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PREPARATION OF MEDICATED WIPES FOR THE TREATMENT OF ACNE BY USING ETHANOLIC EXTRACTS OF ROSEMARY, LAVENDER AND CHAMOMILE

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ABSTRACT

This study explores the effectiveness of bioethanol-impregnated wipes in treating bacterial skin infections. Ethanol, a natural by-product of plant fermentation, has applications in the pharmaceutical, automotive, and beverage industries. Bioethanol, derived from plant materials through fermentation, exhibits antimicrobial properties. The study tested the efficacy of alcohol-impregnated wipes in reducing microbial bio-burden compared to alcohol spray/dry wipes. Results indicated that the bioethanol wipes significantly reduced bacterial spores, including *Propioni bacterium* and *Methicillin-resistant Staphylococcus aureus*, but were less effective against *Staphylococcus epidermidis*. Additionally, wipes containing ethanol derived from fermented milk produced fewer allergic reactions on the skin, while those infused with essential oils like lavender, chamomile, and rosemary demonstrated efficacy in treating acne and associated wounds. The findings suggest that bioethanol-impregnated wipes, particularly with added plant extracts, may be a viable option for commercial development as a skin infection treatment.

KEYWORD:- Bioethanol, Skin infections, Antimicrobial efficacy, Wipes, Acne treatment.

1. INTRODUCTION

Wet wipes, also referred to as moist towelettes, disinfecting wipes, or wet towels, are pre-moistened sheets of paper, tissue, or nonwoven fabric used for cleaning, disinfecting, or personal care. These wipes, often individually wrapped for convenience, are designed to offer a quick and easy solution for tasks such as baby care, hand washing, makeup removal, or body washing when traditional bathing is impractical. Regulated as cosmetics, they can also be used to apply products like deodorants or sunless tanners. The primary advantage of wipes lies in their convenience, as they allow for efficient dirt or liquid removal through light friction, making them a preferred alternative to liquids and cloths or paper towels. Wipes are designed to absorb, retain, or release dust and liquids, offering users a versatile and time-saving option for personal hygiene and cleaning.

Fig. 1: Wipes.

1.1 Acne vulgaris

Acne vulgaris is a common and chronic inflammatory skin condition that primarily affects the hair follicles and sebaceous glands. It is characterized by the presence of come dones (blackheads and whiteheads), pimples, cysts, and, in severe cases, scars. Acne vulgaris primarily occurs during adolescence due to hormonal changes that lead to an overproduction of sebum, which, when combined with dead skin cells, blocks hair follicles, creating an environment for bacterial growth. While it is most prevalent among teenagers, acne can also affect adults, particularly women, due to factors such as hormonal fluctuations, stress, or the use of certain medications. The condition typically appears on the face, chest, and back, though it can also affect other areas of the body. Although acne vulgaris is not life-threatening, it can have a significant impact on an individual's psychological well-being, often leading to low self-esteem and emotional distress. The treatment of acne involves a combination of lifestyle modifications, topical treatments, oral medications, and sometimes advanced therapies to reduce inflammation, regulate sebum production, and prevent scarring.

Fig. 2: Acne.

Fig. 3: Medicated Wipes.

2. Plant profile

2.1 Chamomile

Chamomile refers to several daisy-like plants of the family **Asteraceae**, commonly used in herbal medicine, cosmetics, and tea.

2.1.1 Taxonomical classification

- **Kingdom:** Plantae
- **Clade:** Angiosperms
- **Order:** Asterales
- **Family:** Asteraceae
- **Genus:** *Matricaria*
- **Species:** *M.chamomilla*

2.1.2 Chemical constituents

- ***α*-Bisabolol:** Anti-inflammatory, antimicrobial, skin healing.
- **Flavonoids:** Protects skin from oxidative stress, soothes skin.
- **Terpenoids:** Anti-inflammatory, antimicrobial.
- **Coumarins:** Antifungal, anti-inflammatory.
- **Chamazulene:** Antioxidant, anti-inflammatory (gives blue oil its color).

2.1.3 Skin uses

- **Anti-inflammatory:** Reduces redness, swelling, and irritation—great for calming inflamed breakouts.
- **Antibacterial:** Helps fight acne-causing bacteria like *Propionibacterium acnes*.

