



To Study *Cymbopogon Citratus* and *Aegle Marmelos* for Anti-Bacterial Activity against *Staphylococcus Aureus*, *Escherichia Coli*.

¹Snehal Dilip Bhalsing, ²Dnyandev Gorakh Jadhav

¹Walki Tal/District: Ahmednagar,414006, India Email: snehalbhalsing222002@gmail.com

²Ahmednagar,414006, Email: dnyandevjadhav536@gmail.com

ABSTRACT -

Lemongrass (*Cymbopogon citratus*), is a member of poaceae family. It's a medicinal plant with composites able of controlling pathogens and adding herbal resistance to pathogenic conditions. Lemongrass extract contains citral and geraniol that act as the antibacterial property. The composites linked in *Cymbopogon citratus* are mainly terpenes, alcohols, ketones, and esters. Some of the reported phytoconstituents are essential oils that contain are substantially terpenes, alcohols, ketones, and esters. Citral, Nerol Geraniol, citronellal. Some herbal plant extract and their oils were set up to have antibacterial activity The aim and idea of the present Study are to formulate and estimate anti-bacterial herbal cleanser (soap) using *Cymbopogon Citratus* and *Aegle marmelos*. To find the effectiveness of essential oil painting of lemongrass for the treatment of pathogenic organisms. Lemongrass oil painting was delved for exertion against *Staphylococcus aureus*(*S. aureus*) *Escherichia coli*(*E. coli*),

Keywords – Antimicrobial, Anti-inflammatory, soap *Cymbopogon citratus*, *Aegle marmelos*, *Staphylococcus aureus*, *Escherichia coli*.

INTRODUCTION-

Anti-bacterial activity –

Antibacterial of a patch is fully associated with the composites that provincially kill bacteria or decelerate down their rate of growth, without being considerably poisonous to near apkins. Antibacterial agents are the most important in fighting contagious conditions The antimicrobial agents could be classified as the agents that can either be bactericidal, which kill bacteria, or bacteriostatic, which decelerate down the growth of bacteria. Antimicrobials are essential drugs used to help and treat infections in humans, creatures and shops.

Lemongrass – *Cymbopogon citratus*



Fig 1 LEMONGRASS – *Cymbopogon citratus*)

Botanical classification –

Kingdom-plantae

Division -Magnoliophyta

Class-Liliopsida

Order -poales

Family -poaceae

Genus -Cymbopogon

Species-Citrus

citral and geraniol most will be found on the lemongrass so that the best harvest period is 6.5 - 7 months [2,3].

Chemical composition of lemongrass essential oil -

The chemical composition of C. citratus essential oil is Analysis of the essential oils from C. citratus species from Brazil, Asia, West and Eastern Africa showed high contents of neral and geraniol chemotypes In turn, the essential oil from C. citratus of African origin was found to contain a high amount of myrcene, whereas the essential oil from the lemongrass contained -

geraniol (40%) as its main compound,

citral (13%)

oxobisabolene (12%). [4]

The major components identified in the lemongrass essential oil were

geraniol (20.90|40.72%),

neral (16.20|34.98%)

geraniol (8.30%)

and linalool (5.60%)

Geraniol

Geraniol has antioxidant, anti-inflammatory and potentially anti-fungal properties that make it an effective natural insect repellent. It is also chemically stable and non-neurotoxic, which means it can also be sprayed on human skin without irritation.

