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A REVIEW ARTICLE ON EUCALYPTUS AND CLOVE HAND SANITIZER

Anchal Kohli[1]*, Drishti Chamoli[2], Bhupendra Kumar[3] and Dr. Amandeep Singh[4]

[1*]Research Scholar, [2,3]Assistant Professor, [4]Principal,

[1,2,3,4]Dev Bhoomi Institute of Pharmacy and Research Dehradun, Uttrakhand, India.

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***Corresponding Author**
Anchal Kohli
Research Scholar, Dev Bhoomi Institute of Pharmacy and Research Dehradun, Uttrakhand, India.

ABSTRACT

The aim of this study is to review hand sanitizer of eucalyptus globules leaves oil and clove oil. Eucalyptus contain various phytoconstituents like antiseptic, antibacterial, antifungal, antimicrobial activates etc. Sanitizer play a vital role to protect and maintain hand hygiene. As its corona time we need to protect our hands to stop the spread of covid-19 virus. As covid-19 is a severe acute respiratory syndrome coronavirus 2 (SARS-Cov-2). The formulation of alcohol-based sanitizers contain about 70%-95% alcohol in it as alcohol does denaturation of microbial protein to deactivate the viruses. Clove oil (syzygium aromatic) have the same active consitituents such as antioxidant, antifungle, anti-viral, anti-microbial, anaesthetic, pain reliving and act as a insect repellent. Sanitizers work instantly to kill all microbes present in our hands. Hand sanitizer act in preventing nosocomial infections caused by different microbes.

KEYWORDS: eucalyptus oil, clove, sanitizer, antibacterial, antimicrobial.

Fig 1: hand sanitizers.

1. INTRODUCTION

Antiseptic hand rubbing(or sanitizer) –(defined by who) appling an antiseptic handrub to reduce or inhibit the growth of microbes without the need of an exogenous source of water and and requiring no rinsing or drying with towels or other things.[14]

The work of sanitizer is to remove out the outer oil layer of our hand which contain all the microbes. Sanitizer is a replacement of soaps and hand washes, though it don't kill 100% of germs but in every situation we can't wash our hands with soap.

Alcohol based hand sanitizers are best as they disinfect out hand and are also best for gastrointestinal, respiratory infections caused by gram negative bacteria and virus, and they will decrease the transmission of microbes to patients, and will ultimately reduce morbidity, mortality rate, and the costs associated with healthcare-associated infections (HCAI). According to HCAI data more then 1.4 million patients in developing and developed countries worldwide are affected any time. The evidence claims that hand antiseptics reduces the transmission of healthcare associated pathogens.[16] Whereas Non alcoholic based hand sanitizers (benzalkonium chloride) have weak activities against microbes and gram negative bacteria as compared to alcohol.

2. EUCALYPTUS GLOBULUS

Fig 2: Eucalyptus Leaves.

Eucalyptus globulus is a large evergreen tall tree, and was discovered on Tasmania island in 1972. it belongs to Myrtaceae family, And is native to Australia and Tasmania. it has spreaded extensively in various countries. Commonly known as blue gum, was introduced to india as fuel tree in 1843. This plant grows very well in Nilgiris about (5,000-8,300ft.) and in Annamalai, palnihills in south to shimla hill about (4000-7000ft.) in himachal Pradesh and shilong, and other places which are suitable for cultivation are kullu, raniket, chamba, kangraetc. They have long height of 300ft. leaves are sessile, covered, cordateovate with bluish white bloom, and adult leaves lancolate, alternate, 5-12in ling and 1-2 inch broad.[17]

In eucalyptus among 900 species there are only 25-35% species which contain volatile oil and aroma in their leaves. In Indian eucalyptus globulus commonly known as nilgiri. eucalyptus globulus oil is obtained by hydro distillation method, and the essential oil obtained from eucalyptus globulus is colourless in nature, Different parts of eucalyptus plant have high therapeutic value and important nutritional value. It grows in loamy soil, with clay base. The soil it require slightly acidic in nature with ph of range 5.5-6.5 in india.

