



# FORMULATION AND EVALUATION OF ANTIMICROBIAL CREAM CONTAINING CLOVE AND CINNAMON

1Shaikh Rizwan Taher, 2Dr. Santosh jain, 3Shingane Pooja vyankati, 4Mr. S.B. Deshmukh

1Student , 2Principal , 3Student , 4Guide

1Aditya institute of pharmaceutical ,

2Aditya institute of pharmaceutical

## ABSTRACT

Herbal products containing essential oil as antimicrobial agent are undoubtedly growing trend. Clove oil is reported to have antimicrobial activity against *Staphylococcus aureus*, *Escherichia coli*, *Streptococcus pyogenes*, *Propionibacterium acne*, *Staphylococcus epidermidis* and *Candida albicans*. One of the most establish property of cinnamon extract, EO is antibacterial activity against gram positive and gram negative bacteria responsible for human infectious disease. Cinnamon oil can increase the blood flow to the affected area and fade away the blemishes, helps in lightening the skin. Hence the present study is aims to formulate and develop antimicrobial cream containing clove oil and cinnamon oil. The EO of clove and cinnamon is extracted by maceration method and formulation were develop with the various concentration of both the oils.

**Key Words:** Clove, Cinnamon, Antimicrobial.

## 1. INTRODUCTION

The antimicrobial property of EO have been known for many centuries. In recent years large number of EO and their constituent has been investigated for their antimicrobial property against some bacteria and fungi. It is reported that EO provide a gentle inexpensive way of treating acne, clearing infection, healing acne scaring and skin lightening. India has a rich heritage of traditional remedies. In India spice and cinnamon are used extensively adding aroma and taste to the food. They are used widely in Ayurveda preparation flavour and perfume industry. From natural and synthetic sources various antimicrobial agents are used in cosmetic preparation. Normally synthetic material are used because of low cost and strong antimicrobial activity but synthetic material may give adverse effect to human and environment, also faith of consumer on herbal product is growing fast. Hence there is need to find out effective natural antimicrobial agent. Clove oil and cinnamon oil are mainly investigated for their strong antimicrobial property against the some species of bacteria which causing the minor to serious infection to the skin. Cinnamon oil having additional property to lightening the skin. The preparation of combination of clove oil and cinnamon oil helps to reduce the microbial infection occurs on skin surfaces.

## 1.1. TOPICAL DRUG DELIVERY

Over the last decades the treatment of illness have been accomplished by administrating drugs to human body via various routes namely oral, sublingual, rectal, parental, topical, inhalation etc. Topical delivery can be defined as the application of a drug containing formulation to the skin to directly treat cutaneous disorder or the cutaneous manifestations of a general disease (eg. psoriasis) with the intent of containing the pharmacological or the effect of drug to the surface of the skin or within the skin semisolid formulations in all their diversity dominate the system for topical delivery, but foams, spray, medicated powders, solutions and even medicated adhesive systems are in use.[1]

### Advantages of topical drug delivery system

- Avoidance of first pass metabolism.
- Convenient and easy to apply.
- Avoid of risk.
- Inconveniences of intravenous therapy and of the varied conditions of absorption like pH changes presence of enzymes gastric emptying time etc.
- Achievement of efficacy with lower total daily dosage of drug by continuous drug input.
- Avoid fluctuation of drug levels inter and intra patient variations.
- Skin irritation or dermatitis may occur due to the drug or excipients.
- Most drugs have a high molecular weight and are poorly lipid soluble, so are not absorbed via skin or mucous membranes.
- Very slow absorption.
- It can be used only for those drugs which need very small plasma concentration for action.
- Can be used only for drugs which require very small plasma concentration for action Possibility of allergic reactions.
- Drugs of larger particle size not easy to absorb through the skin.[2]

## 1.2. CREAMS

Creams are the topical preparations which can be applied on the skin. Creams are defined as “viscous liquid or semi-solid emulsions of either the oil-in-water or water-in-oil type” dosage forms which consistency varies by oil and water.[3] Creams are used for cosmetic purposes such as cleansing, beautifying, improving appearances, protective or for therapeutic function. These topical formulations are used for the localized effect for the delivery of the drug into the underlying layer of the skin or the mucous membrane. These products are designed to be used topically for the better site specific delivery of the drug into the skin for skin disorders.[4]

Creams are considered as a pharmaceutical product as they are prepared based on techniques developed in the pharmaceutical industry; unmedicated and medicated creams are highly used for the treatment of various skin conditions or dermatoses. Creams can be ayurvedic, herbal or allopathic which are used by people according to their needs for their skin conditions. They contain one or more drug substances dissolved or dispersed in a suitable base. Creams may be classified as o/w or w/o type of emulsion on the basis of phases. The term ‘cream’ has been traditionally applied to semisolid formulated as either water-in-oil