Structure of Geraniol

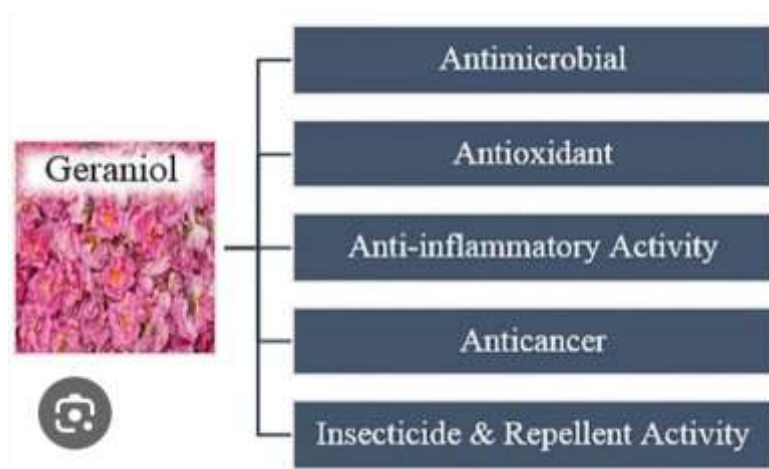
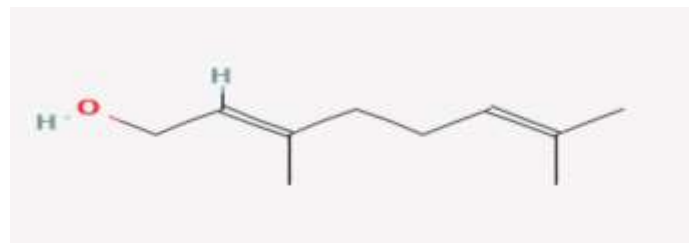
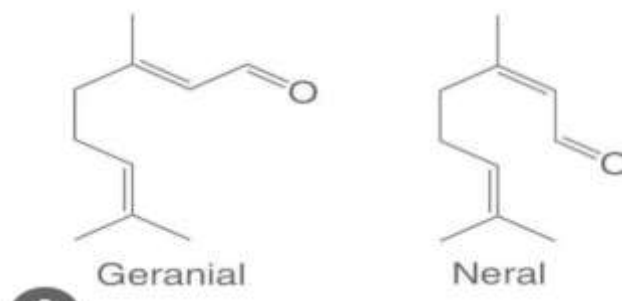


Fig 2 Use of Geraniol

Citral -

Citral is an acyclic monoterpene aldehyde. Being a monoterpene, it's made of two isoprene units. Citral is a collaborative term which covers two geometric isomers that have their own separate names; the E-isomer is named geranial (trans-citral; α -citral or citral A. The Z-isomer is named neral (cis-citral; β -citral or citral B. Biological exertion of lemongrass essential oil painting – Antimicrobial exertion [6]

Structure of citral-



Antibacterial properties of lemongrass essential oil -

Antibacterial parcels of lemongrass essential oil painting depend on the presence of three main factors geranial, neral, and myrcene [7]. Geranial and neral collectively evoke antibacterial action on Gram-negative and Gram-positive organisms, while myrcene, doesn't show observable antibacterial exertion on its own. still, myrcene was observed to induce enhanced bioactivity when it was mixed with either geranial or neral or both. [8] delved the effectiveness of lemongrass essential oil painting against the named pathogenic bacteria *Staphylococcus aureus*, *Bacillus subtilis*, *Bacillus cereus*, *Escherichia coli*, *Klebsiella pneumoniae*, and *Pseudomonas aeruginosa* using agar prolixity system and broth dilution system. In general, Gram-positive bacteria were set up to be more sensitive to the oil painting than the Gram-negative bones

Anti-inflammatory activity –

Studied the anti-inflammatory and antifungal eventuality of lemongrass. They set up out that lemongrass essential oil (10 mg/kg, administered orally) significantly reduced carrageenan-convincing paw edema with an analogous effect to that carrageenan-convincing paw edema with an analogous effect to that the positive control. Oral administration of lemongrass essential oil showed cure-dependent anti-inflammatory exertion. In addition, topical operation of lemongrass essential oil in vivo redounded in a potent anti-inflammatory effect, as demonstrated by using the mouse model of croton oil painting-convincing observance edema. The topical operation of lemongrass essential oil at boluses of 5 and 10 mL/observance significantly reduced acute observance edema convinced by croton oil painting in 62.5 and 75% of the mice, independently. In addition, Histological analysis easily verified that lemongrass essential oil inhibits the skin seditious response in beast models [8]. The anti-inflammatory property of Lemongrass essential oil has been largely attributed to the activity of citral. Boukhatem et al. found that both topical and oral administration of Lemongrass essential oil significantly inhibited chemically induced skin inflammation in a mouse model [9]

Material and Methods –

Collection of plant material:

Fresh plants or plant parts were collected. Fresh plant material was washed under running tap water; air dried, homogenized to fine powder, and stored in tightened light-protected containers.

Method of extraction –

Essential oil are uprooted from flowers, sauces, trees and colorful other factory accoutrements. These canvases contain a admixture of chemical composites. Terpenes associated with aldehydes, alcohols and ketones form the major chemical element of similar essential oils. [10] piecemeal from being used to manufacture of scents, detergents, cosmetics and soap, citronella oil painting also finds an operation in the pharmaceutical assiduity. The birth of this essential oil painting is classified as clean technology [11,12]. Lemon lawn contains 1-2% of essential oil painting on a dry weight base [13]. Lemon lawn oil painting is also known technology [14,15]. Lemon lawn oil painting is also known as citronella oil painting. Brume and hydro distillation are the conventional styles of its birth. These procedures are still time consuming. [16,17] An innovative Microwave oven supported Hydrodistillation (MAHD) not only reduces the birth time but also retains the quality of oil. The benefits of microwave oven radiation backed oil painting birth fashion over hydrodistillation have also been reported [16,17]. Pressurized liquid birth using nitrogen gas, is a new fashion and was set up to yield better quality of oil painting in comparison to Soxhlet birth and hydrodistillation method [18]. Supercritical extraction of citronella oil with CO₂ under high pressure has also been investigated [19]

