



COCOA BUTTER, CORN STARCH AND SODIUM BICARBONATE INFUSED ROLL-ON DEODORANT: A NOVEL APPROACH TO ODOR CONTROL

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ABSTRACT

Deodorant Roll-on is a topical preparation containing antibacterial from natural ingredients that is used to reduce armpit odor caused by the bacterium Staphylococcus epidermidis. The odor of armpit is caused by microbial biotransformation of odourless secretion into volatile odorous molecules Staphylococcus epidermidis and coryne bacterium. Species feeds on sweat excreting bad smell. Deodorant products inhibit the growth and activity of bacteria that degrade the apocrine gland in the armpit deodorants. Despite their effective antibacterial properties, common antibacterial agents such as increase risk of Alzheimer's disease and contact dermatitis. This research study was carried out by opting the Cocoa butter, Coconut Oil, Sodium bicarbonate, corn starch, Lavender oil, Clove oil, castor oil and mogra oil. Lavender oil are reported to possess antibacterial activity. Deodorant roll-on were prepared and characterized for physical observation. PH measurement, spreadability, viscosity, drying time, Stability, homogeneity test, skin irritation test. The physicochemical evaluation was obtained.

KEYWORDS: *Deodorant, Antibacterial, Corn starch, Sodium bicarbonate, Staphylococcus epidermidis, Deodorant Roll-on stick.*

1. INTRODUCTION

Sweat glands emission is without anyone else unscented, and armpit rottenness is brought about by the microbial biotransformation of the scentless discharge into unpredictable musty molecules.^[1] Nowadays, in most antiperspirant items, antibacterial specialists, for example, quaternary ammonium mixes like triclosan, aluminum salts, and sweet-smelling scent covering operators are used. Most conventional antiperspirants rely on aluminum compounds, like aluminum trichlorohydrate, which plug the sweat ducts, and stop sweat coming to the skin's surface.^[2] Crystal deodorants are a popular alternative to conventional deodorants and antiperspirants. In topical countries, Deodorant are common Cosmetic Products used by bacterial growth and bacterial breakdown of perspiration in Special areas of the body.^[3] Deodorants may contain perfume fragrances or natural essential oils intended to mask the odor of perspiration. The popular roll-on deodorant is a leave-on liquid deodorant contains in a glass bottle or plastic bottle with a revolving ball dispenser as an applicator for applying the deodorants on skin to affect body odor. Inasmuch as two types of products, antiperspirants and deodorants, are used daily in armpits by a large number of people (perhaps as many as 90% of people in the US, according to Benohanian, 2001), armpits represent an interesting context in which to explore the general phenomenon of how human behavior and product use influence skin microbes.^[4] Deodorant is one of cosmetic preparations that consist materials or mixtures of materials that can be used to eliminate or reduce body odor as a result from excessive sweating and decomposition of sweat by bacteria.^[5] One of them is deodorant either in powder and roll-on from that used to adsorb excessive sweats in the body that interfere daily activity and lower confidence.

1.1. Sweat glands and their Functions

Ecrrine, apocrine, and apoeccrine glands

Skin is a part of the human integumentary system which forms the outermost layer of the human body. Skin is the largest organ in the body which provides a mechanical barrier, protecting the body from the external environment.^[6] In addition, skin also contributed to both endocrine and exocrine functions of the human body. Examples of an exocrine function of the skin are secretion of sebum and sweat fluid.^[7] There are three main compartments of human skin, epidermis, dermis, and the subcutaneous fascia. Sweat glands are skin

appendages found at the dermis compartment of the human skin.^[8] An early morphological study in 1917 showed that there are two types of sweat glands, eccrine and apocrine sweat glands (illustrated in Figure 1).

