thickness at five different locations on the soap, the thickness was determined.
4. **Weight determination:** The weight was determined by using a digital weighing balance.
5. **Foam height:** 0.5 gm of sample of soap was taken and dispersed in 25 ml of distilled water. Then, transferred it into 100 ml measuring cylinder, the volume was made upto 50ml with water. 25 strokes were given and stand till aqueous volume was measured upto 50ml and measured the foam height above the aqueous volume.
6. **Foam retention:** Prepared the 25ml of the 1% soap solution and transferred it into 100ml measuring cylinder. Then the cylinder was shaken 10 times. The volume of foam was recorded at one minute for 4 to 5 minutes. **pH test:** The test was performed for all the formulations. Each formulation of soqpa solution was dissolved in 20ml of distilled water and tested for pH with the help of digital pH meter. The measurement of pH of all the formulations was done in the previously calibrated pH meter.
7. **Alcohol-insoluble material:** To dissolve 5g of soap in 50ml of warm ethanol in a conical flask, and the mixture was rapidly agitated. 20 ml of warm ethanol were added to the solution, which was then filtered through tarred filter paper and dried at 105 degrees for an hour. The left over on dried paper is collected and weighed.
FORMULA: %Alcohol insoluble matter = $\frac{\text{Weight of residue} \times 100}{\text{Weight of sample}}$
8. **High temperature stability test:** Liquid soap was allowed to stand at 50 °C for a week to test its high temperature stability. During this time, the stability of liquid soap was observed. The samples that were homogenous and stable after standing were labelled as stable, while the samples where the crystals

were roughened and the samples where precipitation was brought on were described as unstable.

Anti Microbiological test [5] The formulated soap was put through an antimicrobial screening using the agar-well diffusion standard cup plate method. The zone of inhibition is tested using *Staphylococcus epidermidis*, and the results are compared to those of normal soap.

Evaluation of Prepared Herbal soap Formulation for Antimicrobial Activity: [5]

To evaluate the anti bacterial activity of prepared poly herbal soap the standard cup

plate technique was used Initially the bacteria *staphylococcus epidermidis* incorporated into melted media. Later the media transferred into a petriplates in aseptic conditions and allowed to solidify. Followed by different concentrations of soap were aseptically transferred to the media in petriplates. They are placed in a incubator for a period of 24 hours. After completion of incubation time the zone of inhibition calculated with the help of Haloes calliper.

RESULTS AND DISCUSSION:

Table 2: Physicochemical Parameters of Herbal Soap Formulation

S. No.	Physicochemical parameters	Poly herbal soap result
1.	Appearance	Medium Beige
2.	Odour	Pleasant smell
3.	Texture	Solid and smooth
5.	Foam Height	12.5
6.	Foam Retention	15 min
7.	Alcohol Insoluble matter	18.0
8.	pH	7.6
9.	High temperature stability	Soap melts above 400°C
10.	Saponification value	160mg/ml

Results for antibacterial activity for herbal soap:

Zone of inhibition for bacteria

Table 3: Zone of inhibition results

S. No.	Concentration of soap Solution	Zone of Inhibition for standard soap	Zone of Inhibition for polyherbal soap
1.	5 %	21.5 mm	21.2 mm
2.	10 %	27.5 mm	25.2 mm
3.	20 %	31 mm	32.7 mm
4.	30 %	32 mm	32.7 mm



Figure 5: Zone of inhibition

SUMMARY AND CONCLUSION:

In the present study anti bacterial poly herbal soap were prepared having suitable size, shape, thickness weight and have a good foam producing ability. Various herbal extracts such as neem, tulsi and few essential oils such as curcuma longa and rosemary used. The herbal extracts and essential oils have thereapeutic application to treat various microbial infections such as eczema, rashes, acne and few other. *Azadirachta indica* has gained popularity in modern medicine due to its extensive use in Ayurveda, Unani, and homoeopathic treatment. Simple, attractive soaps with pleasant scents having antibacterial properties were created utilising a variety of essential oils and evaluated. The cold process method was used for producing the soaps. The soaps were evaluated using different pharmaceutical parameters along with microbial evaluation. The formulation

provide excellent foaming property and free from alkali on the basis of its evaluation. The microbiological study gave the information that the prepared formulation has antimicrobial property. The zone of inhibition of prepared formulation was compared with the standard soaps marketed. The antimicrobial activity of bacteria gives satisfactory results. Hence, based on our study the prepared soap have antimicrobial property and can be effectively formulated in the form of medicated herbal soaps by using cold process technique.

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