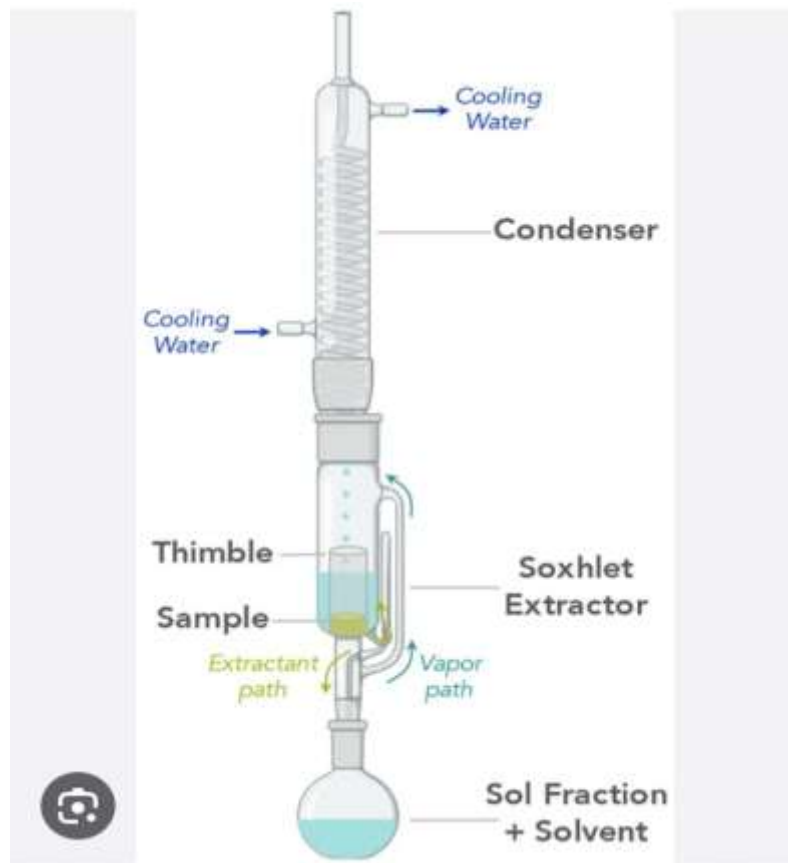


Fig 3 Soxhlet apparatus

Mechanisms of action of lemongrass extract-

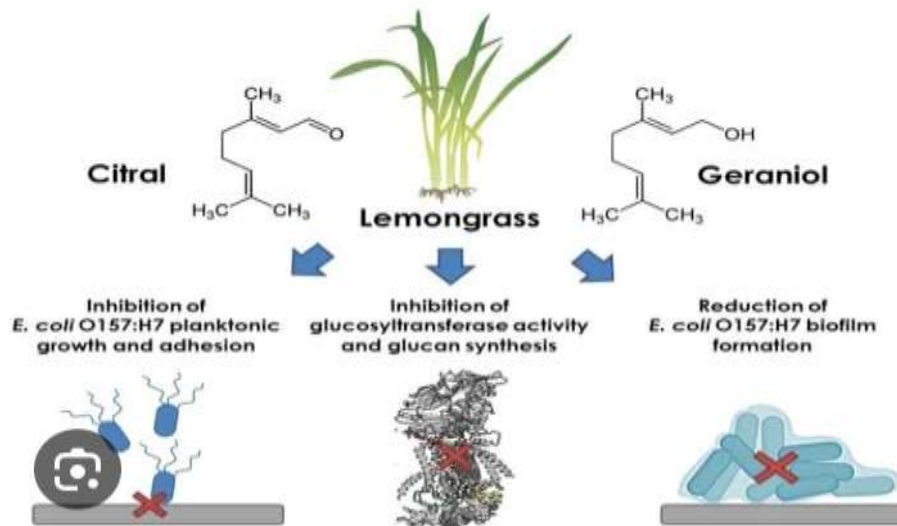


Fig 4 Mechanisms of action of lemongrass

Bael-(Aegle marmelos)**Fig 5 Bael****Botanical classification –**

Kingdom – plantae

Division -Magnoliophyta

Class- Magnoliopsida

Order-Sapinales

Family -Rutaceae

Genus -Aegle

Species-A. marmelos

Bael(Aegle Marmelos(Linn), family Rutaceae, is also known as Bale fruit tree, is a moderate sized, slender, sweet tree,6.0-7.5 m in height, and 90 to 120 cm in circumference, with a some what fluted caddy of3.0-4.5 cadence growing wild throughout the evanescent timbers of India, thrusting to an altitude of 1200 cadence in the western Himalayas and also being in Andaman islet.[20]This is generally considered as sacred tree by the Hindus, as its leaves are offered to Lord Shiva during deification. According to Hindu tradition, the tree is another form of Lord Kailashnath.[21]Leaves fruit, stem and roots of this tree at all stages of maturity are used as ethno drug against colorful mortal affections.

Chemical composition of Bael –

Leaf- Skimmianine, Aegeline, Lupeol, Cineol, Citral, Citronella, Cuminaldehyde, Eugenol, Marmesinine

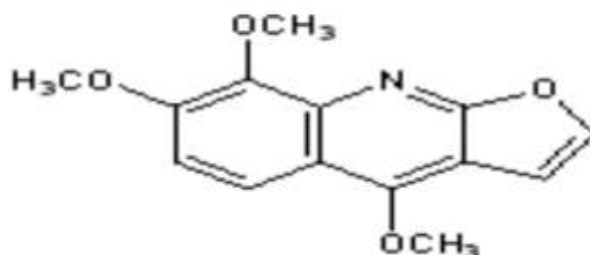
Bark- Skimmianine, Fagarine , Marmin

Fruit - Marmelosin, Luvangetin, Aurapten, Psoralen, Marmelide, Tannin

Skimmianine

-Skimmianine is a furoquinoline alkaloid present substantially in the Rutaceae family, with antispastic,anti-inflammatory conditioning and antiplatelet aggregation effect. Skimmianine exhibits cytotoxicity against a variety of cancer cell lines and genotoxicity.

Structure of Skimmianine-



Biological activity .

.Antifungal activity

Fungal diseases including candidiasis and ring worm infection are cosmetic problems that may become fatal due to secondary or super infection as commonly occurs in AIDS patients. There are many synthetic antifungal drugs available, but attention is now been paid to discover herbal drugs by using natural resources directly or by using them to manufacture other products. The essential oil isolated from the leaves of the bael tree has proved its antifungal activity against many animal and human fungi like *Trichophyton mentagrophytes*, *T.rubrum*, *Aspergillus niger*, [23,24,25,26] The essential oil obtained from the leaves of bael exhibits variable efficacy