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Formulation and Evaluation of Herbal Antifungal Cream Of Garlic Oil and Clove Oil

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ABSTRACT

The goal of the study was to formulate a cream with a composition for treating fungal skin infections and which enhances skin properties. This formulation belongs to a medicinal cream that has two antifungal active components. It reveals a formula for treating fungal skin infections, as well as other components that can help improve skin issues. For skin infections, the topical approach is the best option. Because of the numerous advantages over traditional routes of drug administration, the development of topical drug delivery systems with systemic effects appears to be advantageous for a variety of medications. Garlic oil and clove oil are the active pharmaceutical ingredients (API) used to treat fungal skin infections. It also includes two types of primary and secondary emulsifiers, waxy materials, co-solvents, two preservatives, a buffering agent, a humectants, and water in the cream base. When the active components are combined, they provide a potent antifungal effect. Several experiments were done to assess the physicochemical characteristics of formulated cream, such as visual inspection, pH measurement, extrudability, expandability, skin irritant test, etc. The cream was further analyzed with the use of nutritional agar for antifungal activity. The medicated cream was good in consistency and color; however the smell of the garlic was quite unpleasant, so the odor of the garlic was masked with peppermint oil, which also acting as an additional antifungal agent, in improved version.

KEYWORDS: Fungal skin infections, Garlic oil, Clove oil, Peppermint oil, Antifungal cream

I. INTRODUCTION

The last few decades have witnessed an increase in fungal infection. Fungal infections are evolving diseases in sanatorium institutions. Increase in immunosuppressive diseases and conditions have been influencing the epidemiological pattern of mycoses in hospitalized patients the epidemiology of invasive fungal infections is currently at a crucial stage.[1] Fungal infection caused by Candida has become more prevalent than Escherichia coli and Pseudomonas sp., Aspergillus sp. and other sp[2] There are many host factors that predispose patients to fungal infections. These include: immobility; mucositis; use of antibiotics; radiation therapy or certain immunosuppressive agents; intensive care unit (ICU)[3] Candida albicans is the most common species in the genus which has been implicated in Candidiasis. The infections range from superficial skin to systemic diseases. C.albicans, C. tropicalis, C. glabrata and C. parapsilosis are part of the normal flora of humans and can be isolated from oral cavity, vaginal and other parts of body sites from normal healthy people.[4]

Treatment with herbs is an ancient method for curing diseases. Since the vedic time humans have used medicinal plant material to cure any disease or to give a satisfactory treatment against that disease. Plants are also known for treating the infectious and non infectious skin disorders. The antimicrobial effect of some plants is attributed to the number of phytoconstituents like flavonoid, tannins, triterpenes etc.[5] The purpose of the current study is also based on the medicinal property of a plant i.e. Garlic (Allium sativum) and clove oil (Eugenia caryophyllus)

Garlic oil shows a wide range antimicrobial activity. Alliin is the main chemical constituent in garlic oil which shows antimicrobial activity. This oil consists of sulfur containing six compounds such as i. allicin, ii. alliin, iii. ajoene, iv. diallyl disulfide, v. dithiin and vi. Sallylcysteine. These large amounts of sulfur compounds give the smell and taste to the garlic. Diallyl disulfide is an important component in

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garlic and being a powerful antibiotic and antifungal compound [6].

Clove oil is reported to have very strong antifungal activity against a lot of fungal species [7]. The essential ingredient liable for its antifungal activity is eugenol from the clove. Eugenol is the major volatile compound of extracted oil from clove buds (S. aromaticum L). It is reported that clove oil possesses tough antifungal activity against C. albicans, C. neoformans [8].

Aim of this present work is to prepare various cream formulations with herbal antifungal extract of garlic oil, clove oil and peppermint oil by using emulsification method. And evaluate the cream properties like various organoleptic property, viscosity, spreadability, tube extrudability, and microbiological study, to check the antimicrobial property.

