



“FORMULATION AND EVALUATION OF HERBAL DEODORANT STICK”

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Abstract:

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 aluminium 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 Bees wax, Virgin coconut oil, Chamomile oil & Sandalwood oil. Chamomile oil & Sandalwood oil are reported to possess antibacterial activity. Herbal deodorant sticks were prepared and characterized for physical observations, pH measurement, softening point test (Softening time), breaking load test (Breaking point test), Spreadability, stability test and antibacterial study. The result data shows that prepared herbal deodorant stick is equally stable in comparison with marketed deodorant sticks and has shown significantly comparable antibacterial effect.

Keyword: Deodorant; Herbal; Bees wax; Marketed Deodorant Stick; Antimicrobial

INTRODUCTION:

Deodorant sticks are used to control body Odour. These products are made by blending active ingredients with waxes, oils, and silicones and moulding the mixture into stick form. Body odour 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 Odourless, 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 sweat its smell. Odour control can be achieved by various means - basic hygiene (washing with soap and water) is the most important but also by antiperspirant, fragrances or any combination of these. Basically, deodorants and antiperspirants are two different ways to prevent odour. Deodorants are perfumed preparation, which mask but do not actually affect perspiration, it can also work by creating a more acid, inhospitable environment to odour producing bacteria, while antiperspirants clog or block the pores, cutting down on the amount of perspiration that leaves the body, thus giving the bacteria less to feed on ^[1,2].

Natural deodorants are the modern trend in the field of beauty and fashion. 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, aluminium, and neurotoxins found in commercial deodorants and antiperspirants [4, 5]. This research study was carried out by selecting the Chamomile oil & Sandalwood oil ^[6] which was reported to have antibacterial activity.



Fig 1. Chamomile oil

Sweat glands secretion is by itself odourless, and armpit malodour is caused by the microbial biotransformation of the odourless secretion into volatile odorous molecules. ^[1] Therefore, a satisfactory deodorant product could prevent the growth and activity of the degrading apocrine gland secretion bacteria like *Staphylococcus epidermidis* and *Corynebacterium* species. Nowadays, in most deodorant products, antibacterial agents such as quaternary ammonium compounds like triclosan, aluminium salts, and aromatic odour-masking agents are used. ^[2] Aluminium salts, in spite of their suitable antibacterial effect, increase the risk of Alzheimer's disease and breast and prostate cancers. ^[3-6] many of other antibacterial agents found to be effective against skin organisms are irritating or sensitizing. ^[6] There is also the risk of resistance to ordinary antibiotics. Therefore, herbal extracts possessing antibacterial effects against staphylococci and aerobic *Corynebacterium* form are alternatively available for the treatment of armpit odour ^[7-9] among plants, Chamomile oil is a good candidate due to the presence of angelic acid, tiglic acid and phenolic acid with suitable antibacterial, antimicrobial and antioxidant effects against the *Corynebacterium* species responsible for the sweat odour. ^[10]

History of Chamomile Oil, Sandalwood oil, Coconut oil and Beeswax:

Chamomile is one of the most ancient medicinal herbs known to mankind. Its history dates back as far as the ancient Egyptians who dedicated it to their Gods due to its healing properties, particularly when used for the treatment of acute fever, known at the time as Ague. While it was first believed to be a gift from Ra, the Egyptian Sun God, Chamomile was previously used in ancient Egypt as part of the embalming oil used to preserve Pharaohs in their tombs and as a skincare treatment by women of nobility, as shown in hieroglyphics. Chamomile was also used by Romans in medicines, beverages, and incense.



Fig 2. Chamomile

The Anglo-Saxons considered Chamomile among the nine sacred herbs and used it for ceremonies as well as for healing. During the middle Ages, the Roman species of Chamomile was used as a strewing herb, which basically helped to create a fresh, fragrant atmosphere at public gatherings and celebrations. When stepped upon, the oil sacs in the flower would release their fruity fragrance in the air. A simple stroll through a Chamomile field will give you a similar experience. Chamomile was also added to beer for its bitter taste during the middle Ages, but was later replaced by hops. Cultivation of Chamomile began in the 16th century, and later, Chamomile became a mainstay in the black bags of doctors in Europe and the earliest days of the United States, due to its diverse health benefits.

Sandalwood has a sacred 4,000-year-old history of being mentioned in Sanskrit and Chinese manuscripts. The oil was used in religious rituals, and many deities, temples & sacred carvings were crafted from its soft wood. The ancient Egyptians imported the wood and used it in medicine, embalming and ritual burning to venerate their gods. In Buddhism, it is considered to be one of the three incenses integral to Buddhist practice, together with aloes wood and cloves.



