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Research Article

**FORMULATION AND EVALUATION OF AN ANTIMICROBIAL
HERBAL SOAP PAPER****V.Gnaneshwari*, R. Raveena, R. Akhila, R. Anusha, S. Hanumanthu Nayak, S. Aishwarya.**
Department Of Pharmaceutics, Teegala Krishna Reddy College Of Pharmacy, Hyderabad.**Abstract:**

The present study aims to formulate and evaluate an antimicrobial herbal soap using *Cassia auriculata* and *Nelumbo nucifera* flower extracts, which are traditionally known for their medicinal and skin-beneficial properties. With the growing interest in herbal and chemical-free personal care products, this research focuses on harnessing the natural antimicrobial and antioxidant properties of these flowers to develop an effective herbal soap. The extracts were prepared and incorporated into a standard soap base using the cold saponification method. The formulated soap was subjected to various physicochemical evaluations, including pH, foam height, hardness, spreadability, and stability. Antimicrobial efficacy was tested against common skin pathogens such as *Staphylococcus aureus* and *Escherichia coli* using the agar well diffusion method. The results demonstrated that the herbal soap possessed significant antimicrobial activity, along with acceptable physical properties and stability. This study highlights the potential of *Cassia auriculata* and *Nelumbo nucifera* as valuable natural ingredients in the formulation of herbal antimicrobial soaps, offering a safe and effective alternative to synthetic cleansing products.

Keywords: *Cassia Auriculata* And *Nelumbo Nucifera* Flower Extracts, Herbal Soap.

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INTRODUCTION:

1.1 Paper soap ^[1]

Paper soap refers to small, dry sheets of soap that are packaged in paper or lightweight material. These sheets are designed to be portable, convenient, and easy to use. They typically dissolve in water, releasing a gentle cleansing agent for washing hands or other purposes. Paper soap is often used in travel, outdoor activities, or in situations where traditional liquid soap is not available.

1.2 Herbal paper soap

Polyherbal paper soap is an innovative, eco-friendly soap product that combines herbal extracts with a paper-like packaging.

1.3 Types of paper soap

1. Antibacterial Paper Soap
2. Moisturizing Paper Soap
3. Medicated Paper Soap
4. Herbal Paper Soap

Soap is the product of a chemical process called saponification, which occurs when acids in the form of animal or vegetable fats are combined with an alkali (a solution of sodium hydroxide and water, called lye) and produce a mixture of soap and glycerine. Quite simply, it's a slippery substance that produces bubbles. Soap making is an ancient craft. Prehistoric people may have discovered soap when fat and ash met and saponified as they cooked over open pits. A soap manufactory was uncovered in the ruins at Pompeii, and the Greek physician Mr. Galen wrote about soap in the second century. It's hard to believe that as late as the last century, soap had to be labelled as to its use. Also, during this time, soap fell out of popularity as some modest Victorians believed "soap baths" as disgraceful and sinful. Some of the famous brand name soaps that you buy today are actually not soap at all. Nowhere on the packages does the word "soap" appear, rather the products are labelled "beauty bars" or "deodorant bars". They are synthetic detergents. These "beauty bars" also contain chemical components called "builders" that increase the efficiency of the soap. This book will teach you how to make your own "NATURAL SOAP". Starting with a soap bar, you can add your own natural ingredients, creating a product superior to a synthetic chemical blend that is commercially available. This book contains practical, easy-to-follow instruction for creating your own hand-milled soap and other bath products. From the experience, perhaps you will develop a kinship with generations of home-makers who, using recipes handed down for centuries, produced bath and beauty products for their household using simple ingredients, herbs from the garden, and natural fragrances. I've included secrets for hand

milling your own soap from a store-bought soap base with added ingredients to make a superior, quality bar. The addition to the basic white soap includes fragrant essential oils, herbs, flowers, colorants and rich oils to greatly improve the quality and appeal of the soap. Recipes are presented for more than 20 different hand milled soaps. Only simple equipment is required (most of what you need is probably already in your kitchen), and the ingredients are common and readily available in grocery stores, natural food markets, or easily grown in a home garden. There are also a variety of packaging and labelling ideas and plans for creaming unique and attractive gift collections with soap and bath products that will delight family and friends, children and adults even the family dog. Most of the money you pay for commercial bath products covers the costs of advertising, packaging and promoting the products, not for what's in them. You can make your own bath products at home and package them elegantly for a fraction of the cost of store-bought wares. Another advantage is knowing what's in your home-made products many store-bought products, including soaps, are not required to list their ingredients. Enjoy the process of creating your own personal care products and fragrance blends and presenting them in a professional, eye-catching manner. It's another way to say, "I care, so I made it myself." ^[2-7]

