

Herbal Antimicrobial Deodorant Stick

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ABSTRACT:

A subclass of deodorants called antiperspirants prevents sweating itself, typically by blocking sweat glands. Antiperspirants are used on a wider range of body parts at any place where sweat would be inconvenient or unsafe. Other types of deodorant allow sweating but prevent bacterial action on sweat. Deodorant products inhibit the growth and activity of bacteria that degrade the gland in the armpit. Despite their effective antibacterial properties, common antibacterial agents such as triclosan and aluminum salts increase the risk of Alzheimer's disease, breast and prostate cancer, and contact dermatitis. As a consequence, plant extracts with antibacterial properties are useful. This research study was carried out by opting the coconut oil, Arrow root powder, shea butter, Baking Soda, Bees wax, Tea Tree oil, Eucalyptus oil vitamin E oil, corn starch & Lavender oil. These are reported to possess antibacterial activity anti-inflammatory activity which reduces the skin irritation and redness. Herbal deodorant sticks were prepared and characterized for physical observations PH measurement, softening point test, stability study, and Antimicrobial activity test etc.

KEYWORDS: Deodorant, bees wax, lavender oil, corn starch, PH

1. Introduction:

Deodorant sticks are used to control body odor. These products are made by blending active ingredients with waxes, oils, and silicones and molding the mixture into stick form. Body odor is primarily generated in the area under the arms where there is a high concentration of sweat glands.

While sweat from these glands is initially odorless, it contains natural oils, called lipids that provide a growth medium for bacteria living on the skin. These bacteria interact with the lipids, converting them into compounds that have a characteristic sweaty odour. Isovaleric acid, for example, is one chemical compound that gives sweats its smell. odour control can be achieved by various means - basic hygiene (washing with soap and water) is the most important but also by antimicrobial agents, antiperspirant, fragrances or any combination of these. Basically, deodorants and antiperspirants are two different ways to prevent odour [1].

Deodorants are perfume preparation, which mask but do not actually affect perspiration; it can also work by creating a more acid, inhospitable environment to odour producing bacteria. Natural deodorants are the modern trend in the field of beauty and fashion [2].

These agents are gaining popularity as nowadays most people prefer natural products over synthetic materials for their personal care to enhance their beauty as these products supply the body with nutrients and enhance health and provide satisfaction as these are free from synthetic chemicals and have relatively less side-effects compared to synthetic cosmetics [3]. Natural Deodorants are a great way to avoid parabens, aluminum, and neuro-toxins found in commercial deodorants and antiperspirants [4,5]. This

research study was carried out by selecting the & Lavender oil essential oil, Eucalyptus oil, Vitamin E oil [6]. which was reported to have antibacterial activity.

1.1 Drug Profile:

Coconut oil:

Coconut oil's efficacy as a natural deodorant stems largely from its well-established antibacterial properties. This is chiefly due to its high content of lauric acid a fatty acid that makes up about 50% of the oil's composition. Lauric acid exhibits potent antimicrobial activity that combats odour-causing bacteria on the skin.



Figure of coconut oil

Rather, it's the bacteria residing on the skin that breaks down sweat and yields the characteristic body odour. By effectively eliminating these bacteria, coconut oil works as a natural, non-aggressive solution in controlling body odour. Aside from this antibacterial benefits, coconut oil also has moisturizing properties this makes it beneficial for underarm skin, which is often subjected to regular shaving and can thus suffer from dryness, irritation, and damage. Coconut oil has become increasingly popular as an ingredient in natural deodorants, largely due to its inherent sustainability. it is highly oxidatively stable due to its high saturated fat content. This makes it a long-lasting and shelf-life ingredient, eliminating the need for artificial preservatives in deodorant formulations. Coconut oil is highly stable due to its high saturated fat content. This characteristic allows such products to have a longer shelf life more over; coconut oil solidifies at room temperature, making it an ideal base for deodorant sticks. It can also be easily combined with other natural ingredients [7].