Mojor species

There are over 900 species of eucalyptus globulus. The major are inlisted below.

Table 1: Major Species.

MAJOR SPECIES OF EUCALYPTUS	
Eucalyptus amygdalina	Eucalyptus globulus
Eucalyptus australiana	Eucalyptus grandis
Eucalyptus botryoides	Eucalyptus incrassate
Eucalyptus calophylla	Eucalyptus gunnii
Eucalyptus cypellocarpa	Eucalyptus kino
Eucalyptus dives	Eucalyptus largeflorens
Eucalyptus gigantean	Eucalyptus macrocarpass

Eucalyptus marginata	Eucalyptus populnea
Eucalyptus meanophoia	Eucalyptus radiate
Eucalyptus melliodona	Eucalyptus regnans
Eucalyptus microtheca	Eucalyptus rossi
Eucalyptus nitens	Eucalyptus rostrata
Eucalyptus ovate	Eucalyptus smithii
Eucalyptus pauciflora	Eucalyptus umbra
Eucalyptus pilularis	Eucalyptus wandoo

2.1 Scientific classification[3]

Table 2: Classification

Kingdom :	Plantae
Subkingdom	Tracheobionta
Superdivision	Spermatophyta
Division	Flowering plants
Class	Dicotyledons
Subclass	Rosidae
Order	Myrtales
Family	Myrtaceae
Genus Species	Eucalyptus Eucalyptus globulus labill.[3]

Fig 3: eucalyptus oil.

2.2 Chemistry

Chemically essential oil contain ethers, esters, ketones, aldehydes, alcohols,caroboxylic acids, sesquiterpenes, along with hydrocarbons. Leaf oil contain some phytochemical compounds 1,8-cineole,d-limonene, alpha-pinene, spathulenol,cryptone and p-cymene. Major activities of eucalyptus oil are found to be anti-microbial, antiviral, anti-inflammatory, anti-fungal, analgesic, and anti-oxidant in nature.[2] Eucalyptus globulus essential oil is composed of mixture of volatile organic compounds involves hydrocarbons, aldehydes, alcohols, ketones, acids, esters etc.(2-4.1) it have fresh mint like taste and have a little spicy, fresh soothing effect in it. eucalyptus globulus have naturally occurring cellulose and protein. The taste of oil is distinctive, colouress and is volatile in nature. eucalyptus is highly flammable.

2.3:- Chemical Constituents

the essential oil mainly consist of oxygenated monoterpenes and oxygenated sesquiterpenes. like 1,8-eucalyptus (72.71%), alfa-terpined (2.54%), terpiene-4-ol (0.34%), and linalool(0.25%), geranyl acetate(0.72%) L-pinocarveol(0.35%) epilobulol(0.45%), terpinolene (0.19%) and a portion (0.26%) total constituents remains unidentified.(4-3.1)

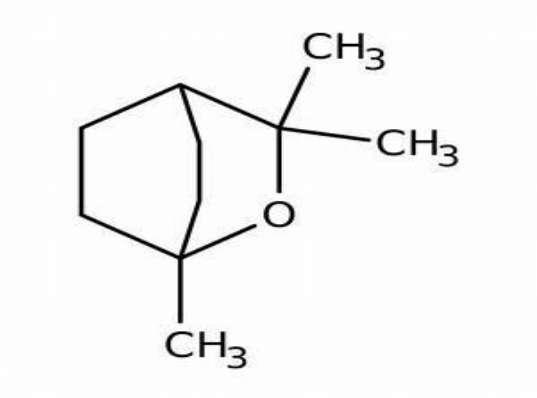


Fig 4: Structure of 1,8-Cineole.