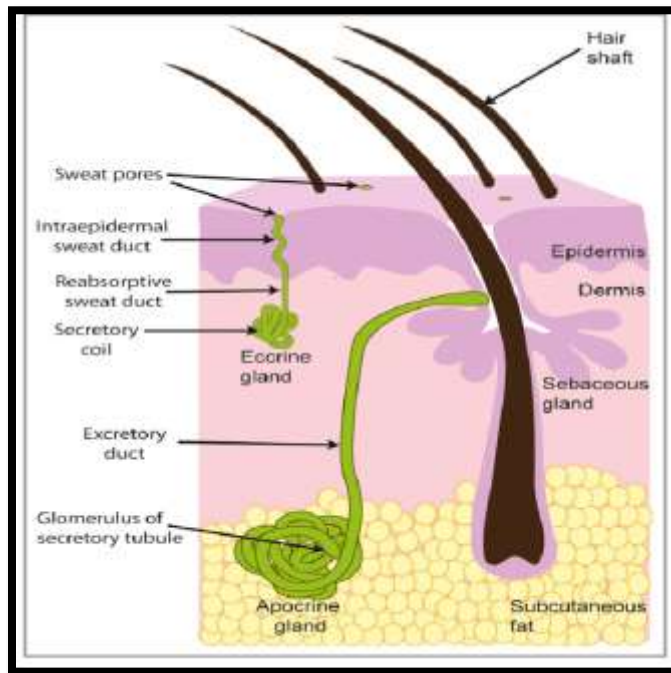


Fig.1: Structure of skin

- **Eccrine sweat glands:** Eccrine glands are often referred to as the small gland variety, but are by far the most ubiquitous type of sweat gland. Humans have ~2–4 million eccrine sweat glands in total and are found on both glabrous (palms, soles) and non-glabrous (hairy) skin. Gland density is not uniform across the body surface area.^[9] In fact, most of the variability in regional and whole-body sweating rate within and between individuals is due to differences in sweat secretion rate per gland, rather than the total number of active sweat glands. This is the most effective means of thermoregulation in humans. Eccrine sweat glands also participate in ion and nitrogenous waste excretion. In response to emotional or thermal stimuli, sweat glands can produce at least 500 mL to 750 mL in a day.^[10]

- **Apocrine sweat glands**

Apocrine glands, which are associated with a hair follicle, are located mainly in the axillae, perineal, and scalp regions. The apocrine gland secretes lipids, steroids and cholesterol.^[11] There are 2 main types of secretory glands: exocrine glands and endocrine glands. Exocrine glands remain connected with the surface epithelium and secrete their products through ducts. They are subclassified as merocrine (or eccrine), apocrine, and holocrine.^[12] Although the exact function of apocrine glands varies depending on the gland's location, apocrine glands are believed to be an evolutionary remnant of an odorous organ of animals. For example, the scent glands of the skunk are modified apocrine-type structures.

- **Apoeccrine sweat glands:** Apoeccrine glands are described as having a seven-fold higher sweat secretion rate than eccrine glands. They are developed during puberty from an eccrine-like precursor and contributed up to 45% of sweat glands found in the axillary region.

1.2. The Mode Of Action Of Available Deodorant In Market

Perspiration itself is almost odourless. Most of the odour that accompanies perspiration is caused by the action of bacteria. Deodorants reduce this odour in one of three ways.

(A) Deodorants that kill or inactivate bacteria contain antiseptic substances, such as alcohol, formaldehyde, and boric acid. Chlorine compounds, e.g. hypochlorite and chlorhexidine, work by killing bacteria which may be responsible for the odour.

(B) Deodorants that mask perspiration odor contain perfumes. Essential oils and such disinfectants as carbolic acid simply mask the odour, making it less offensive.



(C) Relying on the use of antimicrobial agents to inhibit the growth of body odour-forming microbiome.^[13]

1.3. Advantages of Natural deodorant over Synthetic:

- 1) Natural deodorant is the modern trend in the field of beauty and fashion.^[14]
- 2) Deodorant products that are free from parabens, aluminium, alcohol and artificial preservatives, are getting very talk about with in the market due to the rising demands for safe, Natural material and organic products.
- 3) Antibacterial agents such as quaternary ammonium compounds like triclosan, aluminum salt and aromatic odor-masking agent are now found in deodorant materials.
- 4) Antibacterial agents have been found to be effective against skin bacteria are irritants or sensitizers.