(e.g.: cold cream) or oil-in-water (e.g.: vanishing cream).[5]

## TYPES OF SKIN CREAMS

They are divided into two types:

- **Oil-in-Water (O/W) creams** which are composed of small droplets of oil dispersed in a continuous phase, and an emulsion in which the oil is dispersed as droplets throughout the aqueous phase is termed an oil-in-water (O/W) emulsion.
- **Water-in-Oil (W/O) creams** which are composed of small droplets of water dispersed in a continuous oily phase. When water is the dispersed phase and an oil the dispersion medium, the emulsion is of the water-in-oil (W/O) type.[6-8]

## CLASSIFICATION OF CREAMS

All the skin creams can be classified on different basis:

1. According to function, e.g. cleansing, foundation, massage, etc.
2. According to characteristics properties, e.g. cold creams, vanishing creams, etc.
3. According to the nature or type of emulsion.

### Types of cream according to function, characteristics, properties and types of emulsion:

1. Make-up cream (o/w emulsion): a) Vanishing creams. b) Foundation creams.
2. Cleansing cream, Cleansing milk, Cleansing lotion (w/o emulsion)
3. Winter cream (w/o emulsion): a) Cold cream or moisturizing creams.
4. All-purpose cream and general creams.
5. Night cream and massage creams.
6. Skin protective cream.
7. Hand and body creams.

#### 1. Make-up cream-

These are mainly o/w type of emulsion. It is cream-based product which leaves a smooth hydrated finish (either stain matte or luminous) on the skin. It nourishes skin and is basically sweat-resistant and creates a dewy sheen.

- **Vanishing creams:** They are called vanishing creams because they seem to disappear when rubbed onto the skin. These formulations are based on stearic acid. After application, the cream leaves a dry but tacky residual film which also has a drying effect on the skin. Because of this reason, these are used particularly in hot climates which cause perspiration on the skin.
- **Foundation creams:** These cream serve as a foundation base for make-up. It acts as an adherent base for application of make-up powders. They provide emollient action and a protective action against environment to the skin which is neither too greasy nor too dry. It is multi-coloured make up applied on the face to create an even, uniform colour similar to the complexion, to cover flaws and to change the skin tones.

#### 2. Cleansing creams

These creams are used for body cleaning purposes and it is used for personal hygiene and beautification which is important for cosmetics. Cleansing creams or lotions can be used for the removal of make-up, surface grim, oil mainly from the face and neck.

#### 3. Winter creams

These are w/o type of formulation and in this formulation oil content will be more than water content. These creams are mainly used for chapped and dry skin. Cold cream: It is known as moisturizer or moisturizing cream. Cold cream must have an emollient action. It should produce a cooling sensation in use and the oil film on the skin should be non-occlusive.

#### 4. All-purpose creams and general creams

These creams are used more nowadays than before. These creams are somewhat oily but non-greasy type and can spread on the skin easily. This can also be used as a night creams, nourishing creams, protective creams for prevention or alleviation of sunburns or for the treatment of roughened skin areas.

### 5. Night cream or massage creams

These creams are mainly used for the nourishing the skin or as a treatment to dry skin. Creams which are generally applied on skin and left for few or several hours over night are mainly known as night creams. Creams which acts as an emollient by rubbing the cream on the skin with massage is known as massage cream.

### 6. Skin protective creams

These creams are smooth, thick bodied creams formulated to provide an invisible, uniform protective film barrier to the skin. It helps to maintain the barrier between the skin and contaminants that may irritate the skin (contact dermatitis and occupational dermatitis).

Strengthens the natural properties of the skin and maintains the balance of normal to combination skin.

### 7. Hand and body creams

Hands are one of the first places to show signs of aging. We tend to wash our hand several times a day, stripping off moisture. Applying cream softens and protects the skin and it keeps the skin looks younger. Since the skin on our palms and fingers needs oil to stay supple and to prevent it from chapping and cracking, it is sensible to use hand creams that puts plenty of oil back in. It is used on the hands more than other parts of the body.[9-12]

#### Preparation of o/w emulsion cream

The oil soluble components and the emulsifier are taken in one beaker and melted in a water bath at 75°C. And in other beaker water, preservatives and water-soluble components are taken and melted at 75°C. After heating, the oil phase was taken in a mortar and pestle and slowly the water phase was added and triturated till clicking sound was heard. Finally, when the temperature cools down, perfuming agents and/or preservatives are added. In this preparation, water content will be more than the oil.