1.4 Making hand milled soap

A basic bar of white soap can be further manufactured and enhanced with fragrances, colours, fillers, and oils that the saponification action would normally affect. This process is called hand milling or French milling. The basic soap is transformed by grating it, remelting it and mixing in additives to greatly improve the qualities of the soap. Commercially produced hand milled soap bars are considered the finest quality of soap available for their silky hardness, fragrance and excellent emollient characteristics. Produced at home, hand milled soaps are equally exceptional and can be molded and decorated in many creative ways. Using a store-bought soap as a base to make hand milled soaps makes it possible to create wonderful soaps in an afternoon, rather than the days it would take if you made your own soap. Additives/Ingredients added to soap during the hand milling process. These additions impart special characteristics to the finished bar. Examples: addition of extra oils to create a super fatty soap that adds extra moisturizing qualities and makes the soap richer and milder.

- **Anti-oxidants**

Ingredients that retard the deterioration of the soap by preventing natural ingredients, such as fruits or vegetables, from combining with oxygen and becoming rancid. Example: vitamin E oil.

- **Antiseptics**

Substances that inhibit the growth of bacteria on living tissue and in the product. Example: Lavender.

- **Aromatic**

Having a fragrant smell and/or taste.

Detergent A cleanser in which petroleum distillates take the place of natural fats.

- **Emollients**

Ingredients that moisturize the skin, smooth wrinkles, improve elasticity and protect. Example: glycerine.

- **Hand milling**

Soap made by grating a base soap, remelting with water, adding beneficial ingredients, and remoulding do produce a superior quality soap.

- **Herb**

A plant used in medicines, as food, or for fragrance which has a soft stem and which, after flowering, dies of withers to the ground. The American Herb Society's official definition is "any plant that can be used for pleasure, fragrance or physic.

- **Hydrating**

Maintaining or restoring normal proportion of fluid in the body or skin. Used in cosmetics to keep the skin moist, firm, and young looking. Example: sweet orange oil, chamomile.

- **Irritant**

A substance that produces irritation or inflammation of the skin. Examples: natural and synthetic substances.

- **Saponification**

The chemical process in which fats or oils are combined with an alkali (lye) to produce soap and glycerine.

- **Spice**

A strongly flavoured, aromatic substance usually obtained from the seeds or fruit of tropical plants. With a few exceptions, spices are not grown in home gardens in the northern hemisphere. Example: cinnamon, cloves.

- **Ingredients**

The ingredients used to make hand-milled soap include base soaps, additives, oils, fragrances, and colorants. They can be found in grocery stores, health food stores, drug stores, and crafts stores and can be ordered from catalogues. It's important to become familiar with ingredients and their qualities before you start. For example, using instant oatmeal instead of regular oatmeal can result in a soggy mess. Just because herbs and flowers are natural doesn't mean they are harmless in every situation; many deadly poisons come from plants. The herbs and flowers used in the recipes in this book are ones that are generally considered safe. If you would like to learn more, there

are many books available to educate you in the safe use of plant material.

- **Natural powders**

Powdered spices, herbs, and flavouring's give your hand-milled soap soft, natural hues. Add them to the mixture when the fragrant oils are added and mix well. The powders will not completely colour all the bits of soap, but the resulting soap will be pleasantly speckled. You can find powdered spices, herbs, and flavourings at grocery and health food stores. Here are some suggestions: Turmeric: Adds a golden orange hue. Use very little to avoid altering the scent of the soap. Neem: An Ayurvedic ingredient which might be beneficial for treating health conditions like skin disorders and treats insect bites. Tulsi: Used to treat heart disease and fever and treat respiratory problems.

