



FORMULATION AND EVALUATION OF DEODORANT STICK WITH POLYGLYCERYL-3-CAPRYLATE

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ABSTRACT

Off odor of armpit is caused by microbial biotransformation of odourless secretion into volatile odorous molecules. *Staphylococcus epidermidis* and *corynebacterium* species feeds on sweat excreting bad smell. Satisfying deodorant can prevent activity and growth of degrading apocrine gland secretion bacteria. Deodorant stick with 2% Polyglyceryl -3-Caprylate was formulated and evaluated for antimicrobial efficacy. Swab test for stick with 2% Polyglyceryl -3- Caprylate after application to underarms provided good antimicrobial effect.

Keywords: Microbial transformation, Polyglyceryl -3- Caprylate *Corynebacterium* Deodorant Stick, Apocrine

1. Introduction

The resident micro flora of the human underarm skin consists of up to $10^6/\text{cm}^2$ organisms e.g. aerobic cocci, lipophilic diphtheroids and varying species of gram- negative bacteria. In the axillae two types of bacterial flora exist- coryneform bacteria and micrococcaceae such as *Staphylococcus epidermidis*. The origin of strong compared to low underarm odor is associated with a numerical dominance of coryneform bacteria. (Paye, et al. 2008). Apocrine perspiration consists of nitrogen derivatives, proteins, lipids and carbohydrates and hence it is an excellent food for bacterial metabolism. The enzymes produced by them permits the perspiration components to transform them into lower molecular weight products which are volatile and responsible for off odour (Gasparri.2017). Any compound which inhibits the growth of these micro-organisms found in the axillae exhibit deodorant properties. (Cosmetics Processes and Formulations Hand Book with

Herbal Cosmetics Technology and Formulae.1996). Active ingredients in skin care can offer a variety of benefits. They are simply ones that deliver a targeted, pharmacological or therapeutic effect to the skin.

(Meisel. 2012) Deodorants with such active ingredients are designed to reduce axillary odor. (Wilkinson & Moore. 1982) They differ from perfume because they don't only cover human stink but also reduce its production (Sarah.2012). Some of the antibacterial agents used in Cosmetics and toiletries are zinc compounds, organic acids such as benzoic acid, salicylic acid, quaternary ammonium compounds and phenols. (Eiri board of Consultants and Engineers; "Profitable Small Scale Manufacture of Cosmetics") Polyglyceryl-3caprylate is an ester of caprylic acid and polyglycerin -3. It is a multifunctional ingredient. It is used in cosmetic industry as antimicrobial agents, co emulsifier and humectants. (Lonza.2014)

2. Experimental

Polyglyceryl-3caprylate was procured from Evonik Company Pvt. Ltd. It was evaluated and tested as per the specifications provided by the company and qualitative analysis was also carried out. The chemicals were of AR (Analytical Reagent) quality and they were used for tests as such. The procured Polyglyceryl-3Caprylate was checked for its purity by performing various qualitative tests.

2.1 Evaluation of Active

2.1.1 Acid Value

10gm of substance was dissolved in 50ml of mixture of equal volumes of ethanol (95per cent) and ether, previously neutralized with 0.1 M Potassium hydroxide to phenolphthalein solution. 1ml of phenolphthalein was added and

titrated with 0.1M Potassium hydroxide until faint pink colour was observed (Indian Pharmacopoeia).

2.1.2 Saponification Value

2gm of substance was taken in 200ml flask fitted with reflux condenser. 25ml of 0.5 M ethanolic KOH and a little pumice powder was added in it and boiled under reflux on water bath for 30 min. 1ml of phenolphthalein was added in it and titrated immediately with 0.5 M Hydrochloric acid. Operation was repeated omitting the substance being examined. (Indian Pharmacopoeia)

2.1.3. Hydroxyl Value

Specified quantity of the substance was taken into a flask fitted with a reflux condenser, 12g of stearic anhydric and 10 ml of xylene was added and heated under reflux for 30 minutes. It was cooled and a mixture of 40 ml of pyridine and 4 ml of water was added and heated under reflux for further 30 minutes and the hot solution was titrated with 1 M potassium hydroxide using dilute phenolphthalein solution as indicator. A blank determination was also performed. (Indian Pharmacopoeia)

2.2 Formulation and Development of Deodorant stick

The base for deodorant stick was selected and Polyglyceryl-3Caprylate was incorporated in base in 0.5 %, 1%, 1.5%, and 2% as per the formula showed in table 1.

Table 1 Formulation of Deodorant stick

Sr no.	Ingredients (100per cent)	Base with 2 % active
1	Bees wax	6.0
2	Stearyl alcohol	7.0
3	Aluminium	11.5
4	Chlorohydrate	0.5
5	Castor oil	2.0
6	Coconut oil	1.0
7	Lavender oil	1.0
8	Talc	2.0
	Polyglyceryl-3 Caprylate	

2.3. Assessment of deodorant stick efficacy(Microbial Analysis)

Deodorantstickwith 0.5%, 1%, 1.5% and 2% Polyglyceryl-3Caprylate were tested for their antimicrobial effect.Amongst the methods of

evaluation of deodorant products, swab test is commonly used method. (Fredwell & Longfellow.1958). On the first day of the test, odor of axilla was recorded. Sample of micro flora from underarm before applying deodorant stick was taken using sterile cotton swab. It was used as a control (Sharma. 2005). Dilutions of this were prepared and subsequently plating was carried. Deodorant stick was applied on underarm. Sample of micro flora from underarm after using stick with the help of sterile cotton swab as described were taken after 10 min. Subsequently dilutions of these were prepared and plating was carried out. Number of colonies developed were counted and noted down.