#### ➤ Preparation of w/o emulsion creams

The oil soluble components and the emulsifier are taken in one beaker and melted at 75°C. And in another beaker water and water soluble components are taken and melted at 75°C. After melting, water phase are taken in mortar and pestle and slowly oil phase was added and triturated till clicking sound was heard. And when the temperature of the cream will get cooled, then the perfuming agent are added. In this preparation, water phase will be less and oil phase will be more.[13]

## 1.3. MICROBIAL SKIN INFECTION

Skin disease are caused by bacteria, fungi, viruses, rickettsia and parasite. This work focuses on the common bacterial disease of skin. Skin infection may be either primary or secondary. Primary infection have characteristic morphologies and courses, are initiated by single organism, and usually occur in normal skin. They are most frequently caused by *S.aureus*, *Streptococcus pyogenes* and *caryneform* bacteria. Secondary infection originate in disease skin as a superimposed condition. Most skin disease involves erythema, edema and other signs of inflammation. Focal accumulation of pus or fluid may form, but lesions may also be scaling without obvious inflammation.

Acne is a chronic inflammatory disease of the pilosebaceous unit. It is characterised by formation of comedones, papules, pustules, inflamed nodule, superficial pus, filled cyst and in extreme cases canalizing and deep scarring. Acne develops on those areas where subcutaneous gland are most numerous. The face, scalp, neck, chest, back, upper arms and shoulders. The bacteria *Propionibacterium acnes*, *Staphylococcus epidermis*, *S.aureus*, the fungus *candida albicans* are most commonly present in the pustular contents of the acne. Acne is common skin problem associated with microbial infection. For its treatment antimicrobial agents are required.

## Causes of skin infection

- **Bacterial skin infection:** This occurs when bacteria enter the body through a break in the skin such as cut or scratch. Getting a cut or scratch doesn't necessarily mean you'll develop a skin infection, but it does increase your risk if you have a weakened immune system. A decrease in immune system can be a result of an illness or the side effect of medication.
- **Viral skin infection:** The most common viruses come from one of three groups of viruses; poxvirus, human papilloma virus and herpes virus.
- **Fungal infection:** Body chemistry and lifestyle can increase the risk of fungal infection. For example, you may experience multiple bouts of athlete's foot if you're a runner or if you sweat a lot. Fungi often grow in warm, moist environments. Wearing sweaty or wet clothes is a risk factor for skin infection. A break or cut in the skin may allow bacteria to get into the deeper layers of the skin.
- **Parasitic skin infection:** Tiny insects or organisms burrowing underneath your skin and laying eggs can cause a parasitic skin infection.

### Classification of selected bacterial skin infection

Disease agent	common
Primary	
Impetigo	- S.aureus, streptococcus pyogenes.
Cellulitis and erysipelas	- Group A streptococci.
Staphylococcal scaled skin syndrome	- S.aureus
Folliculitis	- S.aureus
Superficial folliculitis	
Staphylococcal folliculitis	- S.aureus
Gram negative folliculitis	- Klebsiella pneumonia, Enterobacter Proteus vulgaris.
Propionibacterium acne folliculitis	- Propionibacterium acne Deep
Sycosis barbae	- s.aureus
Furuncles or Carbuncles	- S.aureus
Pitted keratolysis	- Gram positive coryneforms
Secondary	
Intertrigo	- Over growth of resident end
transient bacteria Eczematoid dermatitis	- S.aureus
Tinea web infection	- Fungi, coryneform bacteria.

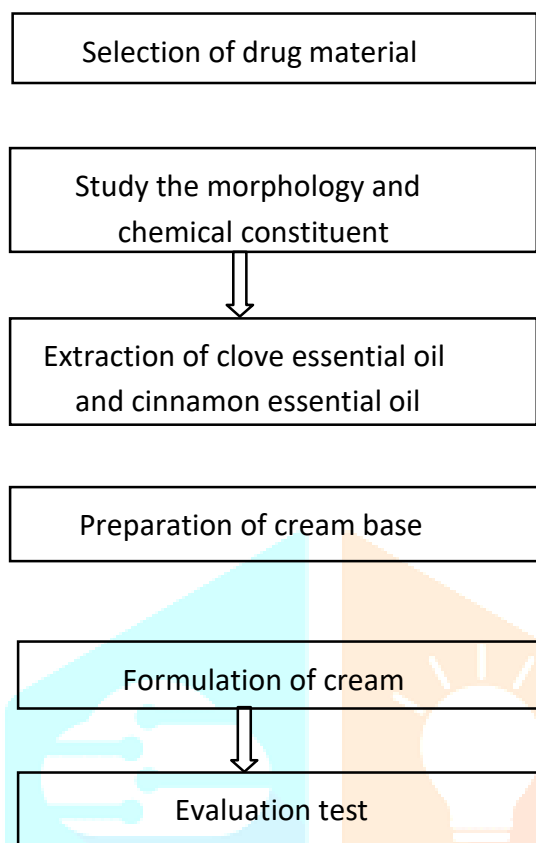
Table 1. Classification of selected bacterial skin infection

## 2. AIM AND OBJECTIVE

- To prepare antimicrobial cream by using clove oil and cinnamon oil.
- To determine the antimicrobial activity of clove, antioxidant and skin lightening property of cinnamon.
- To provide a natural treatment for drug resistant bacteria by avoiding any adverse effect.
- To improve health benefit.