- **Fragrant**

Fragrant oils are a significant part of creating bath products. Scents from botanicals and additives are not strong enough for beautiful, aromatic products. Fragrant oils are the most expensive ingredients you will buy, but they are the most important. Do not buy cheap oils or extracts. You will be disappointed.

- **Lavender essential oil**

Used in antiseptic and anti-inflammatory, help in even skin tone.

Materials

Ethanol

DMSO

Antibiotics

Sodium lactate

Vegetable Oils

Sodium Hydroxide

Glass wares

Soap silicone Mould

METHODOLOGY:

SAMPLE PREPARATION

Cassia auriculata and Nelumbo nucifera flowers were collected and shade airdried for 7 days. After that, the dried flowers were powdered using mixer. The grounded powders were subjected to Phyto-compounds extraction by followed maceration method. 20 grams of flowers powder was added to 200 ml of ethanol. The extraction was carried out for 2 days by keeping it in room temperature with intermittent mixing. On 3rd day, the extracts were filtered using Whatman filter paper No.1 to obtain filtrate of crude extracts. The collected filtrate was concentrated by evaporating the ethanol under room temperature for 2 hours. The recovered crude extracts were stored in sample vial at -20°C until further use.

ANTI-MICROBIAL ACTIVITY**PREPARATION OF INNOCULUM:**

The antimicrobial properties of flowers crude extract were tested against Grampositive bacteria *Staphylococcus aureus* (MTCC No 96), Gram-negative bacteria *Escherichia coli* (MTCC NO 1687) and as well as one pathogenic fungus *Candida albicans* (MTCC 227). All the cultures were purchased from Microbial Type Culture Collection and Gene Bank (MTCC), CSIR-Institute of Microbial Technology, Sector 39-A, Chandigarh - 160036, INDIA. The Grampositive and Gram-negative bacteria were cultured in Mueller Hinton broth (MHB) at 37°C. The fungal inoculum was prepared from the 48hrs culture of fungal isolates in Potato dextrose broth (PDB).

ANTIMICROBIAL SCREENING

Agar well diffusion method was followed to study the anti-microbial activity of ethanolic crude extract. 100 µl of freshly prepared bacterial or fungi culture was pipetted in the center of solidified Muller Hinton medium for bacteria and PDA for fungi medium in the petri dish. Using sterile 1 ml pipette tips, five wells (6mm in diameter) were made into agar plates containing microbial inoculums. Then, 40 µl, 60µl, and 80 µl of each extract (100 mg/ml concentration) was added to respective wells. The plates were incubated at 37°C for 24 hours. Antimicrobial activity was recorded by measuring the zone of inhibition appeared around each well. DMSO at a concentration of 100% was added as a negative control and antibiotics was added as a positive control.

Table 4.1: Herbal Soap Formulation

S. No	Materials	Quantity in gram
1.	Sodium Hydroxide (43%)	82
2	Water	95
3.	Coconut Oil	200
4.	Sesame Oil	150
5.	Palm Oil	250
6.	Fragrance	10ml

TOTAL FATTY MATTER (TFM)

TFM is a measure of identifying the amount of fatty matter present in soap. Bureau of Indian Standards (BIS) has categorized bath or toilet soaps as 'normal', 'baby', transparent, and antibacterial soaps. The last three are called specialty soaps targeted to specific users. A toilet or bath soap is a cosmetic by law and it must fulfill the requirements of the relevant Indian standard. 5 gram of soap sample was grated and transferred to the beaker. To that beaker, 100 ml of distilled water and 30 ml of 1:1 Sulphuric acid was added. Then all the contents were digested for 30 minutes using water bath with temperature of 80 °C until formation of clear soap solution. After that, the digested soap solution was transferred to separating funnel. To that, 5 ml of acetone and 4 ml of ethanol was added. The separating flask was shaken manually for 2 minutes. 10 ml of diethyl ether was added to the separating funnel for separation of phases. The extract was collected using Whatman No.1 filter paper. The collected extract was boiled for 30 minutes in water

bath with temperature of 80 °C. After 30 minutes, the oil which used to make herbal soap was starts to separates. After oil separation, the flask was transferred to hot air oven to find out the total fatty matter of herbal soap by using the formula:

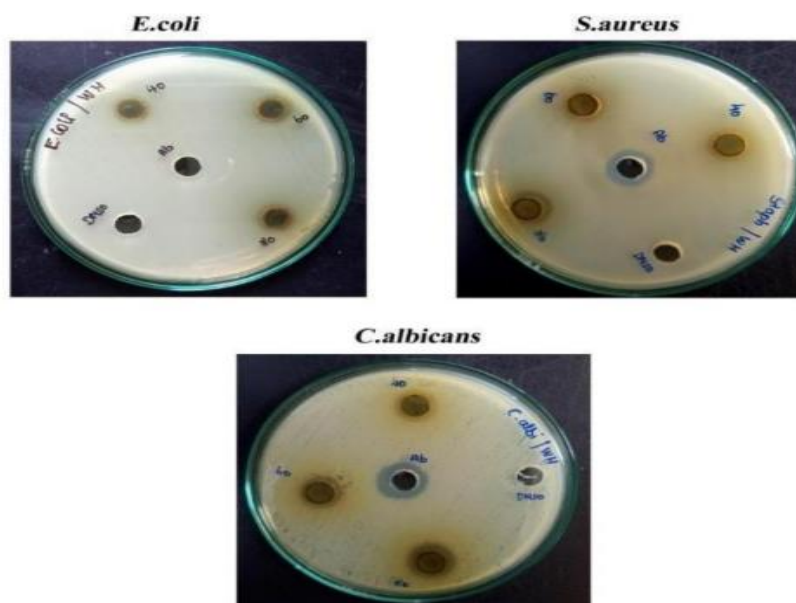
$$\text{Total Fatty Matter} = \frac{\text{Final Weight} - \text{Initial Weight}}{\text{Sample weight}} \times 100$$

FOAM FORMING CAPACITY

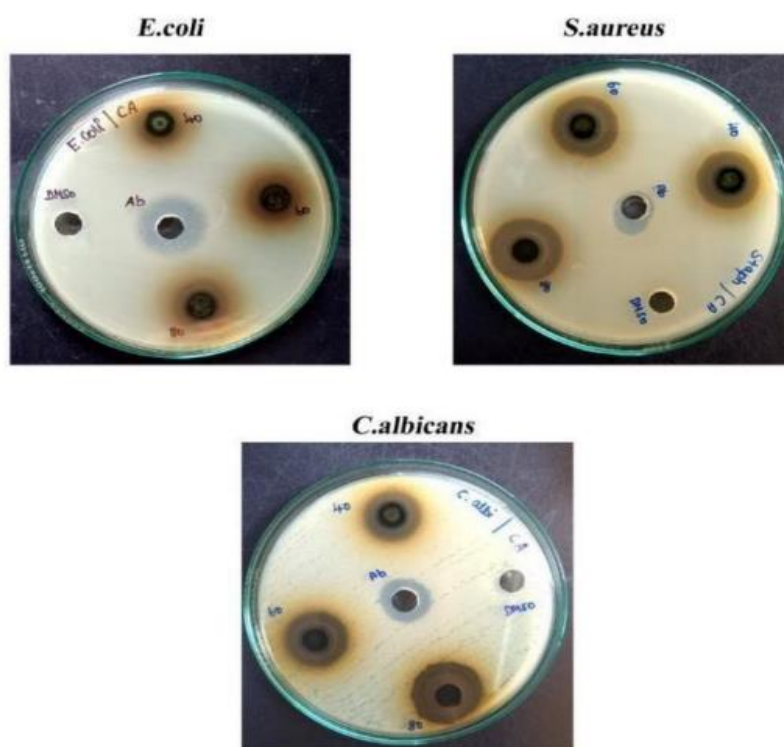
100 ml of water is taken in 250 ml capacity conical flask and then add 5 gram of soap sample was added. The contents were boiled to dissolve and get a clear soap solution. The conical flask was Shaked vigorously by covering the mouth of the flask by hand. After shaking for 3 minutes, foam will be formed in the conical flask. The time taken for the disappearance of the formed foam was noted down with the help of stop watch. The height of the foam was measured using ruler.

