



FORMULATION AND EVALUATION OF MULTITHERBAL, TOPICAL, AND ANTIMICROBIAL SKIN CREAM

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Abstract: The skin is the largest and most protective organ of the human body. It protects the human body from external foreign factors and covers the internal organs. Human skin can be damaged by many diseases caused by microbes such as bacteria, fungi, and viruses, such as MRSA infection, herpes zoster, acne vulgaris, warts, eczema, psoriasis, fifth disease, and can also be damaged by carcinogenic and tumor-causing substances that cause skin cancer, such as melanoma, which is fatal and life-threatening. Skin diseases can be treated with drugs like antibiotics, antifungals, and antivirals in the form of tablets, ointments, and creams, and a combination of chemicals and organic herbs in allopathy and AYUSH. The aim of this project is to formulate and produce a multi-herbal skin cream with antimicrobial properties against MRSA-causing *Staphylococcus Aureus* and *Candida fungi* for topical application to wounds and to test its antimicrobial and physicochemical properties.

Keywords: MRSA, Microbes, Skin, deep learning, skin cancer.

1. INTRODUCTION:

The skin is the body's biggest organ, made of water, protein, fats, and minerals. It secures the body from germs and controls body temperature. Nerves in the skin offer assistance you feel sensations like hot and cold. Your skin, hair, nails, oil organs, and sweat organs are a portion of the integumentary framework. "Integumentary" implies a body's external covering. The skin is made up of 3 layers. Each layer has certain capacities: Epidermis, Dermis, and Subcutaneous fat layer (hypodermis). Skin is the huge organ that covers and secures your body. Your skin has numerous capacities. It works to hold in liquid and avoid lack of hydration. It makes a difference you feel sensations, such as temperature or torment, keep out microscopic organisms, infections, and other causes of disease, stabilize your body temperature, and synthesize (make) vitamin D in reaction to sun introduction. Skin illnesses incorporate all conditions that clog, bother, or kindle your skin. Frequently, skin maladies cause rashes or other changes in your skin's appearance. A few skin infections are minor. Others cause serious side effects. A few of the most common skin infections are caused by organisms such as microscopic organisms, infections, parasites, and parasites, including Skin break, Alopecia areata, Atopic dermatitis (dermatitis), Psoriasis, Skin cancer, Herpes Zoster, etc. Certain way-of-life variables can lead to the improvement of a skin illness. Basic well-being conditions may influence your skin, as well. Skin infection side effects change essentially depending on the condition.

.Many skin maladies react well to treatment. Depending on the condition, a dermatologist (specialist specializing in the skin) or other healthcare suppliers may suggest anti-microbial,

Antihistamines, Laser skin re-emerging, Cured creams, treatments or gels, Moisturizers, Verbal drugs (taken by mouth), Steroid pills, creams or infusions, Surgical procedures. Methicillin-resistant Staphylococcus aureus (MRSA) disease is caused by staph microscopic organisms that's gotten to be safe to numerous anti-microbials utilized to treat standard staph contaminations. Most methicillin-resistant Staphylococcus aureus (MRSA) diseases happen in individuals who've been in clinics or other healthcare settings, such as nursing homes and dialysis centers. When it happens in these settings, it's known as healthcare-associated (HA-MRSA). healthcare-associated methicillin-resistant Staphylococcus aureus (HA-MRSA) contaminations are more often than not related with intrusive methods or gadgets, such as surgeries, intravenous tubing, or counterfeit joints. HA-MRSA can spread by healthcare laborers touching individuals with unclean hands or individuals touching unclean surfaces. Another sort of disease has happened in the more extensive community — among sound individuals. This shape, community-associated (CA-MRSA), frequently starts as a excruciating skin bubble. It's as a rule spread by skin-to-skin contact. At-risk populaces incorporate bunches such as tall school wrestlers, child care laborers and individuals who live in swarmed conditions. The Candida organism is one of these possibly destructive living beings. When an excess of Candida creates on the skin, an contamination can happen. This condition is known as candidiasis of the skin, or cutaneous candidiasis. Candidiasis of the skin regularly causes a ruddy, bothersome hasty to frame, most commonly in the folds of the skin. This hasty may too spread to other regions of the body. Whereas the indications are frequently bothersome, they can ordinarily be treated with made strides cleanliness and antifungal creams or powders.