II. MATERIAL AND METHOD

Materials

Propylene glycol, Beeswax, Stearyl alcohol, Cetyl alcohol, Triethanolamine, Propyl paraben, Methyl paraben, Liquid Paraffin, Stearic acid, Peppermint oil were purchased from Royal Drug and Pharmaceuticals Mumbai. Garlic Oil and Clove oil are extracted from Garlic and Clove respectively by steam distillation in the laboratory.

1. **Garlic** [6]

Synonyms: Allium; lassan (Hindi).

Biological Source: Garlic is obtained from ripe bulb of Allium sativum Linn. Family: Liliaceae.

Chemical Constituents: Allicin, Alliin, volatile and fatty oils, mucilage and albumin

2. **Clove** [7]

Synonyms: Caryophylli; Clove buds and Clove flower, Lavang (Hindi).

Biological Source: Clove is obtained from dried flower and buds of Eugenia caryophyllus tree. Family- Myrtaceae

Chemical Constituents: Clove contains Volatile oil (16-21%):- Phenol group mainly in the form of Eugenol (80-88%), acetyl eugenol (10-15%); α and β -Caryophyllene. Also present Pyrogallol tannins, methyl furfural and dimethyl furfural

Collection of sample

Garlic and clove crude drugs are purchased from the market.

Extraction of Oil

Oil of garlic and clove was extracted by the steam distillation method by using the Clevenger apparatus in the laboratory. Garlic and clove cleaned properly and separately filled in the RBF with solvent arranged the assembly properly by attaching Clevenger apparatus and condenser and heat. The obtained oils are separated and fill in an airtight container.

Preparation of Cream Formulation [9]

Table 1: Formulation 1(F1) Table of two phases

Part A- Oily Phase			**Part B-Aqueous Phase**		
Ingredients	**Quantity**	**Activity**	**Ingredients**	**Quantity**	**Activity**
Clove Oil	5%	Anti-fungal	Propylene glycol	5%	Humectants
Garlic Oil	5%	Anti-fungal	Triethanolamine	2%	Stabilizer
Stearyl alcohol	5%	Emollient	Methyl paraben	0.01%	Preservative

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Cetyl alcohol	6.5%	Binding agent	Propyl paraben	0.04%	Preservative
Mineral oil (Liquid paraffin)	5%	Moisturizer	Distilled Water	Upto 100%	Solvent base
Stearic acid	2.5%	Emulsifying agent			
White Beeswax	1.5%	Thickening agent			

Table 2: Formulation 2 (F2) Table of two phases

Part A- Oily Phase			**Part B-Aqueous Phase**		
Ingredients	**Quantity**	**Activity**	**Ingredients**	**Quantity**	**Activity**
Peppermint oil	5%	Antifungal & Flavoring agent	Propylene glycol	5%	Humectant
Clove Oil	5%	Anti-fungal	Triethanolamine	2%	Stabilizer
Garlic Oil	5%	Anti-fungal	Methyl paraben	0.01%	Preservative
Stearyl alcohol	5%	Emollient	Propyl paraben	0.04%	Preservative
Cetyl alcohol	6.5%	Binding agent	Distilled Water	Upto 100%	Solvent base
Mineral oil (Liquid paraffin)	5%	Moisturizer			
Stearic acid	2.5%	Emulsifying agent			
White Beeswax	1.5%	Thickening agent			

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I. Preparation of oil phase [6]

All the ingredients like white beeswax, stearic acid, stearyl alcohol, cetyl alcohol were melted in a stainless steel container. To this mixture liquid paraffin was added and allowed to melt. The temperature was then kept between 65 to 70°C.

II. Preparation of Aqueous phase [6]

Water was heated to 65 to 70°C. To this aqueous medium pre weighed all the reagent like propylene glycol, triethanolamine, propyl paraben and methyl paraben were added; Then the temperature of the aqueous phase was maintained at 65 to 70°C

III. Development of Cream formulation [6]

Total Oil phase was then slowly pour into the aqueous phase at 65-70°C and mixed for 10 to 15 Minutes. When the temperture of both the medium were at the same temperature, the aqueous phase was slowly added to the oil phase with moderate agitation and was kept stirred until the temperature dropped to 40°C. Garlic oil and clove oil was added to it. The o/w emulsion was then cool down to room temperature to changed a thick cream base.