Fig 3. Sandalwood oil

Depression, anxiety and insomnia were thought to be improved by sandalwood and was believed to promote spiritual practices, peaceful relaxation, openness and "grounding." It is used in many death ceremonies to help the crossing over, and to comfort mourners as well as in many forms of initiation rites to open the disciples' mind to receive consecration. In the Zoroastrian Temples, it burns in sacred fires to soothe the troubles of all humanity. It is used by the Jewish, the Buddhist, the Hindus, as well as almost every other belief system for its vast diversity in attributes.

Coconut oil has been used for thousands of years by some of the world's healthiest cultures. Studies conducted in Papua New Guinea and the Polynesian Islands, where the diet consists primarily of coconut and is high in saturated fat but low in cholesterol and sucrose, have shown stroke and heart disease to be completely absent. Studies of ancient cultures alone should rebuff the preposterous claims against coconut oil and saturated fats.



Fig 4. Coconut oil

In the past, coconut oil has been the target of negative public relations campaigns from competitor oil industries. This misinformation led the mainstream away from coconut oil, but recently coconut oil has gained recognition as one of the healthiest oils in the world with extensive benefits.

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 beekeeping is an Egyptian painting from 2400 B.C.



Fig 5. Beeswax

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.

Advantages of Drugs:

- ✚ Digestive upset, such as indigestion, nausea,
- ✚ wound healing, including ulcers and sores
- ✚ Anxiety relief
- ✚ Easing skin conditions like eczema or rashes
- ✚ Anti-inflammation and pain relief for conditions like back pain, neuralgia, or arthritis

- ✦ Promoting sleep
- ✦ Anti-inflammatory
- ✦ Manage anxiety
- ✦ Support wound healing
- ✦ Guard against skin cancer
- ✦ Fight bacteria

Disadvantages of Drugs:

- ✦ Skin irritation
- ✦ Allergies
- ✦ Carnauba Wax can cause dry skin, acne, rashes, inflammation, dermatitis, dizziness, nausea, blurred vision, and eye dryness, irritation, or burning

What is a Stick Deodorant?

A stick deodorant is a type of deodorant that comes in the form of a solid stick. It is applied directly to the skin, typically under the arms, to provide long-lasting odour protection. Stick deodorants are usually made with a combination of sweat-absorbing ingredients, like aluminium chloride, and fragrance. Choose a deodorant formula that glides smoothly and doesn't leave white marks on clothes.



Fig 6. Deodorant stick

Advantages of deodorant stick:

- ✦ It blocks the creation of the bacteria that leads to body odour
- ✦ Deodorants are scented to mask the odour resulting from bacteria
- ✦ Deodorants commonly carry alcohol and few include anti-microbial ingredients which helps to decrease bacteria
- ✦ They ward off sweating in the best way
- ✦ The aluminium contained in majority of deodorants reacts with sweat to create a plug within the sweat glands. These plugs lessen wetness, and thereby, lower the chance for the development of bacteria

Disadvantages of deodorant stick:

- ✦ Skin Sensitivity
- ✦ Residue And White Marks
- ✦ Environment And Volatile Organic Compounds
- ✦ Triclosan And Your Health
- ✦ Skin Allergies

Ingredients:

General Formulation:

Table No: 1 General Formulation of Deodorant Stick.

Sr.no	Ingredients	Quantity	Properties
1	Chamomile oil	5ml	Soothing
2	Sandalwood oil	5ml	Moisturizing
3	Bees wax: coconut oil	15:5	Thickening agent

Uses of Ingredients:**1. Chamomile oil:**

The oil is rich in flavonoids, sesquiterpene, and other beneficial compounds, contributing to its anti-inflammatory, soothing, and calming properties.

The oil is a popular treatment for rashes and eczema.

2. Beeswax:

It is thickening agent.

Bees wax help retain moisturizing skin.

Bees wax is widely used in cosmetics product.

3. Sandalwood:

It has anti-inflammatory properties that may help soothe the skin and reduce inflammation.

It is also a natural astringent that can help tighten the skin and reduce the appearance of pores.

Sandalwood Oil may also help reduce the signs of ageing and improve skin lustre.

4. Coconut oil:

Coconut oil is gentle on sensitive skin.

The antibacterial properties of coconut oil are effective against odour-causing bacteria.

Coconut oil in natural deodorants doesn't block pores.

Drug profile:**1. Chamomile oil:**

Synonym-Matricaria chamomilla,

Family- Asteraceae

Odour-Sweet and fresh

Colour-yellow or white ray flowers

Melting point and boiling point-161 °C

Chemical composition- terpenoids, flavonoids, and lactones, including matricin and apigenin.