### 3. PLAN OF WORK



### 4. MATERIALS AND METHODS

#### Materials

#### 4.1. Clove



Fig 1. Clove buds

Kingdom: Plantae Phylum:

Angiosperm Order: Myrtales

Family: Myrtaceae Genus:

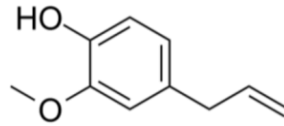
Syzygium Species: *S. aromaticum*

Binomial Name: *Syzygium aromaticum* (L.)

### 4.1.1. Active constituent of clove oil:

Approximately, 72-90% of the essential oil extracted from cloves has Eugenol. Other essential oil ingredients of clove oil are, Acetyl eugenol, Beta-caryophyllene, vanillin, Cratogenic acid, tannins, gallotannic acid, methyl salicylate (painkiller), Flavonoids eugenin, kaempferol, rhamnetin, and eugenitin, Triterpenoids like oleanolic acid.

Structure of eugenol:



### 4.1.2. Pharmacological activity

#### a. Anti-microbial activity

Cloves represent one of the Mother Nature's premier antiseptic. Clove oil was found to be more effective than sodium propionate (standard food preservative) against some food borne microbes. Clove oil was found to be very effective against Staphylococcus species. Amongst the fungi, Aspergillus niger was found to be highly sensitive to the clove oil. Essential oil of clove, dispersed (0.4% v/v) in a concentrated sugar solution, had a germicidal effect against various bacteria (*S. Aureus*, *Klebsiella Pneumoniae*, *Pseudomonas aeruginosa*, *Clostridium perfringens*, *E.coli*) and *Candida albican*. Clove is also included in Dr Huda Clark's protocol for elimination of parasites from the digestive system. It has been found that a 0.05% solution of eugenol is sufficient to kill bacillus tuberculosis. Clove oil showed antimicrobial activity against some human pathogenic bacteria resistant to certain antibiotics. Clove oil and its main component eugenol show considerable antifungal activity against *Candida Aspergillus* and dermatophyte species. It also shows activity against clinically relevant fungi including fluconazole-resistant strains.

#### b. Anti-viral activity

Clove is a potent antiviral agent. Eugenin isolated from clove buds showed antiviral activity against Herpes Simplex virus at a concentration of 10 µg/ml<sup>16</sup>.

#### c. Anti-inflammatory activity

Eugenol, the primary component of clove's volatile oils, functions as an anti-inflammatory agent. In animal studies, the addition of clove extract to diets already high in antiinflammatory components (like cod liver oil, with its high ω-3 fatty acid content) brings a synergistic effect. Clove also contains a variety of flavonoids, including kaempferol, rhamnetin and β- caryophyllene which also contributed to clove's anti-inflammatory and antioxidant properties. The essential oil of *Eugenia caryophyllata* had an anti-inflammatory effect matching to that of etodolac at 0.025 and 0.1 ml/kg and to that of indomethacin at 0.05 and

0.2 ml/kg doses.

#### d. Anti-pyretic effect

Eugenol, the chief constituent of clove oil, showed marked antipyretic activity when given intravenously, intragastrically and centrally to rabbits made febrile by interleukin-1. Eugenol was more effective in reducing fever than acetaminophen. It reduced fever primarily through a central action similar to that of common antipyretic drugs, such as acetaminophen.

### 4.1.3. Identification test

#### Appearance:

Clear, yellow liquid, which becomes brown when exposed to air [IP] **Solubility:**

Miscible with methylene chloride with toluene and with fatty oils. [IP]

**Chemical test:**

- 1] To a thick section through hypanthium of clove add 50% potassium hydroxide solution; it produces needle shaped crystal of potassium eugenate.
- 2] A drop of clove oil is dissolved in 5ml alcohol and a drop of ferric chloride solution is added; due to the phenolic OH group of eugenol, a blue colour is seen.
- 3] To a drop of chloroform extract of clove add a drop of 30% aqueous solution of sodium hydroxide saturated with sodium bromide; needle and pear shaped crystal of sodium eugenate arranged in a rosette are produced immediately.

