Research Article

Formulation Development and Comparative Evaluation of Antimicrobial Herbal Creams

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ABSTRACT

Plants and herbal extracts have formed an important role in modern medicine, due to their chemical and medicinal contents found in the natural form. Herbal cosmetics represent cosmetics associated with active bio-ingredients, neutraceuticals and pharmaceuticals. Garlic and shallots are those plants that were seriously investigated over several years and used for centuries to fight infectious diseases. The main objective of the present study was to formulate herbal antimicrobial creams containing ethanolic extracts of garlic and shallots and compare the antimicrobial activity. The herbal cream containing garlic extract has more activity compared to cream formulated with shallot extract. Stability studies were performed for a period of two months and there was no significant variation in the properties of prepared herbal creams.

Keywords: *Allium sativum, Allium ascalonicum*, Herbal cream, antimicrobial activity.

INTRODUCTION

Herbal medicines are also called as botanical medicine or phytomedicines used to alleviate human illness and for the maintenance of general health. A majority of the world's population still relies on herbal medicines to meet its health needs and are often used to provide first-line and basic health services.[1, 2] The demand for plant based medicine is increasing in both developing and developed countries, due to their nontoxicity, less side effects and easy availability at affordable prizes.[3, 4]

Creams are biphasic topical preparations usually applied to the skin and mucous membranes such as the rectum or vagina. They are semi solid emulsions containing oil-in-water (O/W) or water-in-oil (W/O) type preparations. Oil-in-water (O/W) emulsions are used mostly because they contain water washable bases, whereas water-in oil (W/O) emulsions are emollient and cleansing agents. The use of cosmetics not only used for developing an attractive external appearance, but also achieving longevity of good health by reducing skin disorders. The herbs used in cosmetic preparation also have properties like antioxidant, anti-inflammatory, antiseptic, emollient, anti kerolytic activity and antibacterial activity. Cosmetic products are used to protect the skin from exogenous and endogenous harmful agents and enhance the beauty and attractiveness of skin.[5]

Garlic (*Allium sativum*) and Shallot (*Allium ascalonicum*) are an integral part of Indian diet, which have several health benefits. Allium species are rich sources of Vitamin C, B6, biotin, chromium, calcium, and dietary fibers. In addition they also contain a good amount of vitamin B 1 and K. Garlic has been used from the ancient times in India and China for a valuable effect on the cardiac vascular disease and regular use of garlic may help to prevent cancer, to treat malaria and to boost immunity .Garlic has also be used to treat asthma, candidiasis, colds, diabetes and antibacterial effect against food borne pathogens.[6, 7]

In ancient time's onion (*Allium cepa L)* have been an important dietary resource and have also been of interest for medical purpose. Shallot is a botanical variety of species *Allium Cepa.* Shallot is a bulbous plant widely cultivated in almost every country of the world and are easily propagated, transported and stored. Onions are effective against common cold, heart disease, diabetes, osteoporosis, coughs and sore throat. It is rich in proteins, carbohydrates, sodium, potassium and phosphorus. Folk healers traditionally used shallots, to prevent infection and are among the oldest cultivated plants used both as a food and for medicinal application.[8]

Literature revealed that both garlic and shallots possess anti-microbial and anti-inflammatory activity, hence, the aim of the present study is to compare the antimicrobial activity of the formulated herbal cosmetic creams containing the extracts of garlic and shallot.

MATERIALS AND METHODS

Collection of materials

Garlic and shallots were collected from local market of Thrissur, Kerala and washed thoroughly with distilled water. All other chemicals used were of analytical grade and purchased from Merck Ltd. India.

Preparation of extract

Compound extraction method

The Shallot and garlic bulbs are washed with sterile distilled water. The outer coverings of the bulbs are manually peeled off and the fleshy part of the Shallot and

garlic is rewashed with freshly prepared sterile distilled water. A part of 500gms of the shallot and garlic bulbs is cut in to small parts and place the crushed parts in 50 ml of beaker. Soak the crushed and squashed Garlic and Shallot in 20 ml of ethanol, chloroform and distilled water separately. Cover the beaker with watch glass and allow it to stand for one hour and then filtered the homogenized mixture of garlic through sterile cheese-cloth.[9]

Antimicrobial screening

Muller Hinton agar plates were prepared aseptically to get a thickness of 5-6mm.The plates were allowed to solidify and inverted to prevent the condensate falling on the agar surface. The plates were dried at 37˚c before incubation. The organisms were incubated in the plates prepared earlier by Spread plate method (E coli & S aureus). The anti-microbial study against Gram positive & Gramnegative organism was done by cup plate method. Then by using borer make wells on the agar plate. Then add extracts of shallot & garlic to the concerned wells (in 2 different plates).Incubate all the petri plates for 24hrs. Zone of inhibition were then observed and compared with a standard gentamycin.[10, 11]