2. Sandalwood oil:

Synonym-yellow sandalwood, lignum Santali

Family-Santalaceae

Odour-Strong and fragrant

Colour-Yellowish or pale reddish

Melting point & boiling point-276 °C

Chemical composition-It contain 95% two isomeric, sesquiterpene alcohols, α -sotalol, β -sotalol.

3. Beeswax:

Synonym-Yellow wax, Cera alba

Family-Apidae

Odour-Agreeable and honey like

Colour-Yellow or white

Melting point & boiling point-62 to 64 °C

Chemical composition-80% Myricyl, cerotic acid, melidssic acid.

4. Coconut oil:

Synonym-coconut butter, copra oil

Family-Palmae

Odour-Bland slight coconut odour

Colour-Transparent

Melting point & boiling point-24-25°C

Aim and Objective:

- ✚ Deodorant's purpose is to cover or mask the body's natural odours.
- ✚ Deodorant may contain perfumes, alcohols, or other cosmetic ingredients.
- ✚ Antiperspirants may also reduce body odour, although this is not their primary purpose.

Plan of work:

- ✚ Physical appearance
- ✚ Melting point
- ✚ Acidity test

Evaluation Parameter:

- ✚ PH parameter
- ✚ Softening point
- ✚ Breaking point
- ✚ Spreadability

Formulation method:

1. Method of Preparation of Herbal Deodorant Stick.

Bees wax was taken in a China dish and placed into water bath which was set to 75°C, for 4 - 5 minutes. Careful attention was paid to this process to ensure that the temperature is not too high. Quick melting was ensured & to avoid charring. On confirming the complete melting of Beeswax, it is removed from water bath; virgin coconut oil, Chamomile oil and sandalwood oil were added drop wise and mixed well (table 1). The solution was poured into the pre lubricated container & allowed to settle for 24hours. Different concentration of Bees wax was used to check its physical stability.

Table 1: Composition of the different formulation

Sr.no	Ingredients	S1	S2	S3	S4	S5
1	Chamomile oil	0.34	0.67	1	1.33	1.66
2	Sandalwood oil	0.34	0.67	1	1.33	1.66
3	Beeswax: coconut oil	1:0.34	2:0.67	3:1	4:1.33	5:1.66

2. Physical stability of the Bees wax:

In order to become better acquainted with Bees wax, an experiment was conducted. The wax was melted in varying ratios with virgin coconut oil in a water bath, swirled to combine the melted mixture and let them sit overnight to set up. The next day it was poked, scraped, squished, and examined. When looking at the ratios, the first number is the Bees wax, the second is the coconut oil, so 1:0.34 is 1 part wax to 0.34 parts oil, while 2:0.67 is 2-part wax to 0.67 parts coconut oil.

3. *In-Vitro* Evaluation of Deodorant Sticks:

Physical Observations, pH Measurement, Softening Point Test (Softening time), Breaking load test (Breaking point test), Determination of Spreadability, Stability test and Antibacterial study were carried out using standard protocols and compared with two different Marketed Deodorant Stick.

4. Antibacterial activity of formulated Herbal Deodorant Stick:

The agar-well diffusion standard cup plate technique was used to determine the antimicrobial activity by using sabouraud's dextrose agar [Hi- media]. The melted media was seeded with the suspension of microorganisms and allowed to solidify. The formulations were aseptically transferred to the Hi-media in Petri-dish with the help of sterile forceps. The formulated herbal deodorant stick was kept for incubation in an incubator at 30°C for 5-7 days. The assessment of antimicrobial activity was based on the measurement of the diameter of the zone of inhibition in mm.

5. Physical observation:

Physical observation of S1, S2, S3, S4 and S5 were studied and the results are tabulated in table 2. The results indicate that the formulated S5 had compatible physical observation which was comparable with that of the S1, S2, S3 & S4.

Table 2: Physical observation

Sr.no	Formulation	Colour	Odour	Texture	Appearance	Fragrance
1	S1	Cream	Pleasant	Smooth	Dull	Strong
2	S2	Cream	Pleasant	Smooth	Dull	Strong
3	S3	White	Pleasant	Smooth	Glossy	Mild
4	S4	Cream	Pleasant	Smooth	Dull	Strong
5	S5	Cream	Pleasant	Smooth	Glossy	Strong

6. Evaluation of pH:

The pH of S1, S2, S3, S4 & S5 was found to be from 6.69 to 6.84 which are suitable for the human skin and non-irritant upon application (Table 3).

Table 3: Evaluation of pH

Sr.no	Formulation Code	pH
1	S1	6.69
2	S2	6.71
3	S3	6.73
4	S4	6.82
5	S5	6.84



Fig 7. S5

7. Evaluation of Breaking point

Breaking point was done to determine the strength of deodorant stick. The weight was gradually increased by a specific value (10 gm) at specific interval of 30 second and weight at which breaks was considered as the breaking point. The result of breaking point is displayed in table 4.

