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Formulation and evaluation of antibacterial 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 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 Sunflower wax, Virgin coconut oil, Rosemary oil & Lavender oil. Rosemary oil & Lavender 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 prepared sticks were also compared with two different Marketed Deodorant Sticks. 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; Sunflower wax; Marketed Deodorant Stick; Antimicrobial

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 odor. Isovaleric acid, for example, is one chemical compound that gives sweat its smell. Odor 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 odor. Deodorants are perfumed preparation, which mask but do not actually affect perspiration, it can also work by creating a more acid, inhospitable environment to odor-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, aluminum, and neuro-toxins found in commercial deodorants and antiperspirants [4, 5]. This research study was carried out by selecting the Rosemary oil & Lavender oil [6] which was reported to have antibacterial activity.

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2. Material and methods

2.1. Method of Preparation of Herbal Deodorant Stick (HDS)

Sunflower 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 sunflower wax, it is removed from water bath; virgin coconut oil, lavender oil and rosemary 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 sunflower wax was used to check its physical stability.

Table 1 Composition of the different formulation

S. No.	Ingredients	HDS 1	HDS 2	HDS 3
1	Sunflower Wax : Virgin Coconut Oil	1:6	1:7	1:8
2	Lavender oil	2 ml	2 ml	2 ml
3	Rosemary oil	2 ml	2 ml	2 ml

2.2. Physical stability of the sunflower wax

In order to become better acquainted with sunflower 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 sunflower wax, the second is the coconut oil, so 1:2 is 1 part wax to 2 parts oil, while 1:5 is one part wax to five parts coconut oil (by weight).

2.3. *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 (MDS 1 & MDS 2) [7, 8].

2.4. 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 [9].

3. Results and discussion

From the experiment where the wax was melted in the varying ratios with coconut oil, it was found that at lower concentrations, more creaminess was produced**,** that settles into long - lasting skin tackiness. Hence, it was concluded that HDS 3 was optimum i.e with 1:8 ratio of sunflower wax & virgin coconut oil**.** Physical Observations, pH Measurement, Softening Point Test (softening time), Breaking load test (breaking point test), spreadability, Stability test and Antibacterial study of HDS 3 were carried out using standard protocols and compared with two different Marketed Deodorant Sticks (MDS 1 & MDS 2). From results data, it shows that prepared herbal deodorant stick is equally stable in comparison with marketed deodorant sticks and has shown significantly comparable antibacterial effect (Table 2-9).

3.1. Physical observation of HDS and MDS

Physical observation of HDS 3, MDS 1 and MDS 2 were studied and the results are tabulated in table 2. The results indicate that the formulated HDS 3 had compatible physical observation which was comparable with that of the MDS 1 and MDS 2. In fact the HDS3 had pleasant odour when compared to the MDS 1 and MDS 2 which had strong odour.

Table 2 Physical observation of HDS and MDS

S.No	Formulation	Color	Odor	Texture	Appearance	Fragrance
1	HDS 3	Cream	Pleasant	Smooth	Glossy	Pleasant
2	MDS 1	Yellow	Strong	Smooth	Dull	Strong
3	MDS 2	White	Pleasant	Notsmooth	Dull	Pleasant

3.2. Evaluation of pH

The pH of HDS3, MDS1 and MDS2 was found to be from 6 to 8 which are suitable for the human skin and non-irritant upon application (Table 3).

Table 3 Evaluation of pH

S.No	Formulation Code	pH
1	HDS 3	7
2	MDS 1	8
3	MDS 2	6

3.3. Evaluation of Softening point

The softening point is of interest in hot climate especially during handling, storage and display in pharmacy window. Table 4 shows the softening point of HDS3 which was comparable to the commercial MDS1 and MDS2 formulation.

Table 4 Evaluation of softening point

S.No	Formulation Code	Softening point(^{o}C)
1	HDS 3	76
2	MDS 1	60
3	MDS 2	48

3.4. 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 5.

Table 5 Evaluation of Breaking point

S.No	Formulation Code	Breaking point
1	HDS 3	50
2	MDS 1	80
3	MDS 2	30

3.5. Evaluation of Spreadability

Spreadability of HDS 3, MDS 1 and MDS 2 was tested and found to have excellent spreadability which are tabulated in table 6.

Table 6 Evaluation of Spreadability

S.No	Formulation Code	Observation
1	HDS 3	Excellent
2	MDS 1	Excellent
3	MDS 2	Intermediate

3.6. 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. Table7 shows that all the sticks were stable upon storage for 2 weeks at room temperature.