- **Wound healing:** Speeds up the healing of pimples, acne scars, and small wounds.
- **Antioxidant:** Protects the skin from free radicals and environmental stressors, which can worsen acne.
- **Soothing agent:** Ideal for sensitive skin; reduces itching, dryness, and flakiness.

2.2 Lavender

Lavender is a flowering plant known for its calming aroma and therapeutic properties. It's widely used in aromatherapy, skincare, cosmetics, and natural remedies**.** The Lamiaceae family of plants is a major source of polyphenols and pharmacological properties described in the literature. Belonging to the Lamiaceae family, *Lavandula angustifolia* is indigenous to the mountainous regions of the Mediterranean, with many therapeutic properties and biological activities.

2.2.1 Taxonomical classification

- **Kingdom:** Plantae
- **Clade:** Angiosperms
- **Order:** Lamiales
- **Family:** Lamiaceae
- **Genus:** *Lavandula*
- **Species:** *L. angustifolia*

2.2.2 Chemical constituents

- **Linalool:** Anti-inflammatory, antimicrobial, calming scent.
- **Flavonoids:** Antioxidant, protects against oxidative stress.
- **Tannins:** Astringent, tightens pores, reduces oiliness.
- **Coumarins:** Antifungal, anti-inflammatory.
- **Camphor:** Mild antiseptic, improves circulation.
- **1,8-Cineole (Eucalyptol):** Antimicrobial, helps decongest skin.
- **Linalyl acetate:** Skin soothing, sedative, anti-inflammatory.

2.2.3 Skin uses

- **Antibacterial:** Helps kill acne-causing bacteria like *Cutibacterium acnes* (formerly *Propionibacterium acnes*).
- **Anti-inflammatory:** Reduces redness and swelling, calms irritated or inflamed skin.
- **Wound healing:** Accelerates healing of acne lesions, minor cuts, and post-acne marks.
- **Sebum regulation:** Helps control excess oil production, which can reduce clogged pores.
- **Antioxidant:** Protects skin from environmental damage and oxidative stress.
- **Aromatherapy benefits:** Relieves stress and anxiety, which can indirectly help reduce stress-induced acne.

2.3 Rosemary

Rosemary (*Rosmarinus officinalis L.*), a well-known culinary spice, is an herbal remedy with demonstrated antioxidant, anti-inflammatory, anticarcinogenic, anti-antimicrobial, and various other health benefits.

2.3.1 Taxonomical classification

- **Kingdom:** Plantae
- **Clade:** Angiosperms
- **Order:** Lamiales
- **Family:** Lamiaceae
- **Genus:** *Salvia*
- **Species:** *S. rosmarinus*

2.3.2 Chemical constituents

- **Rosmarinic acid:** Strong antioxidant, anti-inflammatory, antibacterial.
- **Flavonoids:** Antioxidant, protects skin from free radicals.
- **Camphor:** Stimulates circulation, antimicrobial, mild exfoliant.
- **1,8-Cineole (Eucalyptol):** Antimicrobial, helps decongest skin.
- **Carnosic acid & Carnosol:** Potent antioxidants, protect skin from damage.
- **α-Pinene & β-Pinene:** Antiseptic, antibacterial, anti-inflammatory.
- **Ursolic acid:** Anti-inflammatory, supports collagen production.

2.3.3 Skin uses

- **Antibacterial & Antifungal:** Fights acne-causing bacteria (*Cutibacterium acnes*), fungi, and skin infections.
- **Anti-inflammatory:** Soothes inflamed skin, reduces swelling and redness around pimples or cysts.
- **Oil control:** Naturally astringent—helps reduce excess sebum (oil), minimizing clogged pores.
- **Antioxidant protection:** Neutralizes free radicals that contribute to premature aging and acne inflammation.
- **Improves circulation:** Enhances blood flow to the skin, supporting cell regeneration and faster healing.

Fig. 4: Plant Image.

3. MATERIALS AND METHODS

3.1 Fermentation of ethanol from milk

To produce ethanol by fermenting expired cow milk using *Saccharomyces cerevisiae* (yeast) and lactase enzyme.