against different fungal isolates and cause concentration as well as time dependent inhibition of spore germination of all the fungi tested, including the resistance fungus, *Fusarium udum* [27] The essential oil from bael leaves may interfere with the Ca^{2+} dipicolonic acid metabolism. Thus it inhibits the antifungal activity by lowering the vegetative fungal body inside the host or in solid medium [28] Fungal disease including candidiasis and ring worm infection are cosmetic problem that may become fatal due to secondary or super infection as commonly occurs in AIDS patients [29] *Aegle marmelos* leaf extracts and fractions were found to have fungicidal activity against various clinical isolates of dermatophytic fungi

.Respiratory infection

The oil painting attained from the leaves of *Aegle Marmelos* is useful in the treatment of the cold and Respiratory infection. The juice uprooted from Leaves is mixed with equal volume of sesame oil painting And heated completely; a many seeds of black pepper And half a teaspoonful of black cumin are added to The hot oil painting and also it's removed from the fire and Stored for use in future [30] Wound Healing exertion – Effect of topical and intrperitonal administration of methanolic excerpt of *Aegle marmelos* ointment of methanolic excerpt of *Aegle marmelos* ointment and injection was studied independently on two types of crack models in rats, the excision and gash model. Both the injection and ointment of the methanolic excerpt of *Aegle marmelos* produced a significant responds in both. The excerpt facilitates the mending process as substantiation by adding in the tensile strength in the gash model. The result was also comparing to those of blackened medicine nitrofurazone [31,32]

Anti-bacterial activity –

The antibacterial exertion of the methanol, chloroform and waterless excerpts from the leaves, dinghy and fruit of *A. marmelos* was studied using slice prolixity system against *Bacillus subtilis*, *Staphylococcus aureus* (Gram positive), *Klebsiella pneumoniae*, *Proteus mirabilis*, *Escherichia coli*, *Salmonella paratyphi A* and *Salmonella paratyphi B* (Gram Negative). Results suggest that the methanolic excerpt has significant antibacterial exertion against tested bacteria. The present study justifies the claimed uses of *A.marmelos* in the traditional system of drug to treat colorful contagious conditions.