**Relative density:** 1.030 to 1.063 [IP]

**Refractive index:** 1.528 to 1.537 [IP]

**Optical rotation:** 0° to -2° [IP]

**Fatty oils and resinified essential oil:** It complies with the test. [IP]

**Solubility in alcohol:** 1.0ml is soluble in 2.0ml and more of ethanol (70% V/V). [IP]

**% content:** beta-caryophyllene -5% to 14% [IP]

Eugenol- 75.0% to 88.0% [IP]

Acetyleneugenol – 4.0% to 15.0% [IP]

## 4.2. Cinnamon



Fig 2. Cinnamon bark

Kingdom: Plantae

Phylum: True cinnamon tree Order:

Laurales

Family: Lauraceae

Genus: Cinnamomum Species: C.verum

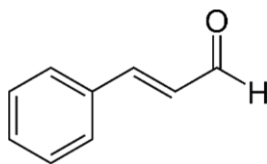
Binomial name: Cinnamomum verum

Cinnamon consist of died bark, freed from the outer cork and from the underlying parenchyma, from the shoots growing on the cut stumps of Cinnamomum Zeylanicum Nees. Belonging to family Lauraceae.

### 4.2.1. Chemical constituent

The main aromatic compound in cinnamon EO is cinnamaldehyde, with a content of 80-94.8%. others are Cinnamic acid, Cinnamal acetate [24], Terpeniol, Eugenol [25], Caumarin, Thujen [26] Structure of cinnamaldehyde:





#### 4.2.2. Antibacterial properties

- a. Combat hard-to-treat bacterial organism:** A study which used bacterial culture and lab test, found that compounds in cinnamon oil had an antimicrobial effect against a potentially lifethreatening, drug resistant bacteria that effect plants, people and other animals.
- b. Support oral health:** Cinnamons antibacterial and antifungal properties have been found to be effective against Streptococcus mutants and on Candida ssp Biofilm, two agents which cause oral infection and cavities in teeth.
- c. Disinfectant:** Cinnamon bark oil's antibacterial properties make it a safe, effective and nonchemical additive alternative that can be used to reserve products and increase their shelf life. One study found that cinnamon oil could be effectively used as a preservatives in cosmetics, and hospital setting disinfectant.

#### 4.2.3. Identification test

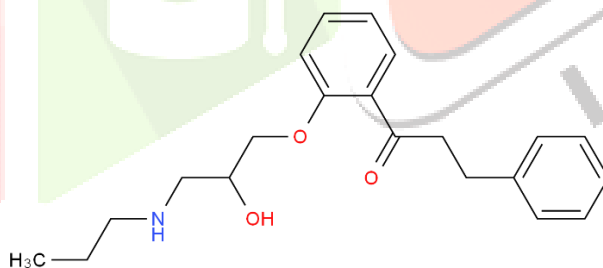
**Content:** minimum 12mg/kg of essential oil [IP]

**Characters:** characteristic aromatic odour [IP] **Chemical**

#### test

- 1] A drop of volatile oil is dissolve in 5ml of alcohol and to it a drop of ferric chloride is added. A pale green colour is produced. Cinnamic aldehyde gives brown colour with ferric chloride, whereas eugenol gives blue colour.
- 2] The alcoholic extract is treated with phenylhydrazine hydrochloride, it produces red colour due to the formation of phenylehydrazone of cinnamic aldehyde

#### 4.3. Paraffin wax [IP]



Hard paraffin is a purified mixture of solid hydrocarbons obtained from petroleum or from shale oil.

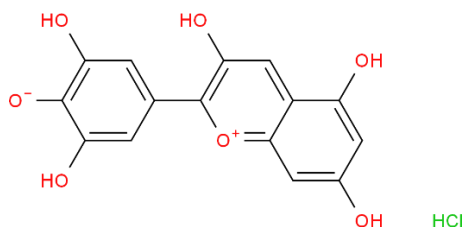
**Category:** Pharmaceutical aid (stiffening agent)

**Description:** a white or colourless, translucent mass, frequently showing a crystalline structure; odourless even when freshly cut; slightly greasy to the touch burns with a luminous flame. When melted, the liquid is free from fluorescence by daylight.

**Congeaing range:** 50° to 60°

**Sulphated ash:** not more than 0.1 %

#### 4.4. Paraffin oil [IP]



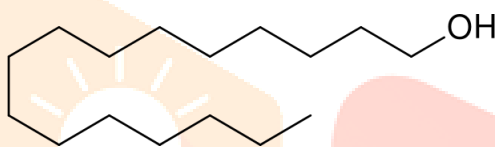
White mineral oil; liquid petrolatum

Liquid paraffin is a purified mixture of liquid hydrocarbons obtained from petroleum to which not more than 10ppm tocopherol or of butylated hydroxytoluene may be added.