In case of Formulation 2(F2), extra reagent peppermint oil was added at the final stage, and immediately transfers in to a container, and closed tightly.

Preparation of oil phase Final formulation F1 Final formulation F2

Figure 1: Stages of herbal antifungal cream formulation

III. RESULTS AND DISCUSSION:

1. Physical examination (Organolectic properties)

The prepared herbal antifungal creams were inspected visually for their colour, appearance, odor, and consistency. The pH was measured in each herbal antifungal cream, using a pH meter, which was precalibrated with standard buffer solutions at pH 4, 7, 9. The pH meters electrode was inserted in to the cream 10 min before the reading at room temperature. The standard pH of a topical preparation should be within the pH range matching to the pH of the skin, namely, 4.5- 6.5.

2. Viscosity [12, 13, 14]

The viscosity of formulated creams was measured by Brook field ViscometerNDJ-8S using spindle S 94 at varying speed and shear rates. The measurements were done over the range of speed setting from 0.15, 0.25, 0.35, 0.45 and 0.55 rpm in 60 s between two successive speeds as equilibration with shear rate ranging from0.25 s-1 to 1.0 s-1. Viscosity determinations were performed at our room temperature.

3. Spredability [12, 13, 14, 15]

Spredability property of a formulation was calculated by an apparatus designed by Muttimer et al.; it made of a wooden block, which was connected by a pulley at a one end. A rectangular shaped ground glass was set on this block. An excess amount of cream (about 3-4 gm) under study was placed on this ground plate. The herbal antifungal cream was then kept in between this plate and a glass plate having the same dimension of fixed ground plate and attached with the hook. A fixed 1 Kg load was placed on the upper of the plates for about 4-5 minutes to expel all the entrapped air and to provide a uniform film of the cream between the plates. Excess of the cream was scrapped off from the boundaries. The top plate was then subjected to drag of 80 Gms. With the help out of string attached to the hook and the time (in seconds) required by top plate to cover a distance of 10 cm be noted. A less interval

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indicates better Spredability. Spredability measured in unit gm.cm/sec

Spredability of the cream may be determined by the following equation,

S= M x L/T

Where,
L= length moved by glass slide
T= Time in seconds
M=Weight in pan &
S= Spredability

3. Tube extrudability

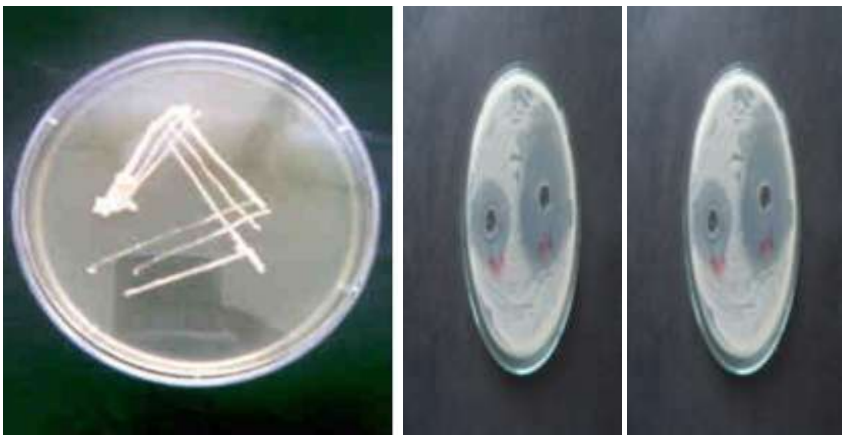
In this present work, the method adopted for evaluating cream formulation for extrudability was based upon the quantity in percentage cream extruded from tube on application of finger pressure 7kg. More quantity extruded improved was extrudability. The both the formulation F1 and F2 was filled in a clean, lacquered aluminium collapsible tube containing about 5 gm of cream which contains in a nasal tip of 5 mm hole and applied the pressure on the tube by the help of finger tip. The tube extrudability property was determined by, quantity of cream formulations were extruded from the tube tip as when the pressure was applied on the tube body.