Mechanisms of action of bael extract



Fig 6 mechanism of Beal extract

Material and Methods –

Collection of plant material:

Fresh plants or plant parts were collected Fresh plant material was washed under running tap water; air dried, homogenized to fine powder, and stored in tightened light-protected containers.

Preparation of extract-

Plant parts leaf were washed, air dried and grinded into powder form for preparation of extract. Aqueous plant extract was prepared by macerating powdered plant sample with 50 ml sterile distilled water The macerate was filtered and filtrate was centrifuged at 8000 rpm for 15 minutes. Supernatant obtained after centrifugation was heat sterilized at 1200 C for 30 minutes extracts of plant parts were prepared in 70% methanol using Soxhlet extraction

for 72 hours and extract was preserved at 40 C in air tight bottles. They were air dried and dissolved in Dimethyl sulfoxide (DMSO) in 1mg/1ml concentration and stored in refrigerator.[33]

Formulation of anti-bacterial herbal soap-

Chemicals-

Glycerine, Propylene Glycol, Sodium lauryl sulfate, Triethanolamine, Steric acid, Sodium hydroxide

Active pharmaceutical ingredients –

leaf extract of Cymbopogon citratus and Aegle Marmelos

Formula ingredients –

Sir no	Ingredients	Quantity Taken	Activity
1	Sodium hydroxide	1.6gm	Lye
2	Steric acid	13gm	Hardening agent
3	Cymbopogon citratus extract	2ml	Antibacterial, Anti-inflammatory
4	Aegle marmelos	2ml	Antifungal, Antibacterial , Antiseptic
5	Coconut oil		Saponifying agent
6	Jasmine oil	1ml	Perfume
7	Glycerine	6.25ml	Humectant
8	Propylene Glycol	18.75ml	Humectant
9	Sodium lauryl sulfate	15gm	Surfactant
10	Triethanolamine	5ml	PH adjustifying agent
11	Amaranth solution	0.2ml	Colouring agent
12	Distilled water	Q.S 100ml	Vehicle

Table 1

Procedure

Cold process method-

- 1) soap base was prepared by taking 1.6gm sodium hydroxide and dissolved in distilled water and the result was hotted to 70 °C
- 2) In another beaker 18.75ml of Propylene glycol, 6.25ml of glycerine, 19ml of ethanol, and 15gm of SLS were taken into 250ml beaker on the hot plate with a stir bar and hotted the mixture to 60°C.
- 3) heat 13.0gm of Stearic acid was added and heated to 68°C and slowly added the lye solution with shifting until the mixture becomes transparent.
- 4) Needed volume of herbal oils like 2ml of Cymbopogon citratus , 2ml of Aegle Marmelos were mixed to the above mixture, and volume was made up to 100 ml by adding remaining distilled water.
- 5) The solution was kept undisturbed for a 1 hour at 68°C and a few drops of essential oil (1ml of jasmine oil) was also added to conduct aroma to the set clear soap
- 6) after 1 hour 5ml Triethanolamine (TEA) was added slowly
- 7) the soap solution was cooled to 62-64°C and eventually, the soap admixture was poured into moulds the moulds were kept
- 8) the moulds were kept aside for 3-4 days for the solidification of soap.[34]

Anti-bacterial herbal soap-**Fig 7 Antibacterial Herbal Soap****Evaluation Tests -****1 Determination of Organoleptic Characteristics -.****2. Size and shape Determination****3. Consistence determination –****4 Weight determination -****5. Froth Height-****6. pH TEST-**

Conclusion –

The prepared herbal soap was formulated using cold process technique with Anti-bacterial properties. The anti-bacterial properties may exhibit due to the presence of , Cymbopogon citratus and Aegle Marmelos. The most important thing that polyherbal soap the formulations were characterized for different evaluation parameters like clarity, color, and odor, size, and shape, thickness, weight, pH in which they exhibited satisfactory results. The herbal soap showed a good appearance aromatic smell and showed good anti-bacterial properties. Based on the study it can be concluded that herbal products can be effectively formulated in the form of medicated herbal soaps by using cold process technique with excellent anti-bacterial properties

Author Contribution-

Both the author involved equally in collecting the information, designing the manuscript

Conflict of interest –

The author declare no conflict of interest.

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