Arrow Root Powder: (Maranta Arundinacea):

Arrow root is belonging to family Marantaceae, is a monocot with vegetative propagation the name arrow root is due to the arrow like appearance of the rhizomes root maranta arundinaceae.



Figure of Arrow Root Powder

It also has various pharmacological activities like antidiarrheal activity, antioxidant, and immune stimulatory and antimicrobial activity. Apart from this arrow root being an elegant, light weight all natural absorbent powder that also possesses skin nourishing and anti-irritant properties.

It is widely used in cosmetic preparations due to its brightening and skin soothing effect which is suitable for oily, acne and sensitive skin type and it produces a cooling, drying and freshening sensation. It's also applied in deodorizing body powders for its ability to absorb sweat and moisture.

It contains minerals, vitamins, such as zinc, iron, potassium and vitamin B6. and it's known to provide a relief from skin irritations including acne, skin, sores and rashes [8].

Shea Butter:

1. Table of Shea Butter

Genus	Vitellaria
Species	V.Paradoxa(also known as Butyrospermum Parki)
Family	Sapotaceae
Biological Source	Derived from nuts of the shea tree

Shea butter moisturizes the skin, it creates a protective Barrier and helps to sooth irritation shea butter is perfect for dry underarms it boost the skin moisture and anti-inflammatory property[9].



Figure of shea butter

Uses:

Shea Butter is used in various applications including Cosmetics: moisturizes, skin care products and lotions Due to emollient properties soften and smooth dry skin.

Lavender Oil:

- Lavender oil is derived from the flowers of the *lavandula agastifolia* plant.
- Characteristic: Floral, herbaceous, and slightly woody, often described as calming and soothing. Botanical Name: *Lavandula angustifolia* and other *Lavandula* species and cultivars.



Figure of Lavender Oil

Health Benefits of Lavender oil:

- Anxiety and stress relief: lavender's calming properties can help reduce anxiety and stress levels.
- Insomnia Treatment: Lavender can promote relaxation and improve sleep quality. Skin Care, Pain Relief, Wound healing Powerful antiseptic and healing agent.

Bees wax:

- Beeswax has been used by humans for thousands of years, with the earliest evidence of human interaction with it being a 6,500-year-old tooth with beeswax filling a cavity.
- A lump of beeswax found in South Africa's Border Cave is at least 24,000 years old, and the first solid evidence of Egyptian painting from 2400BC



Figure of Bees Wax

- Beeswax has been used in cosmetics since ancient times, and is used in some deodorants and antiperspirants today. In ancient Egypt, beeswax was used to make cosmetics, balms, ointments, and mummies, and as a form of currency.
- In China, the Shennong Book of Herbs from 2,000 years ago described beeswax as a skin remedy that could heal wounds, beautify, and prevent aging [10].

Baking Soda:

Baking soda is a sodium bicarbonate, is a naturally occurring substance that is present in all living things, it helps to maintain the PH balance necessary for life baking soda is made from soda ash also known as sodium carbonate.

It is known for absorbing odour causing bacteria that is why many natural deodorant brand choose baking soda as their main ingredients to their Product.



Figure of Baking Soda

Its ability to absorb sweat and due to antibacterial properties it takes curbing odour. If a deodorant contains a higher percentage of baking soda it's a stronger defence against odour [11].

Essential Tea Tree Oil:

- Tea tree oil comes from the leaves of *Melaleuca alternifolia*, a small tree native to Australia.
- Although *Melaleuca alternifolia* is known as the tea tree, it is not the same plant whose leaves are used to make black, green, and oolong tea.
- Tea tree oil has been used as a traditional medicine by the Aboriginal people of Australia for centuries to treat coughs and colds or apply it directly to the skin for healing.
- You can buy tree oil essential oil 100% undiluted or neat



Figure of Tea Tree Oil

- Diluted forms, ranging from 5–50% strength, are also available in products designed for the skin.
- Tea tree oil contains several compounds, including terpinen-4-ol, that can destroy Trusted Source certain bacteria, viruses, and fungi. Tea tree oil's germ-fighting properties.
- make it a valued natural remedy for treating bacterial and fungal skin conditions, preventing infection, and promoting healing [12].