1.4. Characteristics Of antiperspirant & deodorants

- 1) It shouldn't irritate the skin.
- 2) It needs to be safe and non-toxic.
- 3) Easy to apply and sticks well to the skin.
- 4) Covers up body odour with a nice scent.
- 5) Shouldn't ruin clothes.
- 6) Soaks up sweat or stops smelly bacteria from growing.^[15,16,17]

1.5. Application

- 1) The application of the formulated deodorant roll-on in cocoa butter, corn starch and sodium coconut oil extends beyond mere cosmetic enhancement, offering multifaceted benefits for skin care and freshness.
- 2) Cocoa butter, corn starch, Lavender oil and coconut oil, the key ingredients in the formulation, each contribute unique therapeutic properties that target various skin concerns.
- 3) Cocoa butter is known for its antioxidant and clove oil anti-inflammatory properties, which help to combat free radical damage and soothe irritation. Additionally, coconut oil delivers essential hydration and nourishment, leaving the skin soft, smooth, and radiant.
- 4) The subsequent sections of this research article will delve into the detailed formulation process, evaluation methods, and scientific findings to provide a comprehensive understanding of the Control body odor applications and benefits in skincare.^[18]

2. OBJECTIVE

- 1) To prevent or mask body odour caused by bacterial breakdown of perspiration.
- 2) To evaluate allergic contact dermatitis from a widely used Antibacterial deodorant.
- 3) To Develop a product that effectively neutralizes body odor for extended periods.
- 4) To Incorporate ingredients with antibacterial properties to inhibit the growth of odor-causing bacteria.
- 5) To Formulate a product that soothes and moisturizes the skin to prevent irritation and dryness commonly associated with deodorant use.
- 6) To Ensure the formulation provides long-lasting protection against odor and bacterial growth throughout the day.

3. NEED OF THIS PRODUCT

- 1) Responding to the increasing consumer preference for natural and organic products, this formulation incorporates ingredients like coconut oil, cocoa butter, and essential oils to meet market demands.
- 2) There's a need to create a deodorant that effectively neutralizes body odor while also providing long-lasting freshness (effective odour control).
- 3) In response to concerns about hygiene and bacterial growth, there's a need for a deodorant that offers antibacterial properties to maintain cleanliness and prevent unpleasant odors.
- 4) Many consumers seek products that are gentle on the skin, so there's a need to develop a deodorant roll-on that contains soothing ingredients like coconut oil and lavender oil to minimize irritation and discomfort.
- 5) With the inclusion of ingredients like sodium bicarbonate and corn starch, there's an opportunity to innovate in the deodorant market and differentiate this product from others by offering unique benefits such as moisture absorption and odor Control.

4. DRUG PROFILE & EXCIPIENTS PROFILE

4.1. Cocoa butter



fig.2: Cocoa butter

| Sr.No. | Attributes | Details |
|--------|-----------------------|--------------------------------------------------------------------------------------------------------------------|
| 1 | Synonyms | Theobroma oil, cacao butter, cacao beans, semina theo-bromatis. |
| 2 | Biological Source | Theobroma cacao Linn. |
| 3 | Family | Sterculiaceae |
| 4 | Chemical Constituents | Glycerides of stearic (34%), palmitic (25%), oleic (37%) acids, linoleic acids and arachidic acid. ^[19] |

Uses

- Cocoa butter is used in cosmetics and can be found in various skin creams, hair conditioners, and moisturizers.
- Nourishes and protects the underarm skin.
- They are Antioxidant property of cocoa clears the dead cells of the skin to give the body a fresh.

