

# Foot Moisturizing Bars

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**Abstract:** The skin on the feet is unique and different to the skin in other parts of human body therefore special care is required to pamper the feet. A 'Foot Moisturizing Bar' is a solid moisturizer, resembling a soap bar but is actually an ointment with moisturizing benefits. It acts by providing an occlusive layer thus retaining skin moisture. When applied to the skin surface, body warmth will slightly melt the bar. Thus providing an occlusion over the skin with proper spreading providing a protective barrier against cold climate and eventually prevents the drying out of feet. Being anhydrous, slightly greasy and occlusive imparts water proof application. The occlusive nature of the product is influential in reducing trans-epidermal water loss (TEWL). Foot moisturizing bars are unique, natural, safe and very effective for the treatment of dry, chapped feet and cracked heels. It contributes to the foot care range with added advantages than most marketed foot creams. These bars leave a smooth and feathery touch from the very first application.

**Keywords:** Solid moisturizer, Occlusion, TEWL

## I. INTRODUCTION (FOOT PROBLEMS AND TRANS-EPIDERMAL WATER LOSS)

A large proportion of adult population appears to suffer foot discomfort in one form or another. Still it is seen that, very little personal attention is lavished upon foot health. Although foot fatigue affects adversely both the physical and mental wellbeing of the sufferer, it is an undeniable truth that the feet, while needing more care and attention than most other parts of the body, in actual fact generally get far less. [1]

The skin needs three elements .It needs blood flow, moisture and more recently researchers have validated the significance of lipids (commonly called as skin oils).A 2015 German study published in Skin Pharmacology and Physiology noted the lipids that make up the lipid barrier on the surface of the skin, scientifically called the stratum corneum, play the biggest role in the overall health of the skin.[2] Water is absolutely essential for the normal functioning of the skin and especially its outer layer, the stratum corneum (SC). Water is essential to skin function and the degree of hydration is closely linked to the vital plasticity and barrier function of the skin [3][4]. Loss of water from the skin must be carefully regulated, a function dependent on the complex nature of the SC. The retention of water in the SC is dependent on two major components: (1) the presence of natural hygroscopic agents within the corneocyte (collectively referred to as natural moisturizing factor) and (2) the SC intercellular lipids orderly arranged to form a barrier to trans-epidermal water loss (TEWL). The water content of the SC is necessary for proper SC maturation and skin desquamation. Increased TEWL impairs enzymatic functions required for normal desquamation resulting in the visible appearance of dry, flaky skin.The approach to restoring water to dry skin has taken three different routes- Occlusion, Humactancy and restoration of deficient materials which may be combined. While considering foot moisturizing bars, occlusion phenomenon of moisturization consists in reducing the rate of trans-epidermal water loss (TEWL) through old or damaged skin or in protecting otherwise healthy skin from the effect of a severely drying environment. [5]

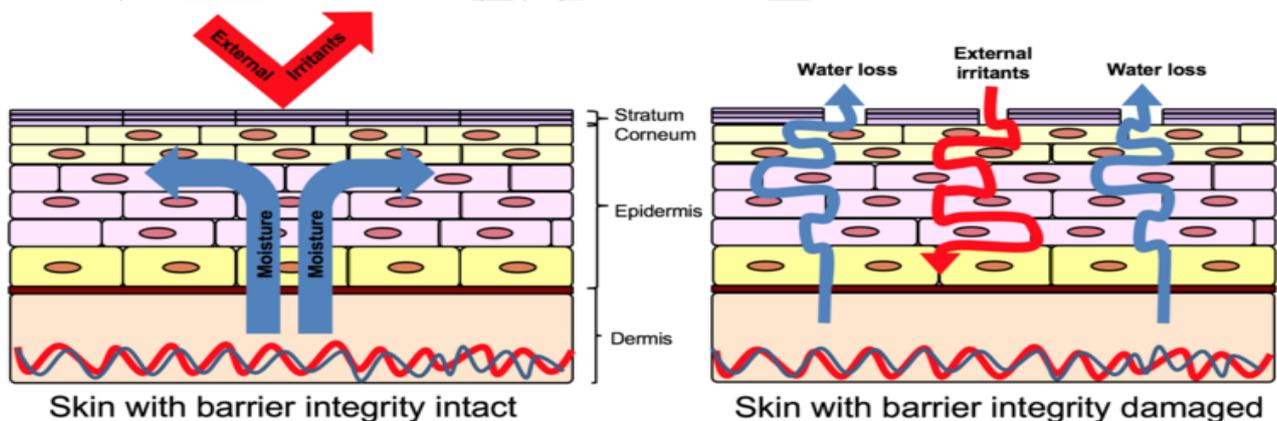


Fig.1: Illustrative diagram showing how skin barrier integrity affects the ability of the skin to retain moisture. Skin with barrier integrity intact due to moisturization (left) & Skin barrier integrity damaged due to water loss(right) [6]