**Category:** laxative; faecal softener.

**Description:** a transparent, colourless, oily liquid, free from fluorescence by daylight; odourless or almost odourless

#### 4.5. Cetyl alcohol [IP]



Palmityl alcohol; n-Hexadecyl Alcohol; 1-Hexadecanol

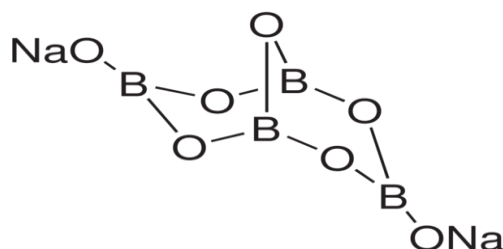
Cetyl alcohol is a mixture of solid alcohol consisting mainly of 1-hexadecanol, C<sub>16</sub>H<sub>34</sub>O. Cetyl alcohol contains not less than 95.0% of C<sub>16</sub>H<sub>34</sub>O.

**Category:** Pharmaceutical aid (stiffening, emulsifying and tablet coating agent).

**Description:** A white, unctuous mass, powder flask or granules; odour slight.

**Identification:** IN the assay the principal peak in the chromatogram obtained with the test solution corresponds to the principal peak in the chromatogram obtained with reference solution.

#### 4.6. Borax [IP]

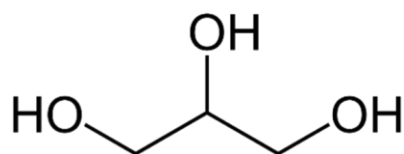


Borax or sodium borate.

Molecular wt. 381.4; chemical formula: Na<sub>2</sub>B<sub>4</sub>O<sub>7</sub>·10H<sub>2</sub>O

**Definition:** borax contain not less than 99.0% and not more than the equivalent of 103.0% of disodium tetraborate decahydrate.

**Characters:** A white, crystalline powder, colourless crystal or crystalline masses, efflorescent, soluble in water, very soluble in boiling water, freely soluble in glycerol. **5.7. Glycerine [IP]**



Glycerine is propane-1,2,3-triol

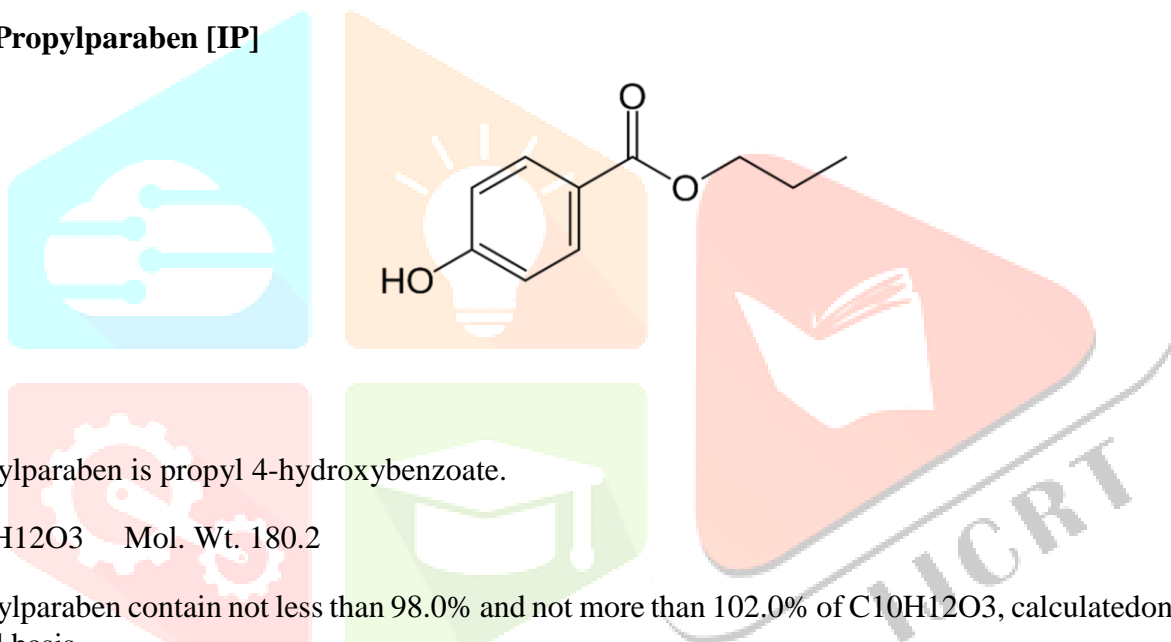
$C_3H_8O_3$  Mol. wt. 92.1

Glycerine contain not less than 98.0% and not more than 101.0% of  $C_3H_8O_3$ , calculated on the anhydrous basis.