S. aureus has long been recognized as one of the most vital microscopic organisms that cause illness in people. It is the driving cause of skin and delicate tissue diseases such as abscesses (bubbles), furuncles, and cellulitis. In spite of the fact that most staph contaminations are not genuine, *S. aureus* can cause genuine contaminations such as circulation system diseases, pneumonia, or bone and joint infections.

Staphylococcus aureus is a Gram-positive roundly molded bacterium, a part of the Bacillota, and is a regular part of the microbiota of the body, regularly found in the upper respiratory tract and on the skin. It is regularly positive for catalase and nitrate lessening and is a facultative anaerobe that can develop without the require for oxygen. In spite of the fact that *S. aureus* ordinarily acts as a commensal of the human microbiota, it can moreover gotten to be an astute pathogen, being a common cause of skin diseases, counting abscesses, respiratory diseases such as sinusitis, and nourishment harming. Pathogenic strains regularly advance contaminations by creating harmfulness variables such as strong protein poisons and the expression of a cell-surface protein that ties and inactivates antibodies. *S. aureus* is one of the driving pathogens for passings related with antimicrobial resistance and the rise of antibiotic-resistant strains, such as methicillin-resistant *S. aureus* (MRSA), is a around the world issue in clinical medication. In spite of much investigate and improvement, no immunization for *S. aureus* has been approved.

Candida albicans is an deft pathogenic yeast that is a common part of the human intestine vegetation. It can moreover survive exterior the human body. It is identified in the gastrointestinal tract and mouth in 40–60% of sound grown-ups. It is ordinarily a commensal living being, but it can gotten to be pathogenic in immunocompromised people beneath a assortment of conditions. It is one of the few species of the class *Candida* that cause the human contamination candidiasis, which comes about from an abundance of the organism. Candidiasis is, for illustration, frequently watched in HIV-infected patients. *C. albicans* is the most common parasitic species disconnected from biofilms either shaped on (lasting) embedded restorative gadgets or on human tissue. *C. albicans*, *C. tropicalis*, *C. parapsilosis*, and *C. glabrata* are together dependable for 50–90% of all cases of candidiasis in people. A mortality rate of 40% has been detailed for patients with systemic candidiasis due to *C.*

albicans. By one appraisal, obtrusive candidiasis contracted in a clinic causes 2,800 to 11,200 passings annually in the US. In any case, these numbers may not really reflect the genuine degree of harm this life form causes, given that unused considers demonstrate that *C. albicans* can cross the blood–brain in mice.

C. albicans is commonly utilized as a show living being for contagious pathogens. It is by and large alluded to as a dimorphic organism since it develops both as yeast and filamentous cells. Be that as it may, it has a few morphological phenotypes, counting misty, Intestine, and pseudohyphal shapes. *C. albicans* was considered an commit diploid life form without a haploid arrange for a long time. This is, be that as it may, not the case. Following to a haploid arrange *C. albicans* can moreover exist in a tetraploid arrange. The last mentioned is shaped when diploid *C. albicans* cells mate when they are in the murky shape. The diploid genome estimate is roughly 29 Mb, and up to 70% of the protein-coding qualities have not however been characterized. *C. albicans* is effortlessly refined in the lab and can be considered both in vivo and in vitro. Diverse considers can be done depending on the impact of the media on the morphological state of *C. albicans*. A extraordinary sort of medium is CHROMagar Candida, which can be utilized to recognize diverse Candida species.

Fig.1. MRSA Wound



Fig.2. Candida Wound



2. FORMULATION AND EVALUATION OF MULTIHERBAL, TOPICAL AND ANTIMICROBIAL SKIN CREAM:

Our paper, " **FORMULATION AND EVALUATION OF MULTIHERBAL, TOPICAL AND ANTIMICROBIAL SKIN CREAM**" mainly focuses to formulate and evaluate a multiherbal cream that has antimicrobial properties against Methicillin-resistant *Staphylococcus aureus* that causes MRSA bacterial skin infection and *Candida Albicans* that causes fungal infections such as Cutaneous Candidiasis, etc., and evaluate its physiochemical properties. Formulation and evaluation of herbal cream with broad-spectrum antibacterial properties, especially against MRSA bacteria resulting in MRSA wounds and Cutaneous Candidiasis.