2.4 Accelerated Stability Test

From microbial analysis it was found that deodorant stick with 2% Polyglyceryl-3Caprylate gave satisfactory antimicrobial effect. Hence it was further studied for accelerated stability over a period of one month. The stick was kept at room temperature, fridge (4°C) and at oven (45°C). Parameters such as colour, odour and pH were checked at these temperatures.

2.5 Break load test

The deodorant stick with 2% Polyglyceryl-3Caprylate was firmly fixed with horizontal assembly. The burette was adjusted just above the deodorant stick. A marking was made at a distance of 1.5cm from the base of the stick. The plastic container was weighed along with hook and was suspended on this 1.5cm mark. Water was released slowly from the burette into the plastic container till the stick breaks. Burette reading was added with the mass of suspended container which gave the breaking load of the stick (Bureau of Indian Standard. 1990).

2.6. Subjective Analysis

In order to access the view of people towards use of deodorant stick and effects of the developed product, subjective analysis was carried out. Subjects were selected as per their age and occupation and grouped. They were given deodorant stick to use over the period of one month. The results obtained from the collected data were tabulated.

3. Results and Discussion

Polyglyceryl-3Caprylate was procured and checked for its purity. Acid value of active was found to be 2.045. Observed Saponification value was 128.80 and hydroxyl value was found to be 598.50. Deodorant sticks with 0.5%, 1%, 1.5% and 2% Polyglyceryl-3Caprylate were prepared. The products were tested for their antimicrobial activity using swab test method. Before application of deodorant stick, numbers of colonies showed by swab test were 5×10^2 Cfu/ swab. After application, number of colonies showed by deodorant sticks with 0.5%, 1%, 1.5% and 2% Polyglyceryl-3Caprylate were 4×10^2 Cfu/ swab, 3×10^2 Cfu/ swab, 6×10^1 Cfu/ swab and 4×10^1 Cfu/ swab respectively as shown in Fig.1 (a) and (b).

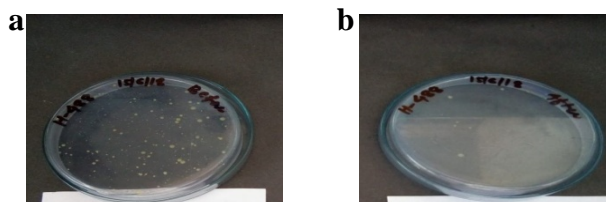


Fig. 1(a) Number of colonies present before using deodorant stick and (b) after using deodorant stick

Stick with 2% Polyglyceryl-3Caprylate showed good antimicrobial effect and hence it was tested further. The deodorant stick was subjected to accelerated tests conditions and was kept at room temperature, in oven at 45°C and in refrigerator at 4°C for one month and checked for color, odor and pH change. Colour and odour of stick was found to be stable. pH of the stick was found to be increasing with time within limit of standard. Assembly for break load test was set as shown in Fig 2. Break load test of stick was found to be 100.



Fig. 2 Break Load Test

Subjective analysis of stick was carried out for 20 subjects and as per collected data results are represented graphically. Maximum percentage of subjects agreed for performance of the stick in the view of freshness, fragrance, non stickiness and non irritancy as shown in

Fig.3. 65% subjects frequently used deodorant stick as shown in Fig.4. 78% of subjects found reduction in off odour of perspiration which is graphically shown in Fig.5. Hence the deodorant stick with 2% Polyglyceryl-3Caprylate was found to give satisfactory deodorant properties.

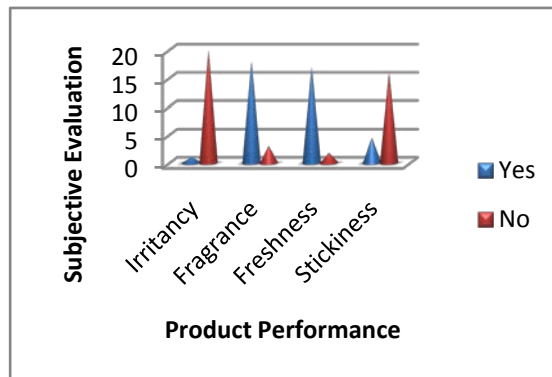


Fig.3 Product Performance

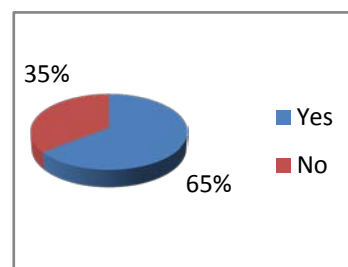


Fig.4 Frequency of usage

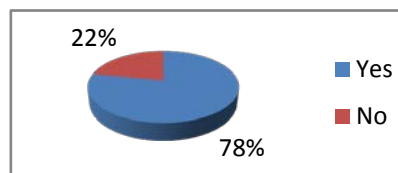


Fig.5 Reduction in off odour of perspiration

4. Conclusion

Deodorant stick with Polyglyceryl-3Caprylate was prepared which was found to be stable in the parameters of colour, odour and pH. From the results of microbial analysis, accelerated stability tests and subjective analysis, it was concluded that the deodorant stick with 2% Polyglyceryl-3Caprylate had a good emollient and antibacterial property.

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