Table 4: Evaluation of Breaking point

Sr.no	Formulation Code	Breaking Point
1	S1	20
2	S2	30
3	S3	50
4	S4	100
5	S5	100



Fig 8. S5

8. Evaluation of Spreadability:

Spreadability of S2 & S5 was tested and found to have excellent Spreadability which are tabulated in table 5.

Table 5: Evaluation of Spreadability.

Sr.no	Formulation Code	Observation
1	S1	Intermediate
2	S2	Excellent
3	S3	Intermediate
4	S4	Intermediate
5	S5	Excellent

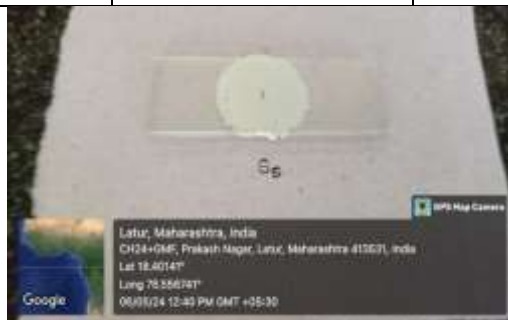


Fig 9. S5

9. Stability test:

Sweating is an excess of oil or solvent occurred onto the surface of the deodorant sticks. Sweating can be seen clearly if the sample is unstable. Table 6 shows that all the sticks were stable upon storage for 2 weeks at room temperature.

Table 6. Stability test

Sr.no	Formulation Code	Colour change	Sweating	Melting
1	S1	NO	NO	NO
2	S2	NO	NO	NO
3	S3	NO	NO	NO
4	S4	NO	NO	NO
5	S5	NO	NO	NO

Table 7. Physical characteristics of S1, S2, S3, S4 & S5.

	S1	S2	S3	S4	S5
Category	Deodorant	Deodorant	Deodorant	Deodorant	Deodorant
Ingredients	Chamomile oil, sandalwood oil, coconut oil & beeswax	Chamomile oil, sandalwood oil, coconut oil & beeswax	Chamomile oil, sandalwood oil, coconut oil & beeswax	Chamomile oil, sandalwood oil, coconut oil & beeswax	Chamomile oil, sandalwood oil, coconut oil & beeswax
Fragrance	Strong	Strong	Strong	Strong	Strong
Fragrance strength	Mild	Mild	Mild	Mild	Mild
Spreadability	Easy to spread	Easy to spread	Easy to spread	Easy to spread	Easy to spread
Staining	Do not stain	Do not stain	Do not stain	Do not stain	Do not stain
Wash treatment	Easily washed off with water	Easily washed off with water	Easily washed off with water	Easily washed off with water	Easily washed off with water
Post wash	No stains	No stains	No stains	No stains	No stains
observation	Mild or strong	Mild or strong	Mild or strong	Mild or strong	Mild or strong

Formulation 1:

Sr.no	Ingredients	Quantity
1	Chamomile oil	0.34ml
2	Sandalwood oil	0.34ml
3	Bees wax	1gm
4	Coconut oil	0.34gm

**Fig 10. S1**

Formulation 2:

Sr.no	Ingredients	Quantity
1	Chamomile oil	0.67ml
2	Sandalwood oil	0.67ml
3	Bees wax	2gm
4	Coconut oil	0.67gm



Fig 11. S2

Formulation 3:

Sr.no	Ingredients	Quantity
1	Chamomile oil	1ml
2	Sandalwood oil	1ml
3	Bees wax	3gm
4	Coconut oil	1gm



Fig 12: S3

Formulation 4:

Sr.no	Ingredients	Quantity
1	Chamomile oil	1.33ml
2	Sandalwood oil	1.33ml
3	Bees wax	4gm
4	Coconut oil	1.33gm



Fig 13: S4

Formulation 5:

Sr.no	Ingredients	Quantity
1	Chamomile oil	1.66ml
2	Sandalwood oil	1.66ml
3	Bees wax	5gm
4	Coconut oil	1.66gm



Fig 14: S5

Conclusion:

An herbal antibacterial deodorant stick was formulated using Bees wax, virgin coconut oil, Sandalwood oil & Chamomile oil. It was evaluated with various in-vitro evaluation parameters like physical observation, pH, softening point, breaking point, Spreadability & stability. Two Marketed deodorant sticks were considered and subjected to the similar in vitro evaluation parameters as that of the prepared herbal deodorant sticks. The results obtained from the research study shows that prepared herbal deodorant stick (S5) is equally stable in comparison with other formulated deodorant sticks (S1, S2, S3&S4). It has also shown significantly comparable antimicrobial effect, although further studies are required to scale up the preparations & evaluate accordingly.

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