4. Microbiological studies

All types of broad, non-resistance microorganism like staphylococci, streptococci, dermatophytes or yeast or molds can be protected by tropical formulations with anti microbial agent have enormous use in dermatology preparation were infections are often mixed. Since herbal anti fungal cream containing antimicrobial extracts as active constitutent, it is expected to protect from microbial growth. To determination of an anti microbial activity of herbal antifungal cream Disk diffusion method was followed. For this study standard media was prepared with 65 g Sabouraud Dextrose Agar, and 28 g Nutrient Broth. Both the sample cream formulation was compared with standard Fluconzole. Finally the zone of inhibition diameters was measured with the help of zone reader.

Antifungal Evaluation:

- Materials: Herbal antifungal cream, fungi.
- Media: Sabouraud Dextrose Agar (65 g), and Nutrient Broth (28 g).
- Sample: Herbal antifungal cream, candida albicans.
- Standard: Fluconazole



Candida albicans Showing antifungal activity

Figure 2: Antifungal activity of Herbal antifungal cream(F2) on organism

Antifungal activity of Herbal antifungal cream on organism

Table 3. Effect of antifungal activity

Organism	Extract	Test	Standard
Candida Albicans	Ethanol	Susceptible	Susceptible

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Table 4. Showing Diameters of Inhibition Zones

Organism	Plant Extract	Zone of inhibition [mm]		
		Test Sample (avgas diameter)		Standard
Candida Albicans	Ethanol	F1 - 8	F2 - 10	23

As Herbal antifungal cream shows antifungal activity against Candida albicans it can be formulated as antifungal formulation (cream).

5. Skin irritancy test

Skin irritancy is determined with that herbal antifungal cream formulations do not affect the human skin cells or tissues. Irritancy may result in swelling, redness and inflammation on the surface of skin when some particular creams are applied without testing. Hence skin irritancy test was carried out by marking an area on the left hand dorsal surface. The cream was applied with a spatula to that marked specified area and time was noted. Irritancy, erythema, edema was checked for regular intervals upto 24 hours. There was no prominent irritation because of the applied herbal antifungal cream hence it was safe to use.

Observation

Table 5. Compiled evaluations results

Sr. No.	**Evaluation Parameter**	**Results**	
		F1	**F2**
1	Colour	Buff yellow to creamish	Buff yellow
2	Appearance	Smooth	Smooth
3	Odor	Pungent (strong garlic oil)	Pleasant peppermint
3	Consistency	No phase separation	No phase separation
	Viscosity	66440 cps.	65740 cps.
4	Spread ability((gm.cm/sec)	14.23	18.00
5	pH	7.5	7.4
6	Extrudability	96.15 %	89.50%
7	Skin irritancy test	No Irritancy, erythema, edema	No Irritancy, erythema, edema
8	Microbiological studies [zone of inhibition]	8mm	10mm

The prepared both formulations showed good spread ability, no evidence of phase separation and good consistency during the study period. Though stability parameters like visual appearance, is same but the F2 shows better fragrance compare to the formulation F1. And both the formulations showed that there was no significant variation during the study period.

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IV. CONCLUSION

The use of herbal/bioactive ingredients in cream (cosmetic) influence biological functions of skins and provide nutrients necessary for the healthy skin aginst antifungal infection. The prepared formulation (F2) showed good spread ability, no evidence of phase separation and good consistency during the study period. Stability parameters like visual appearance, nature but it had a drawback. In first formulation (F1) the smell was unpleasant as garlic oil was used which gives a very strong unpleasant smell. So we prepared another formulation (F2) to mask this unpleasant smell. In the second formulation peppermint oil was used to enhance the preparation and mask the odor of garlic, which was also acting as a tertiary antifungal agent here.

Conflict of interest

The authors declare no conflict of interest for current work.

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