3. PROPOSED METHOD:

The Herbs are gathered, washed, dried thoroughly, and powdered into fine particles. Aloe Vera gel and Castor oil are added. Emulsifiers and preservatives are also added. Finally, the pH is balanced by adding the necessary base, and Essence oil is added for a pleasant odor. The cream is kept at room temperature for a few days, and its stability is checked for any oil and water separation or changes in texture. Then, the antimicrobial effect is studied for the well-diffusion method, and the zone of inhibition of the microbial species is checked compared to standard antimicrobial medicines. Then, PH is evaluated. The ideal pH for skin care products lies between the range of 5.5 to 6.7, which matches the PH of the skin so that it doesn't strip the natural oils from the skin and make it dry and cause irritation. The product will be Paraben and sulfate-free. Mineral oil-free, and free from synthetic preservatives, and contains naturally derived preservatives that can protect the product with a shelf life of 1 to 2 years, and Hypoallergenic, Noncomedogenic, Skin-friendly, and gentle. It contains cleansing and wound-healing compounds that improve the skin barrier, defending against major skin problems caused by MRSA, such as dryness, itching, and irritation, and calms the skin. The primary chemical compounds based on the ingredients are catechins and flavonoids. Various trials are made for the formulation of the cream based on the concentration of the ingredients added, and finally, the desired texture is acquired, which proceeds with the antimicrobial test. A loopful of bacterial species (*Staphylococcus aureus* (or) *Candida albicans*) was inoculated in the sterile nutrient broth and incubated overnight at 37°C. The agar Well diffusion assay is used to determine the zone of inhibition or bacterial growth by the sample. Nutrient broth agar was prepared and poured into a sterile petri plates and allowed to solidify. The overnight nutrient broth culture of *Staphylococcus aureus* (or) *Candida albicans* species was inoculated in Nutrient agar using sterile cotton swab. The given samples were placed in the well. Incubated for 24 hrs. The standard tetracycline 25 µg (or) fluconazole 50 µg was added and antibacterial and antifungal activity was checked.

4. TABLE:

TABLE I. LIST OF INGREDIENTS AND ITS CONCENTRATION

S.NO	List of ingredients	Trial 1 amount added in %	Trial 2 amount added in %	Trial 3 amount added in %
1.	Ashwagandha Powder	3	5	6
2.	Thyme Powder	3	4	5
3.	Aloe Vera Gel	3	4	6
4.	Pomegranate Peel powder	5	3	2
5.	Soap pod powder	4	3	2
6.	Castor oil	4	3	3
7.	Phenoxyethanol	1	1	1
8.	Disodium EDTA	3	2	1
9.	Sodium hydroxide	4	3	2
10.	Stearic acid	5	5	5
11.	Tea tree essential oil	0.5	1	2
12.	Neem powder	2	3	3
13.	Titanium Dioxide	traces	traces	traces

TABLE II. LIST OF INGREDIENTS AND ITS PROPERTIES

S. N O	List of ingredients	Compounds present	Purpose of use	Performance
1.	Ashwagandha Powder	withanolides	Antimicrobial, Anti-inflammatory	Inhibits microbial growth and wound healing.
2.	Thyme Powder	Thymol	Antimicrobial, Anti-inflammatory.	Inhibits microbial growth and wound healing.
3.	Aloe Vera Gel	Flavonoids like catechins	Antimicrobial, Anti-inflammatory, calming and soothing.	Inhibits microbial growth and wound healing.
4.	Pomegranate Peel powder	Flavonoids like catechins	Antimicrobial, Anti-inflammatory	Inhibits microbial growth and wound healing.
5.	Soap pod powder	Vitamins A, D, E, K	Antimicrobial, Cleansing.	Inhibits microbial growth and wound healing.
6.	Castor oil	Ricinoic acid	Antimicrobial, Hydration, Soothing.	Inhibits microbial growth and wound healing.
7.	Phenoxethanol	glycol ether and a phenol ether.	Preservative, Stabilizer	Prevents microbial growth in the product.
8.	Disodium EDTA	disodium salt form of edetate	Stabilizer	Protects integrity of the product without causing physiochemical changes.
9.	Sodium hydroxide	NaoH	Base for PH balance	Balances ideal PH if the product.
10.	Stearic acid	C18H36O2	Antimicrobial, Emollient,	Inhibits microbial growth, make skin soft and supple

			maintains moisture.	
11	Tea tree essential oil	Terpinen	Antimicrobial, Anti-inflammatory.	Inhibits microbe growth, give pleasant odor
12	Neem powder	Azadirachtin	Antimicrobial, Anti-inflammatory.	3
13	Titanium Dioxide	Tio2	Colorant	traces