4.2.Corn starch



Fig.3. Corn starch

| Sr.No. | Attributes | Details |
|--------|-----------------------|------------------------------------------------------------------------------------------|
| 1 | Synonyms | Corn flour, amylacea,maize starch |
| 2 | Biological Source | Endosperm of the kernel. |
| 3 | Family | Poaceae |
| 4 | Chemical Constituents | Amylopectin, amylose, Chemical formula C ₂₇ H ₄₈ O ₂₀ . |

Uses

- Excellent absorbent qualities of corn starch help you stay dry all day by absorbing moisture and perspiration.^[20]
- Additionally, it stops the development of microorganisms 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 a calming effects on the skin making it suitable for individuals with sensitive or irritated skin.

4. 3. Sodium bicarbonate**Synonym:** Beaking soda**Source:** Sodium bicarbonate is a white solid that is crystalline but often appears as a fine powder. It has a slightly salty, alkaline taste resembling that of washing soda (sodium carbonate).**Uses:**

- It is used as a disinfectant and it is also act as Natural antibacterial agents.
- It is used to protect armpits from bad smell and irritation.^[21]
- It is use in odor prevention odourizer

4.4.Coconut Oil**Fig. 4: Coconut Oil**

| Sr.No. | Attributes | Details |
|--------|-----------------------|------------------------------------------------------------------------------------------------------|
| 1 | Synonyms | Coconut oil, coconut butter, copra oil. |
| 2 | Biological Source | Endosperm of coconut, <i>Cocos nucifera</i> L. |
| 3 | Family | Palmae |
| 4 | Chemical Constituents | Caprylic acid, 2%; capric acid, 50–80%; lauric acid, 3%; and myristic acid about 1%. ^[22] |

Uses

- It is useful as a nonaqueous medium for the oral administration of some medicaments.
- The combat odor-causing bacteria and provides a pleasant, subtle scent smelling clean and reduce bacteria.

4.5. Castor oil



Fig.5: Castor oil

| Sr.No. | Attributes | Details |
|--------|-----------------------|-----------------------------------------------------------------------------------------------------------|
| 1 | Synonyms | Castor bean oil, castor oil seed, oleum ricini, ricinus oil, oil of Palma christi, cold-drawn castor oil. |
| 2 | Biological Source | Seeds of Ricinus communis Linn. |
| 3 | Family | Euphorbiaceae |
| 4 | Chemical Constituents | Ricinoleic acid ^[23] , isoricinoleic, stearic, and dihydroxy stearic acids, vitamin E. |

Uses

- castor oil, is a monounsaturated fatty acid that can help lock moisturize into your skin
- It's an ingredient in some moisturizers, cosmetics and deodorants. But that doesn't mean you should use pure castor oil on its own as a skin care product.

4.6. Lavender Oil



Fig.6. Lavender Oil

| Sr.No. | Attributes | Details |
|--------|-----------------------|------------------------------------------------------------------------|
| 1 | Synonyms | Lavender |
| 2 | Biological Source | Flowers of Lavandula angustifolia by steam distillation |
| 3 | Family | Lamiaceae |
| 4 | Chemical Constituents | Linalool, linalyl acetate, terpinen-4-ol, and ocimene. ^[24] |



Uses

- This essential oil gets rid of body odor and fights bacteria the essential oil is effective at reducing anxiety and skin problems.
- This essential oil's scent degrades compounds in your sweat and keeps you Smelling fresh all day.

4. 7. Clove oil



Fig.7: Clove oil

| Sr.No. | Attributes | Details |
|--------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Synonyms | Clove buds, Clove flowers. |
| 2 | Biological Source | Flower buds of <i>Eugenia caryophyllus</i> Thumb. |
| 3 | Family | Myrtaceae |
| 4 | Chemical Constituents | Eugenol ^[25] , acetyl eugenol, gallotannic acid, α - and β -caryophyllenes, methyl furfural, gum, resin, and fibre. |

Uses

- Deodorants cover up the smell of body odor, usually with fragrances.
- Antiperspirants stop or dry up perspiration or sweat.
- They do this by temporarily blocking the pores where sweat comes from.