Benefits of Tea Tree Oil:

- Prevents bad odour. Provides a feeling of freshness.
- Deodorising effect lasting 8 to 12 hours.

Eucalyptus Oil:

- Eucalyptus (*Eucalyptus* spp.), is a large genus of the Myrtaceae family, which includes 900 species and subspecies.
- This evergreen tall tree is native from Australia and Tasmania and is the second largest genera after acacia.
- Ancient times the eucalyptus plant was used for several purposes by aboriginal people both as medicine and food



Figure of Eucalyptus Oil

Nowadays, the plant is used in forestry (timber, fuel, paper pulp), environmental planting (water and wind erosion control), as a source of essential oil (medicinal, perfumery oils) for arts and craft [13].

Represents a fast-growing source of wood as well as source of oil used for several purposes. The oil is extracted from leaves, fruits, buds and bark showing antibacterial, antiseptic, antioxidant, anti-inflammatory, anticancer activities[14,15].

Table.2.Pharmacognostic Profile of Eucalyptus Plant

Kingdom	Plantae
Subkingdom	Tracheobionta
Super Division	Spermatophyta
Division	Magnoliophyta
Class	Dicotyledons
Sub Class	Rosidae
Order	Myrtales
Family	Myrtaceae
Genus	Eucalyptus
Species	Eucalyptus globules labil

Uses of Eucalyptus oil:

The oil is used as stimulant, antiseptic, flavouring agent, aromatic, deodorant, expectorant, antimicrobial, febrifuge, diuretic, and antispasmodic.

Vitamin E Oil:

- Vitamin E was first described in 1922 by Herbert M Evans and Katherine Bishop. In 1936, it was biochemically characterized and named tocopherol (Greek: “tocos” meaning offspring and “phero” meaning to bring forth).

- Vitamin E is synthesized by plants and must be obtained through dietary sources. Richest sources are nuts, spinach, whole grains, olive oil, and sunflower oil.



Figure of Vitamin E oil

- Although many cosmoceuticals contains vitamins C and E very few are effectively effective in topical application because the stability is compromised as soon as the product is opened and exposed to air and light.
- When a stable formulation delivers a high concentration of nonesterified, optimal isomer of the antioxidant, vitamins C and E inhibit the acute UV damage as well as chronic UV photo ageing and skin cancer [16].

Corn Starch:

Table 3. Corn Starch Drug Profile

Synonyms	Corn flour Amylacea, maize starch
Biological Source	Endosperm of the Kernel
Family	Poaceae
Chemical Constituents	Amylopectin ,amylase



Figure of Corn Starch

Uses:

- Excellent absorbent quality of corn starch help you stay dry all day by absorbing moisture and perspiration.
- Additionally it stops the development of microorganism that generate body odour By entirely absorbing an offensive odour and removing it from the system, cornstarch also aids in odour neutralisation. Corn starch has calming effects on the skin making it suitable for sensitive or irritated skin [17].

Literature Survey:

1: Suvarna Ashok Pakhare, Sakshi Omprakash Jaju, Anand Daulatrao Khendke: Deodorants are chemicals that prevent or reduce axillary malodor, which results from bacterial breakdown of perspiration from eccrine and apocrine sweat glands. The sweaty odor is caused by the interaction between a variety of substances including low-molecular-weight fatty acids (i.e caproic, caprylic, isovaleric, butyric), lactates, urea and ammonia, cholesterol, and other steroid compounds. Odor control can be achieved by various means - basic hygiene (washing with soap and water) is the most important but also by antimicrobial agents, antiperspirant, fragrances or any combination of these. Here deodorant sticks were prepared with herbal antimicrobial agent and the sticks were characterized for pH, softening point, disintegration time, colour loss, stability upon 2 weeks storage and anti microbial test. The physicochemical properties remain unchanged after 2 weeks storage. The result of anti microbial activity shows that all the formulations have antibacterial activity towards all tested phytopathogenic bacteria.