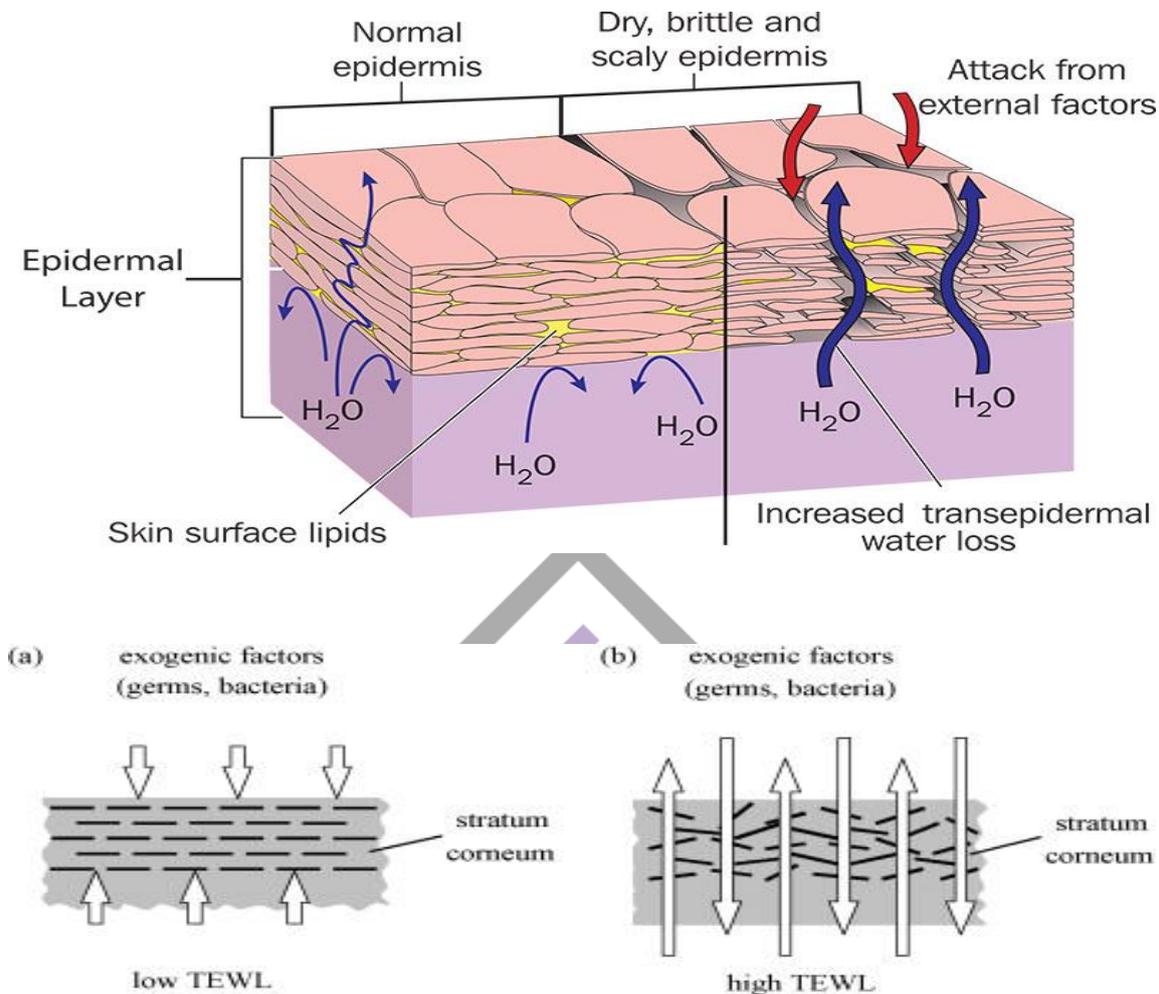


Fig 2: The skin factor needed for healthy and young looking skin [7]