RESULTS AND DISCUSSION:**Fig 3.5:** *Nelumbo nucifera* and *Cassia auriculata* Ethanolic Crude Extract**Fig 3.1:** *Nelumbo nucifera***Fig 3.2:** *Cassia auriculata***Fig 3.3:** *Nelumbo nucifera* powder**Fig 3.4:** *Cassia auriculata* powder

ANTI-MICROBIAL ACTIVITY



40-40 μ l- 60-60 μ l, 80-80 μ l, AB-10mcg of Ciprofloxacin, DMSO- 100 μ l
 Fig : *Nelumbo nucifera* Anti-Microbial Activity



40-40 μ l- 60-60 μ l, 80-80 μ l, AB-10mcg of Ciprofloxacin, DMSO- 100 μ l
 Fig 3.8: *Cassia auriculata* Anti-Microbial activity

Table 3.1: Zone of Inhibition revealed by Nelumbo nucifera ethanolic crude extract

S. No.	Tested Bacterial	40 µl	60µl	80µl	DMSO (80 µl) (-ve)	Chloramphenicol (80 µl (+ve))
1	E. coli	6 mm	7 mm	8 mm	No Inhibition	15 mm
2	S. aureus	14 mm	16 mm	17 mm	No Inhibition	16 mm
3	C. albicans	13 mm	15 mm	18 mm	No Inhibition	16 mm

Table 3.2: Zone of Inhibition revealed by Cassia auriculata ethanolic crude extract

S. No.	Tested Bacterial	40 µl	60µl	80µl	DMSO (80 µl) (-ve)	Chloramphenicol (80 µl (+ve))
1	E. coli	7 mm	8.5 mm	9 mm	No Inhibition	16 mm
2	T. aureus	16 mm	17 mm	18 mm	No Inhibition	15 mm
3	D. albicans	16 mm	17 mm	18 mm	No Inhibition	15 mm

TOTAL FATTY MATTER (TFM)

The main variable to be considered in cleanser quality of soap is its all out Total Fatty Matter (TFM). Higher the TFM value in the bath soap, better is its quality. According to BIS, Grade 1 soap ought to have 76% least TFM, while Grade 2 and Grade 3 should have 70% and 60 percent least TFM, separately. The TFM results revealed that the hand-made herbal soap have 76.7% and proved to be grade 1 soap.

SOAP SAMPLE**EVALUATION OF pH**

Typical normal skin has capability of hydrogen (pH) scope of 5.4-5.9 and an bacteria normal flora. Utilization of soap with high pH causes an increase in skin pH, which thus causes an increase in dehydrative impact, irritation and change in bacterial normal flora. The pH of handmade soap has a pH range of 9. In a review done by Tyebkhan G, in which pH paper was utilized for estimating the pH of cleansers/cleaning agents, it was observed that the cleansers regularly utilized by the populace at large have a pH running somewhere in the range of 7 and 9.

SOAP PHYSIO-CHEMICAL PROPERTIES

Table 3.2 soap physio-chemical properties

S. No	Soap Bar Quality	Reference Range	Formulated Soap Bar Range
1	Hardness	28-55	45
2	Cleansing	13-22	21
3	Conditioning	45-68	52
4	Bubbly	15-47	28
5	Creamy	17-49	35
6	Iodine	42-71	58
7	INS	137-166	161

CONCLUSION:

Hence the prepared herbal soap using *Cassia auriculata* and *Nelumbo nucifera* would have superior skin protection against the tested Gram-positive bacteria *Staphylococcus aureus*, Gram-negative bacteria *E. coli* and pathogenic fungus *Candida albicans*. The formulated Herbal soap also have the good foaming capacity, cleansing, pH and TFM value according to Bureau of Indian standard. Therefore, both the flowers have lots of medicinal value, Anti-fungal and Anti-bacterial properties so it doesn't cause any type of skin problems. It maintains moisture and pH level in the skin.

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