2: Ranjitha Suresh and Thanushree H R: Deodorant products inhibit the growth and activity of bacteria that degrade the apocrine gland in the armpit. Despite their effective antibacterial properties, common antibacterial agents such as triclosan and aluminum salts increase the risk of Alzheimer's disease, breast and prostate cancer, and contact dermatitis. As consequence, plant extracts with antibacterial properties are useful. This research study was carried out by opting the Sunflower wax, Virgin coconut oil, Rosemary oil & Lavender oil. Rosemary oil & Lavender oil are reported to possess antibacterial activity.

3: Bouslimani A, da Silva R, Kosciolk T, Janssen S, Callewaert C, Amir A, et al: Use of skin personal care products on a regular basis is nearly ubiquitous, but their effects on molecular and microbial diversity of the skin are unknown. We evaluated the impact of four beauty products (a facial lotion, a moisturizer, a foot powder, and a deodorant) on 11 volunteers over 9 weeks.

4: Mohammad AS, Mustafa G, Ali F, Niloufar S, Dariush S, Syed AF: Deodorant products prevent the growth and activity of the degrading apocrine gland bacteria living in the armpit. Common antibacterial agents in the market like triclosan and aluminum salts, in spite of their suitable antibacterial effects, increase the risk of Alzheimer's disease, breast and prostate cancers or induce contact dermatitis. Therefore, plant extracts possessing antibacterial effects are of interest. The aim of the present study was to verify the *in vitro* antimicrobial effects of different sage extracts against two major bacteria responsible for axillary odor, and to evaluate the deodorant effect of a silicon-based stick containing sage extracts in different densities in humans.

2. Abdullah Ijaz Hussain, Farooq Anwar, Shahzad Ali Shahid Chatha, Abdul Jabbar, Shahid Mahboob, Poonam Singh Nigam: The aim of this work was to investigate and compare the antiproliferative, antioxidant and antibacterial activities of *Rosmarinus officinalis* essential oil, native to Pakistan. The essential oil content from the leaves of *R. officinalis* was 0.93 g 100g(-1). The GC and GC-MS analysis revealed that the major components determined in *R. officinalis* essential oil were 1,8-cineol

(38.5%), camphor (17.1%), α -pinene (12.3%), limonene (6.23%), camphene (6.00%) and linalool (5.70%). The antiproliferative activity was tested against two cancer (MCF-7 and LNCaP) and one fibroblast cell line (NIH-3T3) using the MTT assay, while, the antioxidant activity was evaluated by the reduction of 2, 2-diphenyl-1-picryl hydrazyl (DPPH) and measuring percent inhibition of peroxidation in linoleic

Aims and objective:

To develop an effective, safe, and eco-friendly herbal antimicrobial deodorant that inhibits odour-causing microorganisms while providing long-lasting freshness using natural plant-based ingredients.

Objectives:

- **Formulation Objectives**
- To select and combine suitable herbal essential oils with proven antimicrobial properties (e.g., tea tree, neem, lavender, rosemary).
- To create a stable deodorant formulation (spray, roll-on, cream, or stick) that is skin-safe and non-irritating.
- To ensure the deodorant is free of synthetic chemicals such as parabens, aluminum salts, and artificial fragrances.
- **Antimicrobial Efficacy Objectives**
- To test the deodorant’s effectiveness in reducing or inhibiting odour-causing bacteria such as Staphylococcus epidermidis and Corynebacterium species.
- **Safety and Stability Objectives**
- To evaluate the skin compatibility of the herbal deodorant through irritation or assessments.
- To conduct stability testing (pH, colour, fragrance, and consistency) under different temperature and storage conditions.
- **Sensory and User Acceptance Objectives**
- To assess the fragrance, feel, and overall user satisfaction.
- To optimize the scent profile using natural fragrance sources.
- **Sustainability and Environmental Objectives**
- To ensure that ingredients are biodegradable, cruelty-free, and sustainably sourced.
- To design eco-friendly packaging, such as recyclable or biodegradable containers.

Commercial and Practical Objectives (optional)

To estimate production cost and identify cost-effective herbal ingredients.