### Foot Moisturizing bars-

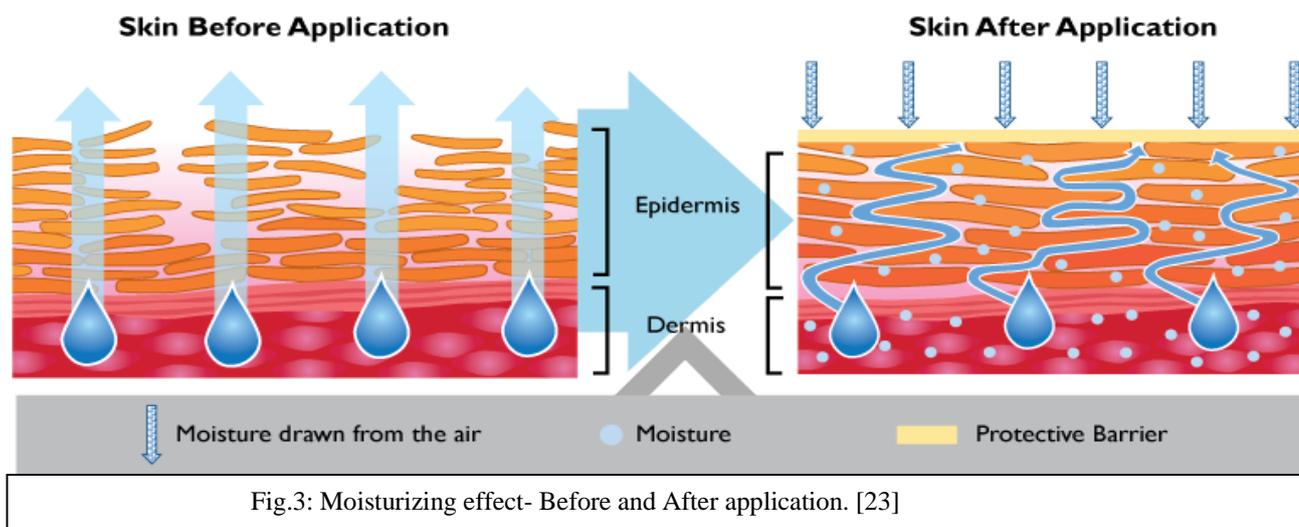
A 'Foot Moisturizing Bar' is a solid moisturizer, resembling a soap bar, but acts like an ointment. It is an innovation having some properties of an ointment, which is acting as moisturizer hence reinventing into a new classic product that is- Solid Bar Moisturizer. The foot moisturizing bars stays solid at room temperature or lower. When applied to the skin surface, body warmth will slightly melt the bar. Thus forming an occlusive layer over the skin with proper spreading providing a protective barrier against cold climate and hence prevents the drying out of the feet. The term 'Moisturizing' is possibly the most widely used. [8] Water is the only material which will plasticize the outer dead layers of the epidermis to give the much desired attribute we call soft and smooth skin. If water is more rapidly lost from the stratum corneum than it is received from the lower layers of the epidermis, the skin becomes dehydrated and loses its elasticity. [9] [10] Dry skin is noted when the moisture content is <10% and there is a loss of continuity of the SC. [11] The Moisturizing action [12,13]: This is the most vital action by which they increase the water content of SC. Hydration smoothens the skin surface by flattening the 'valleys' between the skin contour ridges. It also makes the skin surface soft, more extensible and pliable. The moisturizing action of emollients is evident maximum 30 min-1 hr after their use and usually lasts for 4 hr. [14,15]

These moisturizing bars are typically made from all natural ingredients including butters, waxes, oils like beeswax, lanolin, cocoa butter, jojoba oil etc [16,17,18]. Collectively they provide the feet with additional therapeutic benefits such as-

- Relieving aches and pains.
- Improving blood circulation.
- Eliminating foot odor.
- Smoothing the soles.

Thus these foot moisturizing bars for dry feet can treat the feet with their formula blended with ample amount of antioxidants [19] and several vitamins [20]. The skin on the feet is unique and different to the skin in other parts of human body therefore special care is required to treat the feet [21]. The clinician may describe dry skin as roughened, scaling skin with possibly some cracking. The patient may also experience reddening associated with the dry skin, but basically it is a non-inflammatory condition [22].

The moisturizing bar cosmetically is oleaginous ointment base which consists of fats, fixed oils, waxes and essential oils as well. It is anhydrous, slightly greasy and occlusive (It forms a film on skin, so it increases the skin hydration by reducing the rate of loss of surface water). It is non-dehydrating, imparting water proof application and neutral in reaction. These foot moisturizing bars are unique, natural, safe and very effective for the treatment of dry and chapped feet and cracked heels.