2.4: Description

The texture of leaves is leathery, hang vertically or diagonally, and the average length is about 5.8-7.9 in (15-20cm). the leaves of young shoots are ovate in shape and horizontal, opposite and has glands which consist of fragrant volatile oil. The bud of flowers are closed with cuplike covering. The petals of flower are cohere to form a cap when flower expands. The eucalyptus fruits are surrounded by a woody, cup shaped receptacle. the largest fruits ranges from 5-6 cm (2-2.5in) in diameter.[29]

Molecular formula: C10H18O

Molecular weight: 154.

Refractive index at 20° C: 1.4550-1.4600,

Specific gravity at 25℃: 0.920-0.926.

Freezing point: 0℃- +1℃.

Optial rotation at 20℃: -0.5°- + o.5°.[2]

Fig 5: eucalyptus leaves and tree.

2.4- BIOLOGICAL ACTIVITY OF EUCALYOTUS GLOBULUS

ANTIMICROBIAL

The bark of *Eucalyptus* consist of antimicrobial property.[18] essential oil aromatic and higher plants have shown growth inhibition potential against microbes.

The major constituents of essential oil posses toxicity against wide range of microorganisms including fungi and bacteria, against both soil-borne and post harvest pathogens.[19] Crude eucalyptus oil seems to be more effective against microbes grown in bio films and suspensions with pure 1,8-cineole. The 1,8-cineole is active against two gram +ive bacteria and was inactive against gram –ive bacteria pseudomonas aeruginosa and E-coli.[2]

ANTI-FUNGAL ACTIVITY

Eucalyptus globulus essential oil was found effective against 12 yeast like fungi and filamentous fungi. The MICs value is between 0.025-1% (v/v). the 30 plants oil for anticandida activity were tested against 2 different strains of candida albicans.

ANTI-INFLAMMARORY

A new compound 5,7-dihydrooxychromone was isolated from the leaf extract of eucalyptus viminalis. the leaf extract posses strong anti-inflammatory activity by inhibiting (nitric oxide) NO and production of LPS(lipopolysaccharide) and INF-□ (interferon gamma).[20]

ANTI-OXIDANT ACTIVITIES

The ant oxidative properties of eucalyptus essential oils are well known and proves the ability of essential oils to reduce (ROS) reactive oxygen species production even conformers the anti oxidant effect of eucalyptus essential oil (1microgram/ml) with (COPD) chronic obstructive pulmonary diseasebut the exact mechanism of how essential oils function on inflammatory cells are still unknown.[2]

2.5:- VERNACULAR NAMES

English gum eucalyptus, fever tree.
hindi safeda, yukeliptas
gujrati harit pran
kannada nilgiri, karpoora thaila vriksha,
Malayalam yukkalimaram,
Sanskrit haritaparna, nilaniryasa,
Tamil kapura maram, karpuramaram.

3: SYZYGIUM AROMATICUM (CLOVE)

Syzygium aromaticum, clove is one of the most valuable species used for centuries either for medical purpose or for food preservation. nowadays is cultivated in several parts of world including brazil in state of Bahia clove is native to Indonesia, clove is one of the richest source of phenolic compounds such as eugenol acetate, eugenol, and gallic acid and have great potential for pharmaceutical, food and agricultural, cosmetics, and agricultural applications. The size of an mediumtree is about (8-12m). from family *Mirtaceae*, native to Maluku islands in east Indonesia.

Clove tree is a evergreen plant, flower buds are pale, then turns green, and then transit to bright red and ready to harvest.

Fig 6: Clove tree flowerbuds.

The clove tree is frequently cultivated in various coastal areas at maximum altitude of about 200m above sea level. The production of the flowering buds, which are the commercialized part of this tree, started after four years of plantation. The collection of flower bud started before the maturation phase. The collection is done chemically or manually, by using natural phytohormones which liberates ethylene in vegetal tissue, producing precocious maturation of the plant.