4.8. Mogra oil



Fig.8: Mogra oil



| Sr.No. | Attributes | Details |
|--------|-----------------------|---------------------------------------------------------------------------------------------------|
| 1 | Synonyms | Jasmin flower |
| 2 | Biological Source | Ripe seeds of Hydnocarpus kurzii warb; Hydnocarpus weghtiana and Hydnocarpus anthelmintica. |
| 3 | Family | Oleaceae |
| 4 | Chemical Constituents | Benzle acetate, Methyl benzoate, methyl Sali-cytate, Benzyle benzoatesalicylic acid , Jasmineine. |

Uses

- Mogra essential oil is useful for wound healing, moisturizing, and nourishing the skin.
- Mogra water has soothing ingredients that can support irritated, itchy, dry skin and even prevent acne outbreaks and pleasant smell.
- Jasmine essential oil has been known to reduce stress & anxiety, increase energy levels, clear headaches, and even promote better sleep.

4.9. Formaldehyde

Formaldehyde-releasing agents are sometimes used as preservatives in antimicrobial deodorants to prevent bacterial growth and extend the product’s shelf life. However, due to potential health concerns, some companies are moving towards alternative preservatives.

5. MATERIALS AND EQUIPMENT

- 1. Mixing bowls:** For mixing the ingredients to prepare the deodorant Roll -on formulation.
- 2.Measuring instruments:** weighing balance for accurate measurement of ingredients.
- 3.**Corn starch into powder form.
- 4.Heating apparatus:** Such as a water bath or microwave, for melting and liquefying cocoa butter and coconut oil if needed.
- 5.Stirring rods or spatulas:** For thorough mixing and homogenization of the formulation.
- 6.pH meter:** To monitor and adjust the pH of the deodorant roll-on formulation, ensuring optimal stability and skin compatibility.
- 7.Sterile containers:** To store the prepared antibacterial deodorant roll on formulation, maintaining hygiene and preventing contamination.
- 8.Packaging materials:** such as transfer the deodorant solution in glass container for storage and distribution.

• **Formula**

Table no.1: Formulation

| Sr. No | Ingredients | Category | Quantity Taken |
|--------|--------------------|----------------------------------------------|----------------|
| 1) | Cocoa butter | Antioxidant | 3 gn |
| 2) | Corn starch | Decrease sweat, odor and absorb Perspiration | 4 gm |
| 3) | Sodium bicarbonate | Antibacterial agents | 2 gm |
| 4) | Coconut oil | Moisturizer and odor-fighting | 8 ml |
| 5) | Castor oil | Hydration | 2 drops |
| 6) | Lavender oil | Fragrance, antimicrobial | 2 ml |
| 7) | Clove oil | Anti-inflammatory | 1 ml |
| 8) | Mogra oil | Fragrance | 2 ml |
| 9) | Formaldehyde | Preservative | 2 drops |

Steps

- 1) Firstly collect all the required Ingredients and weigh it
- 2) Take a small bowl mix of Sodium bicarbonate With corn starch.
- 3) Then add cocoa butter and Coconut Oil melted in China dish in water bath.
- 4) After melted cocoa butter in corn starch and Sodium bicarbonate add in mix coconut oil.
- 5) mix properly with continous Stirring.
- 6) Then add other oil like clove oil , Castor oil land our choice in any fragrance add like Lavender oil and mogra oil.Mix well properly.
- 7) Then add formaldehyde as a Preservative in antimicrobial deodorant to prevent bacterial growth.
- 8)Transfer the Deodorant solution in a suitable container.

9) Pack and labelled it into air tight container.

6. EVALUATION TEST

Evaluation Parameters for deodorant roll-on formulation:

6.1. Physical evaluation:

| Sr.No. | Physical Parameters | Observation |
|--------|---------------------|--------------|
| 1 | Colour | Light Yellow |
| 2 | Consistency | Semi solid |
| 3 | Odour | Pleasant |

6.2. Determination of pH:

The pH of formulation was determined using digital PH paper.



Fig.9: Determination of pH

6.3. Spreadability

For determination of Spreadability excess of sample was applied in between two glass slides and was compressed to uniform thickness by placing 25 gm. of weight in pan. The time required to separate two slides, i.e. time in which upper glass slide moves over lower plate was taken as a measure of Spreadability.