### Combating Dryness with Naturals-

Drying of skin is a natural process that develops with various intrinsic and extrinsic factors involved [7]. Thus, the recent advancement in the field of pharmacy and cosmetics have played an influential role in providing therapeutic effects for skin and preventing factors contributing to the ageing process. Various medicines, ointments, creams, etc either from chemicals or herbs alone or in combination of both have been designed. However, the exaggerated use of chemical agents may tend to cause some side effects, therefore the use of naturals as much as possible are empathized upon while designing of this product. Jojoba oil is one of the most popular moisturizing agents. As it is also considered as an emollient, it's capable of trapping water in the skin, keeping it hydrated [17,22]. Peppermint as an ingredient, which have antiseptic qualities and can keep odor and infection at bay [9,17]. The main chemical components of Eucalyptus oil, eucalyptol and alpha-terpineol give the essential oil a soothing, cooling vapor [24,25]. This makes eucalyptus oil useful for massage. Early research has shown eucalyptus oil may have anti-inflammatory and analgesic qualities as a topically applied liniment ingredient [26,27]. Cedarwood Essential Oil can help soothe irritation, inflammation, redness, and itchiness, as well as dryness that may lead to cracking, peeling, or blistering. [28] Clove (*Syzygium aromaticum*) is one of the most valuable essential oil that has been used in cosmetics and pharmaceutical products for its therapeutic properties. [29] The antioxidant properties and antimicrobial properties of clove oil imparts strength to the product from microbial contamination. [30]. Citronella oil has strong [antifungal](#) properties [31,32,33]. Thus essential oil blend add on therapeutic benefits.

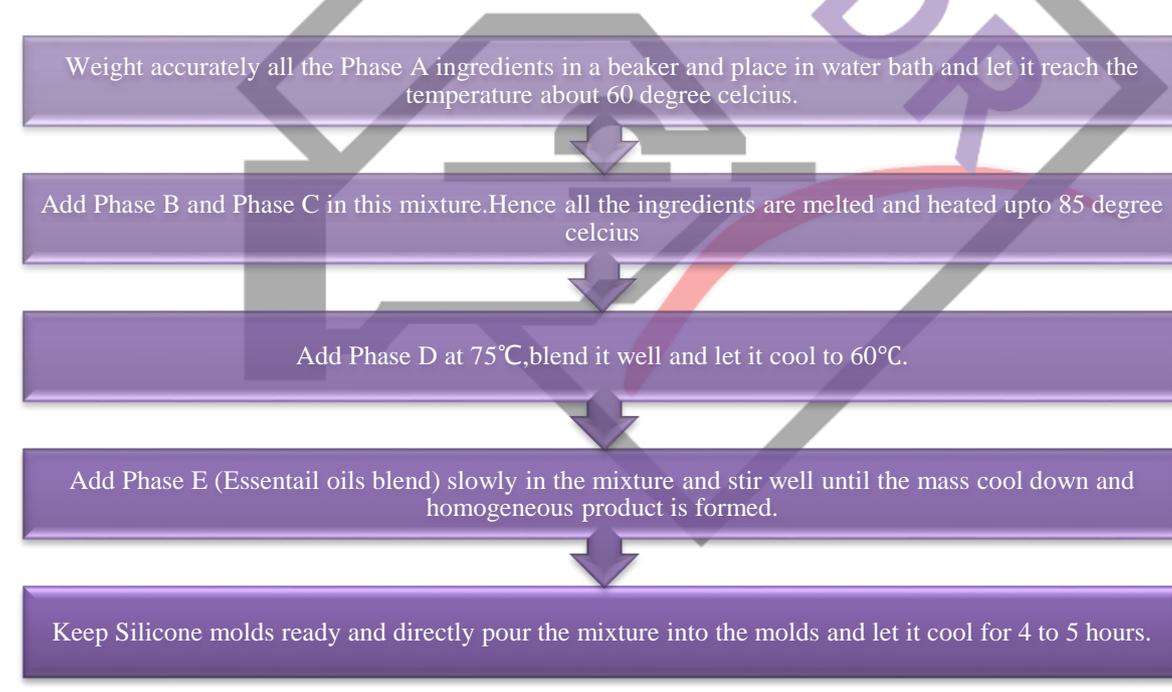
**METHOD: FORMULATION OF PRODUCT**

TABLE NO. 1 –FORMULATION TABLE

PHASES	SR. NO.	CHEMICAL INGREDIENTS	QUANTITY FOR 100%
PHASE A	1.	Beeswax	42.0
	2.	Cocoa Butter	6.0
	3.	Carnauba Wax	0.5
	4.	Petrolatum	8.0
	5.	Lanolin	3.0
	6.	Spermaceti Wax	0.5
PHASE B	7.	Jojoba Oil	14.0
	8.	Coconut Oil	16.0
PHASE C	9.	Iso Propyl Myristate (IPM)	2.0
PHASE D	10.	Vitamin.E Tocopherol	0.5
	11.	Ascorbic Acid	0.05
PHASE E	12.	<b>Essential Oils Blend-</b>	
	a.	Eucalyptus Oil	1.5
	b.	Peppermint Oil	0.5
	c.	Cedarwood Oil	1.0
	d.	Clove Oil	0.5
	e.	Citronella Oil	1.5
	f.	Camphor	1.0

Following flow chart shows the procedure for the final product

TABLE 2- Formulation procedure flowchart.