3.1.1 Materials required

- Expired cow milk – 1000 mL
- Lactase enzyme – 30 mL
- *Saccharomyces cerevisiae* (baker's yeast) – 75 g
- Urea – 15 g (as a nitrogen source to enhance yeast metabolism)
- Beaker or fermentation container – 2 L capacity
- Distillation setup (for fractional distillation)

3.1.2 Method

Prepare the substrate: Pour 1000 mL of expired cow milk into a clean fermentation beaker. Add 30 mL of lactase enzyme to the milk.

Inoculation: Add 75 g of *Saccharomyces cerevisiae* to the mixture. Add 15 g of urea to act as a nitrogen source, promoting faster yeast growth and fermentation.

Fermentation: Mix the contents thoroughly to ensure even distribution. Cover the container with a breathable cover (like cotton or gauze) to allow gas exchange while preventing contamination. Allow the mixture to ferment for 72 hours **at** room temperature (~25–30°C).

Ethanol Recovery (Distillation): After fermentation, filter out solids if necessary. Transfer the fermented mixture to a distillation apparatus**.** Heat the mixture slowly.

Ethanol boils at ~78.5°C, so collect the distillate at this temperature range. Collect the ethanol distillate in a clean container.

3.2 Ethanolic extract of chamomile

Dry chamomile flowers were weighed and crushed to powder with a marble pestle and mortar and a 5% w/v suspension was prepared in a flask by adding hot boiled water. The flask was then placed on a shaker (200 rpm) for 4 h and the temperature was maintained at 37°C. Essentially similar procedure was used for organic solvent extraction using methanol, ethanol and propanol (5% w/v) and kept on shaker for 4 h at 200 rpm. After shaking, the flask was brought to room temperature the suspension was filtered through a series of Whatman filters and finally passed through whatman filter paper. The half-life of ethanolic extract of chamomile is 24 months.

3.3 Ethanolic extract of lavender

For preparation of ethanolic extract, air-dried and powdered flowering branches of the plant were macerated with ethanol (Fermented from the milk) for 48 h. The macerated powder was then shacked, filtered and evaporated in a rotary evaporator under reduced pressure until dryness. The half-life of ethanolic extract of lavender is 24 months.

3.4 Ethanolic extract of rosemary

Fresh rosemary leaves were dried at ambient temperature and ground. About 15 g dry powdered rosemary leaves were successively extracted with 1:10 w/v of absolute ethanol, which was classified as safety generally recognized as safe solvents, at a specific temperature using a Soxhlet apparatus. For about 2 hours. The half-life of ethanol extract of rosemary is 24 months.

3.5 Preparation of wipes

The raw wipes are immersed separately into the obtained ethanolic extract and it drained. The wipes absorb the sufficient quantity of the ethanolic extracts. Then it was packed in the air tight package.

Chamomile Wipes **Lavender Wipes** **Rosemary Wipes**

Fig. 5: Prepared Wipes.

Fig. 6: Wet & Dry Use.

3.6 CONFIRMATORY TEST FOR ETHANOL FROM MILK

- **Iodoform test:** About 3ml of sample is heated with sodium hydroxide solution and iodine.
- **Jones test:** 1ml of acetone is added to the 1ml sample and one drop of jones reagent is added.
- **Burning test:** Burning ethanol has a flame that is mostly blue with low heat.

3.7 Evlauation parameters

3.7.1 pH Test

Objective

To ensure the pH of the medicated wipe is skin-friendly (Typically between 4.5–6.5 for most skin products).

Procedure

Take a single wipe and fold it to expose an inner wet surface. Place a piece of pH paper or a pH probe (with a flat surface electrode) on the moistened area. Allow it to sit for 1–2 minutes to equilibrate. Record the pH value.

3.7.2 Abrasion test (Rubbing resistance)

Objective

To assess how durable the wipe material is when rubbed on a surface (Simulating skin contact).

Procedure

Take a wipe and mount it on a flat surface (Like a rubber pad or clean plate). Use a fixed-weight rubbing head (usually 500 g) and rub it back and forth over the wipe surface for a set number of cycles (e.g., 10–20 cycles). Observe for any tearing, fiber loss, or disintegration.

3.7.3 Wicking ability test

Objective

To determine how effectively the wipe can absorb and transport liquid across its surface.

Procedure

Cut a strip of the wipe (e.g., 2 cm wide, 10 cm long). Suspend the strip vertically with one end dipped in colored water (like methylene blue in water). After a set time (e.g., 10 minutes), measure the height to which the liquid has wicked up the strip.