Table 7 Stability test

S.No	Formulation Code	Color change	Sweating	Melting
1	HDS 3	No	No	No
2	MDS 1	No	No	No
3	MDS 2	No	No	No

Table 8 Comparison of Physical characteristics of HDS3 with marketed products

Parameters	HDS 3	MDS 1	MDS 2
Product Name	Herbal Deodorant Stick	Indus Valley Natural Deodorant	BRUT
Category	Deodorant	Deodorant	Deodorant
Ingredients	Sunflower Wax Virgin Coconut Oil Lavender Oil Rosemary Oil	Propyleneglycol ,Aloe vera leaf juice, Sodium state, Glycerin, Witch hazel, Glyceryl laurate, Matricaria chamomilla aqueous extract, Capryliccapric triglyceride, coconut oil, Ascorbic acid, *Humuluslupulus* extract, Lemon grass oil and Zinc ricinoleate	Cyclopentasiloxane, Aluminum Zirconium, Tetrachlorohydrex GLY, PPG-14 Butyl Ether, Stearyl Alcohol, Hydrogenate Castor Oil, Talc, PEG-8 Distearate, Parfum, BHT, Sodium Lactate, Benzyl Salicylate, Citral, Citronellol, Coumarin, Geraniol, Hydroxycitronellal, Limonene, Linalol
Fragrance	Pleasant	Strong	Unpleasant
Fragrancestrength	Mild	Strong	Mild
Spreadability	Easily spreadable	Easily spreadable	Easily spreadable
Staining	Do not stain clothes	Do not stain clothes	Do not stain clothes
Washtreatment	Easily washed off with water	Easily washed off with water	Easily washed off with water
Postwash observation	No stains	No stains	No stains
	Very mild or No fragrance	Very mild or No fragrance	Strong fragrance

3.7. Antibacterial activity of formulated Herbal Deodorant Stick

The antibacterial activity of Herbal Deodorant Stick was studied. The results obtained from the studies were shown in figure 1 as well as in table 9. The zone of inhibition for HDS and MDS formulations were calculated. HDS 3 formulation showed a maximum zone of inhibition than MDS 1 and MDS 2 formulation. A significant result was obtained for HDS formulation against *Pseudomonas aeruginosa, Staphylococcus aureus* and *Escherichia coli*, which were found to be 14mm, 18mm, and 16 mm respectively due to the synergistic effect produced in the HDS 3 formulation, which showed significant zone of inhibition and acts effectively against bacteria on the skin.

Table 9 Antibacterial activity of HDS 3, MDS 1 and MDS 2

S.No.	Formulation code	Zone of inhibition (mm)		
		Microorganisms		
		P. aeruginosa	***S. aureus***	***E. coli***
1	HDS 3	14	18	16
2	MDS 1	15	16	14
3	MDS 2	14	19	15

Figure 1 Antibacterial activity of HDS 3, MDS 1 and MDS 2

4. Conclusion

An herbal antibacterial deodorant stick was formulated using sunflower wax, virgin coconut oil, lavender oil & rosemary 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 (HDS 3) is equally stable in comparison with marketed deodorant sticks (MDS 1 & MDS 2). It has also shown significantly comparable antimicrobial effect, although further studies are required to scale up the preparations & evaluate accordingly.

Compliance with ethical standards

Disclosure of conflict of interest

No conflicts of interest.

References

[1] Hardik B. Bhatt, Dr. Nikunj B Patel. Natural Deodorants: A way towards sustainable cosmetics-June2021, International Journal of Pharmaceutical Science and Health Care, Issue 11, Vol. 3(ISSN 2249 – 5738).

[2] James G. Corrine J, Diana S , David Taylor, Ralph Calvert. 2013. Microbiological and biochemical origins of human axillary odour. FEMS Microbiology Ecology 83 (3): 527-540. doi: 10.1111/1574-6941.12054.

[3] Bouslimani A, da Silva R, Kosciolek T, Janssen S, Callewaert C, Amir A, et al. The impact of skin care products on skin chemistry and microbiome dynamics. BMC Biol. 2019;17(1):47.

[4] Dr. Satya Prakash Singh, Textbook of cosmetic science, Thakur Publication Pvt. Ltd: First Edition 2021.

[5] Mohammad AS, Mustafa G, Ali F, Niloufar S, Dariush S, Syed AF. Deodorant effects of a sage extract stick: Antibacterial activity and sensory evaluation of axillary deodorancy. J Res Med Sci. 2013;18(10):833-9.

[6] Abdullah IjazHussain, Farooq Anwar, Shahzad AliShahidChatha, Abdul Jabbar, ShahidMahboob, Poonam Singh Nigam, Rosmarinus officinalis essential oil: antiproliferative, antioxidant and antibacterial activities, Braz J Microbiol, Oct 2010 ;41(4): 1070-8.

[7] Monica Borikara, PallaviLondaseb, Formulation and Evaluation of Deodorant stick with polyglyceryl-3-caprylate, International journal of current engineering and scientific research (IJCESR), Volume-6, Issue-1, 2019 ISSN: 2393-8374

[8] VaibhavKhandare, SatishSakhawade, Formulation & long lasting efficacy Evaluation of Herbal based Deodorant up to 48 hours by Sniff Test Method, International Journal of Research in Finance and Marketing (IJRFM): Vol. 7 Issue 4, April - 2017, ISSN:2231-5985

[9] Debnath S, Babu MN, Kusuma G. Formulation and Evaluation of Herbal Anti-microbial deodorant Stick. Res J Topic Cosmet Sci. 2011;2(1):21-4.