**Category:** lubricant, laxative, pharmaceutical aid (humectant)

**Description:** A clear, colourless or almost colourless, syrupy liquid; odourless; very hygroscopic.

#### 4.8. Propylparaben [IP]



Propylparaben is propyl 4-hydroxybenzoate.

$C_{10}H_{12}O_3$  Mol. Wt. 180.2

Propylparaben contain not less than 98.0% and not more than 102.0% of  $C_{10}H_{12}O_3$ , calculated on the dried basis.

**Category:** Pharmaceutical aid (antimicrobial preservative)

**Description:** a white crystalline powder; odourless.

## 5. METHODOLOGY

### 5.1. Collection of crude drug and essential oil

- The clove buds was obtained from Kothari Ayurvedics, kapad bajar, Ahemadnagar. And its extract used for the formulation.
- The cinnamon bark was obtained from Kothari Ayurvedics, kapad bajar, Ahemadnagar. And its extract used for formulation.
- The all necessary ingredient or chemicals was obtained from Pharmaceutics lab of Dharmaraj Shaikshanik Pratishans College of Pharmacy, walki.

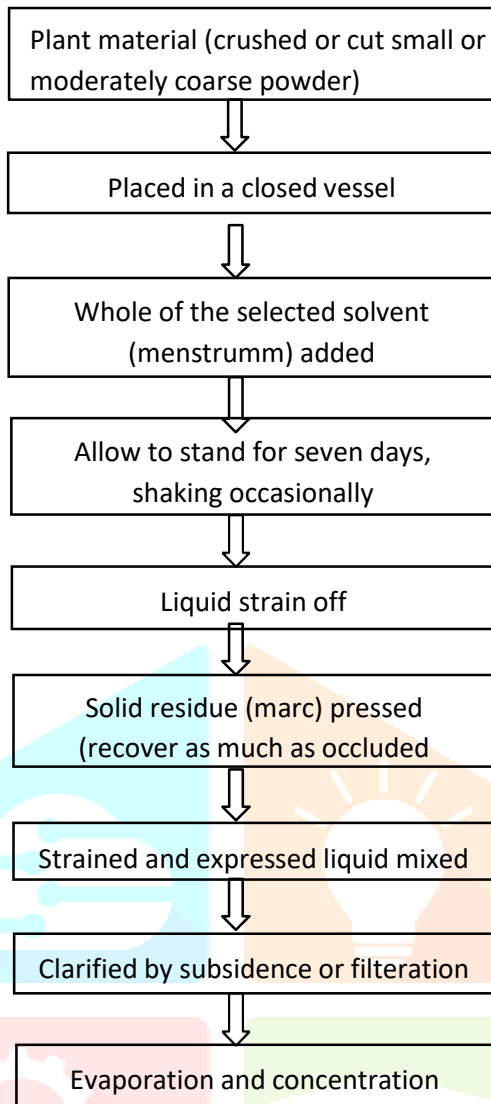
Sr. no.	Name of chemical	Name of manufacturer
1	Paraffin wax	Research-lab fine chem industries
2	Paraffin oil	Research-lab fine chem industries
3	Cetyl alcohol	Research-lab fine chem industries
4	Borax	Research-lab fine chem industries
5	Glycerine	Research-lab fine chem industries
6	Propyl paraben	Research-lab fine chem industries

Table 2. List of chemicals and its manufacturer.

## 5.2. Extraction of essential oil

Maceration process was used for extraction of clove essential oil and cinnamon essential oil. In this process solid ingredient are placed in a stoppered container with the whole of the solvent and allow to stand for period of at least 3 days (3-7 days) with frequent agitation, until soluble matter is dissolved. The mixture is then strained (through sieves/nets), the marc pressed and the combined liquids clarified (cleaned by filtration) or by decantation, after standing.

## Process of extraction



### Merits:

- Small sample size.
- Strong swelling properties or high mucilage.
- Energy saving process

### Demerits

- Not exhaustively extract the drug.
- It is very slow process.
- Solvent required is more.

### 5.3. Formulation of cream

Sr no.	Ingredient	Trial 1 (% W/W)	Trial 2 (%w/w)	Trial 3 (% w/w)
	<b>Phase A</b>			
1	Paraffin wax	5	6	7
2	Paraffin oil	0.8	0.8	0.8
3	Cetyl alcohol	1.5	1.5	1
	<b>Phase B</b>			
1	Borax	7	7.5	8
2	Glycerine	4	4	4
3	Propyl praben	2	2	1.5
4	Water	q.s upto 50gm	q.s upto 50gm	q.s upto 50gm

Table 3. Formulation of cream base

All the ingredients of phase A and phase B were taken in separate beakers. Phase A beaker were kept on water bath till the temperature reached 75°C. At 75°C, phase A was added to phase B and stirred keeping the beaker on the water bath itself. Contents in the beaker were then subjected to stirring with the help of mechanical stirrer. The speed of emulsification was slow in the initial stage and then increased gradually as emulsification of the cream progressed.