Formulation of herbal antimicrobial cream

The cream was prepared by fusion method and formula given in table 1. The oily phase and aqueous phase components are to be heated separately up to 70 °C and are to be mixed using homogenizer by addition of methyl paraben, extract and perfume. Care have to be taken for constant and even mixing, the remaining deionised water is added with continuous stirring until the mixture cools and formed as cream. Base cream is prepared in the same method as formulation without extract. [12, 13]

Table 1: Composition of antimicrobial cream

Active Ingredient	Concentration (% w/w)
Herbal extract	2.5%
Oily Phase	
Stearic acid	7.00%
Cetyl alcohol	2.00%
Mineral oil	20.00%
Aqueous Phase	
Glycerin	10.00%
Methyl paraben	0.05%
Triethanolamine (TEA)	2.00%
Deionised water	q.s 100%

Evaluation of Antimicrobial Cream

Physical Properties

The prepared topical creams were observed for color, odour and appearance. To determine the pH, pH meter have to be calibrated using standard buffer solution. About 0.5 g of the cream have to be weighed and dissolved in 50 ml of distilled water and its pH have to be measured.

Homogenecity

The formulations are to be tested for the homogeneity by visual appearance and by touch.

Loss on Drying

1 g of cream has to be taken in china dish and kept in an oven at 105 °C for 2 hours.

Spreadability

For the determination of spreadability excess of sample was applied in between two glass slides and was compressed to form uniform thickness by placing a weight of 30g for 5 minutes. The time required to separate the slides was taken as a measure of spreadability.

$$S = m \times L/T$$

Where, m = weight applied to upper slide

L = length moved on glass slide

T = time taken

Phase separation

The formulated creams were kept intact in a closed container at 25 – 30° C not exposed to light. Phase separation was observed carefully every 24 hrs. for 30 days. Any change in phase separation was checked.

Antimicrobial study

The creams were inoculated on the plates of Muller Hinton agar media by cup plate method. The plates were placed in the incubator at 37 °C for 24 hours. After the incubation period, plates were checked for the microbial growth by comparing it with the control.

Stability Studies

The developed formulation was subjected to accelerated stability testing for about 6 weeks. Temperatures were maintained as per (ICH guidelines). At the end of the studies, samples are to be analysed for the physical properties.[14, 15]

RESULTS AND DISCUSSION

The antibacterial activity of garlic and shallots were observed by measuring the diameter of the growth inhibition zone of different bacteria (gram positive as well gram negative) in the culture media and the results were shown in table 2 and 3, which indicate that the ethanolic extract of garlic and shallots shows marked antibacterial activity. By comparing the activities, ethanolic extract of garlic showed more activity than shallot extract.

Table 2: Antimicrobial activity of Garlic extract

Bacterial strains	Zone of inhibition (mm)			
	Standard	Solvents for extraction		
		Ethanol	Chloroform	Distilled water
E. coli	14	12	6	3
S. aureus	13	11	5	3

Table 3: Antimicrobial activity of Shallot extract

Bacterial strains	Zone of inhibition (mm)			
	Standard	Solvents for extraction		
		Ethanol	Chloroform	Distilled water
E. coli	12	7	5	2
S. aureus	13	6	4	2

Evaluation of herbal cream

The creams are white and light yellow appealing appearance and smooth texture. The pH of the garlic and shallot creams was found to be 6.3 and 6.2 respectively. The pH should not be too acidic as it may cause skin irritation and should not be too alkaline as it may cause scaly skin. All the formulations were found homogenous with good consistency and no flocculate or lumps were observed. The spreadability of the formulated garlic and shallot herbal creams was found to be 13.5g/sec and 12g/sec respectively (Table 4). The value of values indicates that the formulations were easily spreadable by a small amount of shear. Both the garlic and shallot herbal formulations showed considerable zone of microbial inhibition. Garlic extract formulation showed comparatively more antimicrobial activity than other formulation. The activity of standard drug gentamycin is more than that of all developed formulation. Stability study was performed and parameters like visual appearance, spreadability, pH and phase separation were measured. The nature of the formulation showed that there was no significant variation during the study period.

Table 4: Evaluation of herbal cream

Parameters	Formulation containing	
	Garlic extract	Shallot extract
1. Organoleptic parameters		
a. Colour	Light yellow	White
b. Odour	Characteristic	Characteristic
c. Consistency	Soft semisolid	Soft semisolid
d. Phase separation	No	No
2. pH	6.3	6.2
3. Homogenecity	Uniform	Uniform
4. Spreadability	13.5g/sec	12g/sec
5. Wash ability	Washable	Washable

CONCLUSION

The present study focused on formulation and comparative antimicrobial evaluation of herbal cream containing garlic and shallot extracts. The results showed that antimicrobial activity of herbal ream containing alcoholic extract of garlic shows greater antimicrobial activity than shallot extract. Both the formulations showed better characteristics of a cream and the stability studies indicated that there was no significant change in the properties of creams during the study period.

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