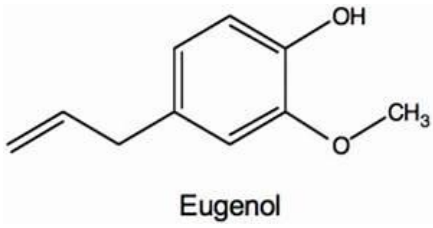
Recently the larger producing countries are India, Indonesia, Sri Lanka, Malaysia, Madagascar, Tanzania and specially the Zanzibar island.

Fig 7: (*Clove*) Syzygium Aromaticum.

3.1- CHEMICAL COMPOUNDS ISOLATED FROM SYZYGIUM AROMATICUM

Clove is one of the major vegetal source of phenolic compounds such as hydrobenzoic acid, hydroxicinamic acids, flavanoids and hydroxiphenyl propens. Eugenol is the main bioactive compound of the syzygium aromaticum. Whose concentrational range is about 9381.70-14650.00 mgper 100g of fresh plant material. Gallic acid derivatives are hydrolizable tannins which are present in higher concentrations. Other phenolic acids found in syzygium

aromaticum are ferulic, caffeic, elagic and salicylic acids. α-humulen is the compound found in essential oil of clove wiyh concentration about 2.1%, 89% of eugenol, 4-15% eugenol acetate and β-cariofilenol.[19]



CLOVE

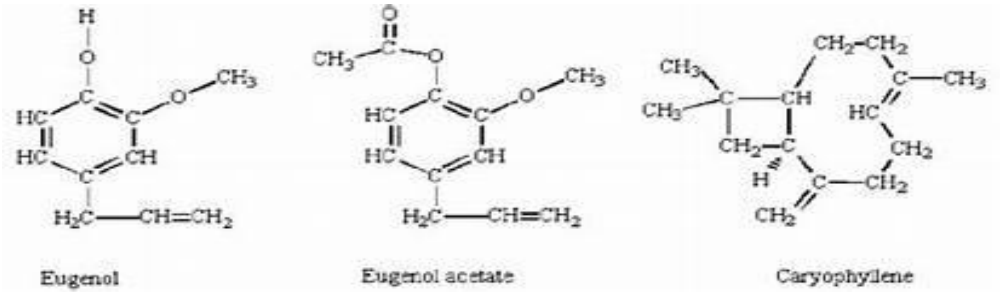


Fig 8.

4: BIOLOGICAL ACTIVITES

Due to wide range of pharmacological effects consolidation from traditional use for centuries, clove is important medicinal plant. Some important biological activates of clove and eugenol are as following.

4.1- ANTIOXIDANT ACTIVITY

The united states department of agriculture in collaboration with the Universities and private companies a database is created with polyphenol contents and antioxidant activity with different kind of foods. According to database, 100 richest dietary sources of polyphenols are classified. Result indicated among fruits, vegetables and seeds. Among other species, clove showed the higher content of antioxidant compounds and polyphenols.[20]

The major types of compounds found in phenolic are flavonol glucosides, phenolic acids(gallic acids), phenolic volatile acids (acetyl eugenol, eugenol),and tannins.[21]

The antioxidative activity of clove were screened using various in vitro models, such as ferric thiocyanote, b-carotene-linoleate, 1,1-diphenly-2-picrylhydroxyl (DPPH)radical, hydroxyl radical and reducing power model. Extracts of clove buds are also used as food antioxidant.[22]

4.2- ANTIMICROBIAL ACITIVITY

Cloves antimicrobial activities have been proven against several bacterias and fungal rains. Pathogens tested are E. coli, Staphylococcus aureus and bacillus cereus are of 3%, the concentration of 1% clove extract shows good inhibitory actions., 50% of clove and clove oil are some food spoikage bacteria, the test against 10 microbes (7 gram positive and and 3 gram negative). Clove oil was found to be better antagonistic agent as counterpart by inhibiting both bacteria and fungai.