Then the cream was allowed to cool down to the room temperature and transferred to suitable container. Since, formulation Trial III (C-1) gave a satisfactory product as a cream base; it was selected as a suitable cream base for incorporation of clove oil and cinnamon oil.

Sr no.	Ingredient	F1	F2	F3
1	Cream base (c-1)	45gm	46gm	47gm
2	Clove oil	1.5ml	2ml	2.5ml
3	Cinnamon oil	1.5ml	2ml	2.5ml

Table 4. Formulation of cream containing clove EO and cinnamon EO



Fig 3. Formulation of cream of trial 1 (F1)



Fig 4. Formulation of cream of trial 2 (F2)



Fig 5. Formulation of cream of trial 3 (F3)

#### 5.4. Evaluation parameter of cream

1. **Determination of pH:** The pH of the cream can be measured on a standard digital pH meter at room temperature by taking adequate amount of the formulation diluted with a suitable solvent in a suitable beaker.

Formulations	pH
F1	6.42
F2	6.39
F3	6.22

Table 5. pH of cream

2. **Physical appearance:** The physical appearance of the cream can be observed by its colour, roughness and graded.

F1: yellowish white with small flocks and slightly hard. F2: yellowish white with consistency and slightly hard. F3: clear white with consistency and soften in nature.

3. **Spreadability:** Adequate amount of sample is taken between two glass slides and a weight of 100gm is applied on the slides for 5 minutes. Spreadability can be expressed as,  $S=m*l/t$

Where, m = weight applied to upper slide. l = length moved on the glass slide. t = time taken.



4. **Viscosity:** Viscosity of formulated creams can be determined by using Brookfield Viscometer
5. **Homogeneity:** The formulation was tested for the homogeneity by visual appearance and by touch.
6. **Removal:** The ease of removal of the creams applied was examined by washing the applied part with tap water.
7. **After feel:** Emolliency, slipperiness and amount of residue left after the application of fixed amount of cream was checked.
8. **Type of smear:** After application of cream, the type of film or smear formed on the skin were checked.
9. **Irritancy study:** Mark an area of 1sq.cm on the left hand dorsal surface. The cream was applied to the specified area and time was noted. Irritancy, erythema, edema was checked, if any, for regular intervals upto 24hrs and reported.

## 6. RESULT AND DISCUSSION

The stability of Antimicrobial creams was studied by observing changes in parameters like colour, odour, pH, viscosity and particle size under extreme conditions and all Antimicrobial creams were found to be substantially stable. The prepared creams (F2 and F3) were found to be homogeneous and in good appearance and consistency. The pH values of all the formulations were in the close range of (6-7). The formulation were slightly irritating to skin due to the spicy nature of clove and cinnamon. The spreadability of formulation (F2 and F3) indicates that the cream formulation is easy to apply. The formulation (F2 and F3) were found to more consistent.

Sr no.	Code	Physical appearance	pH	Consistency	Spreadability	Stability (for 45 days)
1	F1	Yellowish white, hard and not homogeneous	6.42	Not satisfactory	Not satisfactory	Stable
2	F2	Yellowish white, smooth and homogeneous	6.39	Satisfactory	Satisfactory	Stable
3	F3	Clear white, smooth and homogeneous	6.22	Satisfactory	Satisfactory	Stable

Table 6. Evaluation result for antimicrobial cream containing clove EO and cinnamon EO

## 7. CONCLUSION

In India there are many medicinal plant which are used from ancient times for skin care. Acne and skin infection is a common skin problem associated with the microbial infections and many other causes also. Microbial skin infection is not health threatening disorder but it definitely cast negative impact on one's personal self-image. The demand for more and more cosmetics from plant sources is continuously increasing. The prolonged chemical based treatments and the high rate of recurrence suggest the opportunity for alternative options. Despite of having reported antibacterial and antifungal properties, Clove oil and Cinnamon oil is not popular as Antimicrobial agent for incorporation in cosmetic formulations may be because of inadequate documentation and non-availability of any scientific evidence regarding their activity in cosmetic formulations. So this study was undertaken with the aim to formulate, develop and evaluate Antimicrobial cream by using three different concentrations of clove oil and Cinnamon oil. From the results of the present study it can be concluded that Antimicrobial cream containing 2.5ml Clove oil and 2.5ml Cinnamon oil (F3) was acceptable in view of improvement in infectious skin condition and contains all good characters of skin cream.

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