Material Selection:

Table 4. Material Selection

Ingredients	Quality	uses
Coconut oil	5g	Moisturizing base, carrier for active ingredients
Shea Butter	3g	Skin conditioning agent, adds smooth texture
Bees wax	4g	Provides stick form, stabilizes the product
Arrowroot Powder	2g	Absorbs moisture and reduces stickiness

Baking Soda	1g	Neutralizes odor-causing bacteria
Tea Tree Oil	0.5ml	Antimicrobial and deodorizing agent
Lavender Essential oil	0.5ml	Fragrance and antibacterial
Eucalyptus Oil	0.5ml	Antimicrobial and refreshing scent
Vitamin E Oil	0.5ml	Antioxidant, skin conditioning
Cornstarch	3.5g	Absorb sweat and helps skin dry

Method of Preparation:

1. Prepare a clean, dry double boiler setup or use a heat safe bowl over a pot of simmering water.
2. Add coconut oil, shea butter and Beeswax into the double boiler.
3. Heat gently while stirring until all ingredients are fully melted and blended into a smooth liquid.
4. Remove the bowl from heat and quickly mix in baking soda and arrowroot Powder.
5. Stir continuously to ensure a smooth, lump free mixture.
6. Add a tree Essential Oil, Lavender Essential Oil, Vitamin E Oil, and Neem Oil.Mix thoroughly to distribute the oils every throughout the blend.
7. Immediately pour the mixture into a deodorant stick mould or small container while still warm and liquid.
8. Allow the mixture to cool and solidify at room temperature and place in refrigerator for faster setting.
9. Once fully solidified, cap the container and label it properly.

Result and Discussion:

- **Physical Properties:**
- **Appearance and Texture:**
- Examine the color, scent and texture of the deodorant stick.
- **PH Test:**
- Identify the PH level of the deodorant stick, which is vital for the skin compatibility.
- **Spreadability Test:**
- Examine how the deodorant stick behaves over time, including variations in colour.
- **Stability Test:**
- Examine how the deodorant stick behaves over time, including variations in colour, scent and texture.
- **Lasting Time:** examine the time after applying the deodorant on skin and observed for how much duration it odor protection.
- **Colour:** The colour of prepared deodorant was assessed and observed visually.
- **State:** state of prepare deodorant gel was observed visually.

Table 5. Result and Discussion

Sr.no	Parameters	Test
1.	Colour	
2.	Odour	Pleasant Odour
3.	Lasting time	2-3hrs
4.	Skin Irritation test	No Irritation on skin

5.	Spreadability test	Easily Spreadability
6.	Texture	Smooth
7.	Melting Point	60c
8.	PH	7

1. Antibacterial Activity:

Procedure:

- **Preparation of Bacterial Culture:** Inoculate chosen bacterial strains in nutrient broth incubate at 37c for 24hrs until cloudy (log Phase).
- **Preparation of Agar Plates:** Pour molten sterile nutrient agar into sterile petridishes let the agar solidify. Disperse 100ul of the bacterial culture uniformly over the surface.
- **Preparation of Deodorant Extract:** Remove a small portion of deodorant stick. Dissolve in an appropriate solvent (water based on solubility).filter if needed to eliminate solid particles.
- **Agar well Diffusion Assay:** Employ a sterile cork borer to create wells in the agar plate.(6-8mm diameter).fill each well with a constant volume of the test sample .incorporate wells for positive and Negative controls.
- **Incubation:** Place the plates in an incubator at 37⁰C for 24hrs
- **Measurement of zone of inhibition:** After incubation, gauge the diameter of the clear zone surrounding each well in millimeters.



Figure of Antimicrobial Activity

Conclusion:

The Herbal deodorant stick offers a natural, skin-friendly alternative to conventional deodorants, combining plant-based ingredients with effective odor control .its gentle formulation supports daily freshness without harsh chemicals, making it suitable for individuals with sensitive skin or those seeking a more suitable personal-care option.

by harnessing the power of herbs, essential oils, and natural protectants, this deodorant stick provides a clean, eco-conscious solution that promotes both personal well-being and environmental responsibility.

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