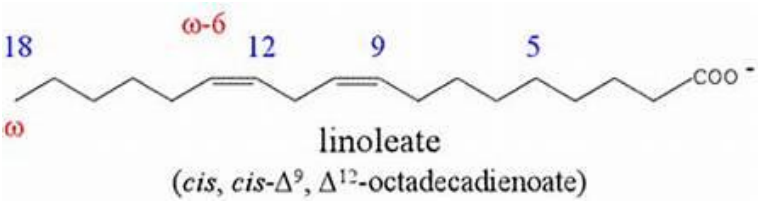


Fig 9.

4.3- ANTIBACTERIAL ACTIVITY

It was found to a process inhibitory effect on multi-resistant staphyloccous.[24]

Clove kills many types / forms of bacterial infections from contaminated foods, and is effective aid for food poisoning.[25]

Eugenol essential oil showed as potent anthelmintic activity. The essential oil interacts with ten antibiotics of hydrophobic and hydrophilic characteristics was studied against gram-negative bacteria.

4.4- BIOLOGICAL SOURCES

Table 3: Classification.

Kingdom	Plantae
Phylum	Angiosperms
(unranked)	Eudicots
(unranked)	Rosids
Order	Myrtales
Family	Myrtaceae
Genus	**Syzgium**
Species	**S. aromaticum**

Fig 10: clove with clove oil.

5- HAND SANITIZER

"*clean care is safer care" (*tag line given by who) Hand hygiene is the most important step as the contamination starts very easily through it, hands come in direct contact with the airborne microorganism from cough and sneezes. And after watching the current scenario its very crucial step to sanitize your hands time to time to prevent the growth of microbes or virus. In this pandemic we don't have any proper medicine to fight against Corona virus, the only options left to prevent our self is to maintain social distancing, wear masks and to keep our hands clean with soap and water or with hand sanitizer.[9]

The emergence of COVID-19 (corona virus disease-2019) pandemic has risen up significantly as global public health concerns and led to extensive use of hand disinfectants (sanitzers). Over 200.

Through recent research we get to know that using hand sanitizer is more effective then using soap and water because the water we use is tap water and its not germ free. As in sanitizers alcohol is used as base which disinfects our hands property almost 99%.

And in case of covid-19 the alcohol required is only 62-95%. To denature the protein binding and inactivate their abilities.

ALOCHOL –BASED	**NON-ALOCHOL**
. 60-95% v/v alcohol	.Antiseptic
- Ethanol	- chloroxylenol
- Isopropanol	- chlorhexidine
- n-propanol	- iodine/iodophors hydeogen peroxide[9]

5.1: formulation

As a review first of all the fresh and dried leaves of Eucalyptus (*eucalyptus globulus)* should be collected, from local area and then steam distillation is done, to obtain essential oil. and same way with the coriander (*coriandrum sativum) s*eeds the essential obtain have property.

As in the formulation of eucalyptus hand sanitizer, it has antimicrobial, antibacterial, antiviral properties. They act on pathogens and kill them.

BACTERIAL STRAINS[10]

1. Escherichia coli (gram –ve) (MTCC-1698)
2. Pseudomonas aeruginosa (gram –ve)
3. Staphylococcus aureus(gram +ve)
4. Bacillus subtilis(gram+ve).[10]

FORMULATION OF GEL BASE[11]

- Carbomer.
- Triethanolamine.
- Propylene glycol
- Aqua destillata
- Isoproply alcohol

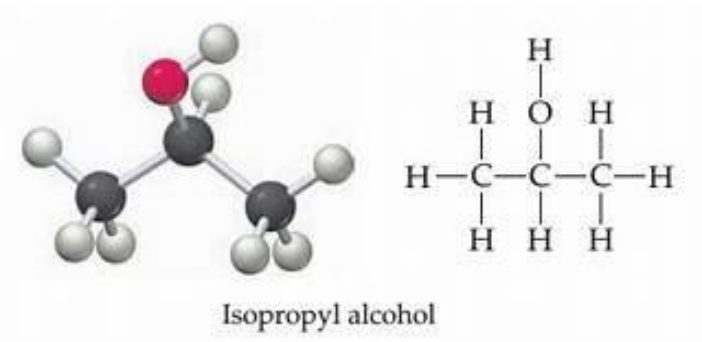


Fig 11.