5. RESULTS:

TABLE III. PHYSIOCHEMICAL AND ANTIMICROBIAL PROPERTIES

S.No	Parameters	Standard	Sample
1.	Candida albicans (Ca)	Zone of inhibition is 19.	Zone of inhibition is 14.
2.	Staphylococcus aureus	Zone of inhibition is 27.	Zone of inhibition is 14.
3.	PH	5.5 – 6 optimal	5.83
4.	Solubility	Water soluble	Water soluble
5.	Irritancy	No irritancy	No irritancy
6.	Allergic response	Nil	Nil
7.	Appearance and Texture	White/ gel based	Yellowish green/ Cream based
8.	Odour	Characterisric	Tea tree
9.	Stabilty/Shelf life inroom temperature	Stable/ 2 to 3 years	Stable/ 1 to 2 years

Fig.3. Antifungal activity against *Candida Albicans*



Fig.4 PH level

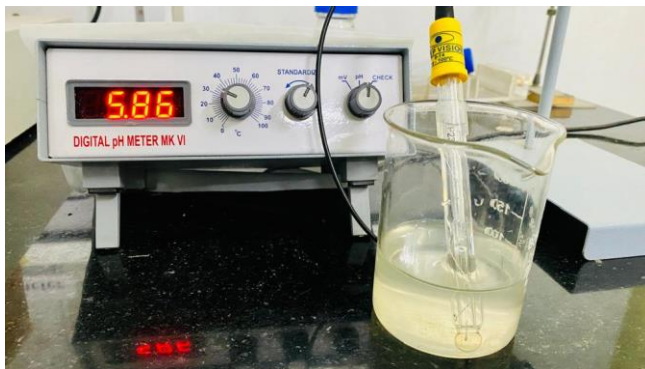


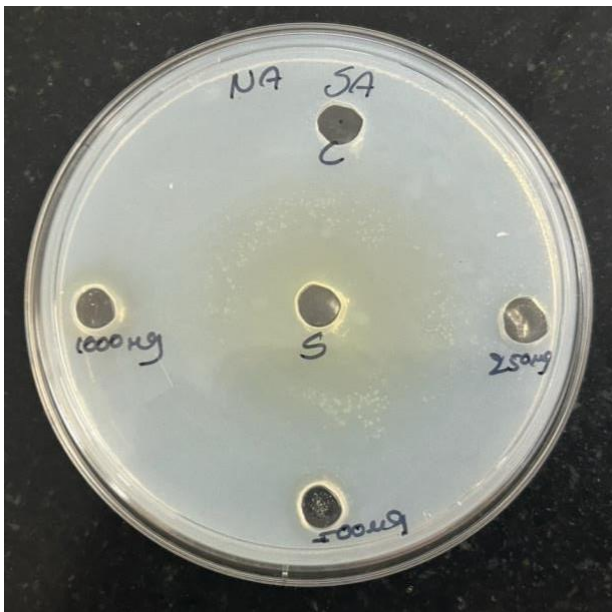
Fig.5 Physical Appearance/ Stability



Fig.6 Irritancy Test



Fig.7 Antibacterial activity against Staphylococcus Aureus



6. CONCLUSION:

The project for the formulation and evaluation of multiherbal topical antimicrobial skin cream has been done and the results were found to be effective against MRSA and Candida Albicans compared to Tetracycline and fluconazole. Also, it possesses proper physiochemical properties that are required for a medicinal cream and is suitable for wounded and affected skin. Thus, this project is effective against MRSA and other skin diseases caused by Staphylococcus and Cutaneous candidiasis, causing bacterial and fungal species. It inhibits the growth of microbes to a great extent and is safer while used on the skin.

In this project, we are able to formulate and evaluate an antimicrobial topical skin cream consisting of multiple herbs, and its physiochemical properties were studied. This project successfully inhibits the growth of microbes on the skin surface safely without any negative response.

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