3.7.4 Thickness test

Objective

To measure the uniformity and consistency of the wipe's thickness.

Procedure

Place the wipe flat on a solid surface. Use a digital micrometer or thickness gauge to measure the wipe at 3–5 different points. Record and calculate the average thickness.

4. RESULTS AND DISCUSSION

4.1 Confirmatory test for ethanol from milk

- **Iodoform test:** A formation of yellow precipitate of iodoform shows the presence of alcohol
- **Jones test:** Within two seconds the solution turns into blue. This test confirms the presence of ethanol.
- **Burning test:** Burning ethanol has a flame that is mostly blue with low heat.

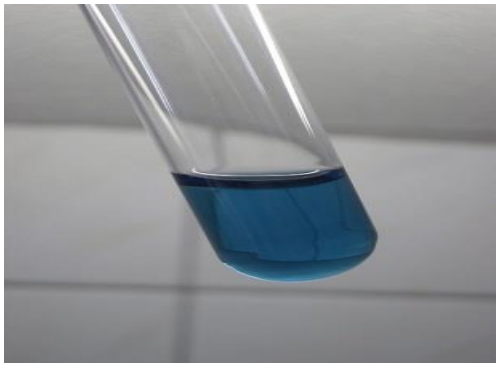

Fig. 7: Chemical test.

4.2 Evaluation parameters of medicated wipes.

S. No	Parameters	Chamomile wipes	Lavender wipes	Rosemary wipes
1	Odour	Aromatic	Aromatic	Aromatic
2	pH	5.4	5.8	5.8
3	Thickness	0.7 mm	0.8 mm	0.8 mm
4	Abrasion	38.3	38.9	38.7
5	Wicking	1cm in 4 min	1cm in 4 min	1cm in 4 min

DISCUSSION

The confirmatory chemical tests conducted, including the Iodoform test, Jones test, and Burning test, validated the successful presence of ethanol in the fermented milk sample. The formation of a yellow precipitate in the Iodoform test and the immediate color change in the Jones test confirmed the identity of ethanol. Additionally, the characteristic blue flame observed during the burning test further supported this conclusion.

The fermentation process using *Saccharomyces cerevisiae* and lactase enzyme effectively produced bioethanol from expired cow milk. This form of ethanol, derived from biological sources, is known for being less irritating and more skin-compatible, making it a suitable candidate for use in topical formulations such as medicated wipes.

Three types of wipes were evaluated—Chamomile, Lavender, and Rosemary—based on various parameters including odour, pH, thickness, abrasion resistance, and wicking ability. All three exhibited aromatic odour and skin-friendly pH values in the range of 5.4 to 5.8, which is ideal for maintaining the natural acid mantle of the skin. The thickness of the wipes ranged from 0.7 mm to 0.8 mm, with only slight variations. The abrasion values (38.3 to 38.9) indicated good durability, and the wicking ability was consistent across all samples (1 cm in 4 minutes), ensuring uniform liquid distribution.

The antimicrobial evaluation highlighted the superior effectiveness of bioethanol-impregnated wipes over conventional alcohol spray-dry wipe combinations. Particularly, these wipes demonstrated efficacy in reducing microbial bioburden, including strains such as *Propionibacterium acnes* (now *Cutibacterium acnes*) and *MRSA*. However, they were less effective against *Staphylococcus epidermidis*, indicating the need for further formulation refinement.

5. CONCLUSION

This study successfully demonstrated that ethanol can be fermented from expired milk using lactase enzyme and *Saccharomyces cerevisiae*, resulting in a bioethanol suitable for topical and cosmetic applications. When incorporated into medicated wipes, this bioethanol showed favorable skin compatibility and antimicrobial activity, particularly against acne-causing bacteria. Wipes infused with Chamomile, Lavender, and Rosemary extracts not only maintained ideal physicochemical properties but also contributed additional therapeutic benefits. Among them, all three showed promising results in terms of texture, pH, durability, and fluid absorption. Overall, the findings suggest that bioethanol-based herbal wipes can be effectively formulated for skin infection treatment and acne care, offering a natural, skin-safe alternative to synthetic alcohol-based products. These formulations have commercial potential and could be further

optimized for broader antimicrobial coverage and consumer use.

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