FORMULATION OF HAND SANITIZER GEL

- Eucalyptus globulus leaves essential oil.
- Coriandrum sativum seed oil.
- Carbomer.
- Propylene glycol.

- Isopropyl myristate.
- Glycerine.
- Aqua destillata.

5.2: evaluation

the evaluation of gels is done by organoleptic properties, viscosity, and Rheology include consistency, ph, antibacterial, antiviral and homogeneity.

The effectiveness of hand sanitizer also depends on which manner the product id used example quantity used, duration of exposure, frequency of use.[12]

To check the effectiveness and hedonic characteristics of gels following stusy should be done. for effectiveness apply gel on palm.

5.3- PHYSIOCHEMICAL PARAMETERS OF PRODUCT[13]

- **Determination of colour, odour, clarity:-** color and clarity will be checked with a white background by naked eyes and odor will be smelled.
- **Ph:-** the ph of the prepared formulation will be determined by using a digital ph meter, the formulation will be dissolved in 100ml of distilled water and be stored for 2 hours, and the measurement of ph formulation will be calibrated by ph meter.
- **Formula:-** Percentage alcohol insoluble matter= wt. of residue □ 100/wt. of sample.
- **Antimicrobial testing of preparation:-** The prepared hand sanitizer were subjected to anti-microbial screening by agar well diffusion method. Organisms used will be E.coli (MTCC-1698), S. aureus(MTCC-1143), and bacillus subtile. 1ml of sanitizer will be mixed with 5ml DMSO, used for evaluation of antimicrobial activities.[13]

IN-VITRO ANTI-MICROBIAL ACTIVITY BY AGAR DUFFUSION PLATE

The antimicrobial activity of trial drug was carried in a agar diffusion plate method. Different concentration of agar is incorporated in petridish. Replicator device were used to inoculate multiple specimens on series of plates of various concentration of antibiotics. For organism E.coli, p. aeruginosa, S. aureus.

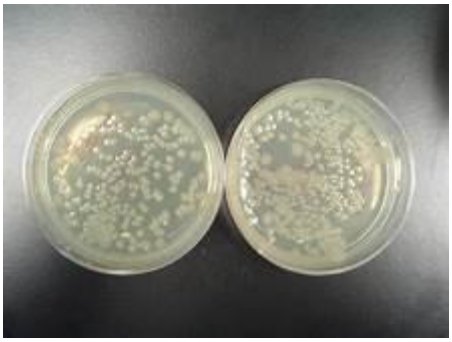


Fig 12: Agar Plate.

Hand sanitization is very essential + maintaining social distancing is even more crucial as today on 25 may 2020 the no. of conformed cases in India are 1,39,049, and at least 3,303 people have died. As per WHO more then 130 countries including india. over 4.8million people have been with the virus worldwide.[15]

CONCLUSION

The hand sanitizer is to prevent us from unwanted hand contamination or from foreign pathogen like e-coli, straptococus aureus, As eucalyptus oil have the anti microbial, antifungal, antiviral, antiseptic, anti inflammatory propertie and the same clove have anti-oxidative, analgesic, antibacterial, antifungal properties.[21] *isopropyl alcohol* will be used as base and eucalyptus oil, clove oil, *carbomer*, (it thickers the prepration, and make it easily spreadable in hands without quickly evaporating, *glycerine* formulation consist of about 1.45% (glycerol) to protect skin against dryness and dermatitis. As the spread of covid 19 is increasing tremendously worldwide till the date the medicine of corona is discovered be safe and using sanitizer should be added in our daily habit to keep ourself safe against pathogens.

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