Formula -

$$S = m \times l/t$$

Where,

S - Spreadability

m - Weight tied to upper slide

l - Length moved on glass slide

t - Time taken

6.4. Viscosity :

Viscosity is a statement of resistance of a liquid to flow, the higher the viscosity the greater the resistance. ^[26] Viscosity was measured using a Brookfield viscometer with spindle 2 in RPM 100. The result of deodorant roll form viscosity was 0.651 Pa.s (651 cps) with plastic flow properties since the preparation was included in the non-newton liquid. The viscosity of the non-newton liquid with the plastic flow properties of the deodorant preparation has a range between 0.25584 and 3.19452 Pa.s (255.84-3194.52 cps). The higher the viscous the dosage will be, the more dilute.

6.5. Drying time test

The drying time test is carried out by observing the time it takes for the preparation to dry, i.e. the time from which deodorant roll-on begin to be applied to the skin until a dry layer is completely formed. The requirement for the mongering dosage time is 9-10 min. ^[27] Where deodorant drying time rolls on for 10 s which dries faster because It alcohol container.

6.6. Stability test:

Stability test was carried out at room temperature (25oC) and 45oC for two weeks. The samples were observed for sweating, and solution deformation phase separation. When the solution was out of shape or oil droplet could be seen on the surface of the deodorant roll-on the system indicated stable and vice versa. Colour no change of the formulations were also observed. ^[28]



6.7. Homogeneity test:

The homogeneity of powder deodorant is more homogeneous than roll-on deodorant because of its separated if it is kept at room temperature during the 1st week until the four week during storage, while after heating with water bath at 80°C gives homogenous preparation. The homogeneity test aims to see whether the active substance has been evenly distributed into the base or all ingredients are mixed homogeneously.

6.8. Skin Irritation test:

Allergies to deodorants and antiperspirants are a form of contact dermatitis. Often these allergies are caused by fragrances, but other chemicals in the product can also cause them. If you have a deodorant allergy, you may find that hypoallergenic or natural products keep you from reacting

7. RESULT

Table no.2: Evaluation tests result

| Sr.No | Test | Formulation |
|-------|-----------------|--------------------|
| 1) | Colour | Light yellow |
| 2) | Odour | Pleasant |
| 3) | Consistency | Semisolid |
| 4) | pH | 6.3 |
| 5) | Spreadability | Easily spreadable |
| 6) | Viscosity | 0.651 pa.s(651cps) |
| 7) | Drying time | 9-10 min (10s) |
| 8) | Stability | Stable |
| 9) | Homogeneity | Homo |
| 10) | Skin Irritation | No irritation |

The Deodorant roll-on was formulated by Using cocoa butter corn starch and Sodium bicarbonate .The formulation were light yellow in colour. The formulations were shiny, on application to the skin formulation work to stop the development of bacteria that cause odour on the skin.To help cover up smell and cooling effect. The consistency and homogeneity of formulation were good. The result of this study showed formulation had semisolid consistency. The formulation were found homogenous, easily Spreadability and the normal pH is 4.5 to 6.8.

The Evaluation Parameters are in the normal range, so considering this formulation is more effective than Other Marketed deodorant.

Conclusion

Topical antibacterial herbal deodorant roll-on formulation was prepared by using cocoa butter corn starch, and sodium bicarbonate as the main drug, which was already known to have Antioxidant, Anti-inflammatory Antimicrobial, antibacterial and Antiperspirant activity and a deodorant roll-on Stick is a type of personal care product intended to help reduce sweating and body odour.Thus,this deodorant roll-on stick formulation could be the safe and efficacious remedy for treating this dermatological disorders and could be safe alternative to synthetic Antibacterial, Antiperspirant deodorant roll-on .The Preparation was found to be stable. It showed good spreadability, the Preparation helps to prevent odor,producing bacteria from growing and keep smelling fresh.

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