**QUALITATIVE AND QUANTITATIVE STUDY OF THE PRODUCT:**❖ **ORGANOLEPTIC PROPERTIES OF PRODUCT-**

- Appearance- Solid resembling soap bar
- Colour - Off White
- Odour - Characteristic fragrance of essential oils
-

TABLE NO.3-STABILITY STUDY OF THE PRODUCT FOR 3 MONTHS DURATION

Sr.No	Samples	pH testing		Sunlight Effect	Temperature effect		
		STANDARD VALUES	OBSERVED VALUE		0°C	25°C	45°C
1.	October 17	pH 4 to 6	4.85	No change	No change	No change	Slightly melted
2.	November17	pH 4 to 6	4.83	No change	No change	No change	Slightly melted
3.	December 17	pH 4 to 6	4.83	No change	No change	No change	Slightly melted

**RESULT-**

- ❖ Very slight change in the pH of the sample product was observed, which implies that the product is stable.
- ❖ When the product was subjected to sunlight, no change was observed at all.
- ❖ The product is stable upto 49°C temperature, afterwards it slightly melts.

**CONCLUSION-**

The product is stable maintaining acidic pH which is compatible for the topical application.

**STUDY OF MOISTURE RETENTION BY USING CORNEOMETER**

- The measurement of skin moisture content was based on Corneometer also known as Capacitance method. [35,36]
- The water content of the stratum corneum can be measured with the skin capacitance meter (Corneometer CM 825).
- The device determines the water content of the superficial epidermal layers down content to a depth of about 0.1mm expresses the values in arbitrary units. [37]
- In practice, the use of Corneometer is the technique, which measures Corneum hydration before and after application of a cosmetic. It is used in industries as it is one of the easy and most effective as well as reliable method which gives reading and prepared graph. [38,39]
- The product was tested for its moisture retention capacity. A subjective study on 10 persons was carried out and the moisturizing bars were compared with 2 other marketed sample products

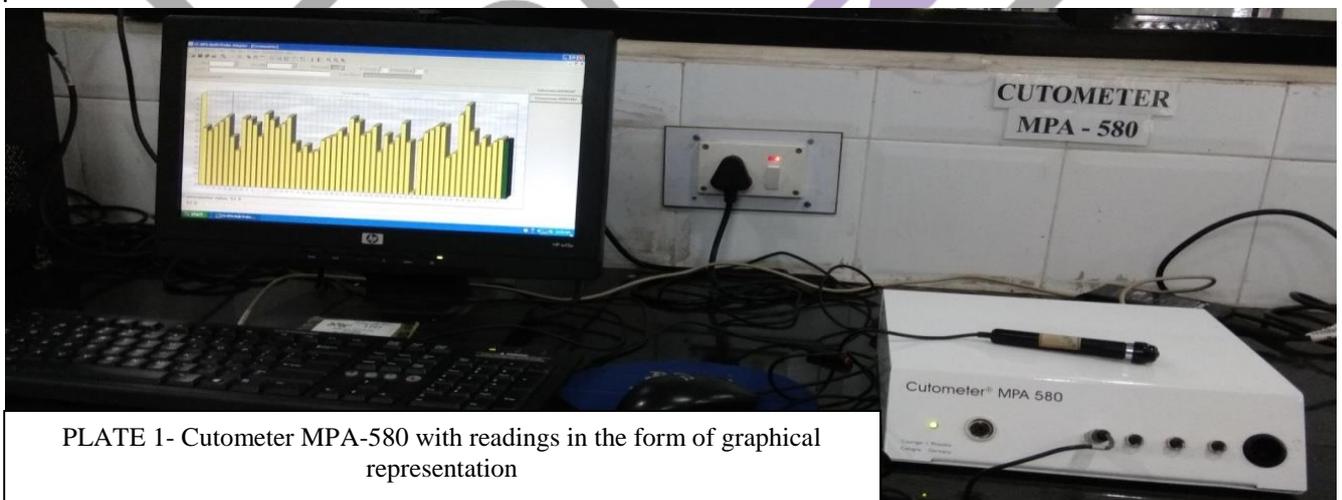


PLATE 1- Cutometer MPA-580 with readings in the form of graphical representation



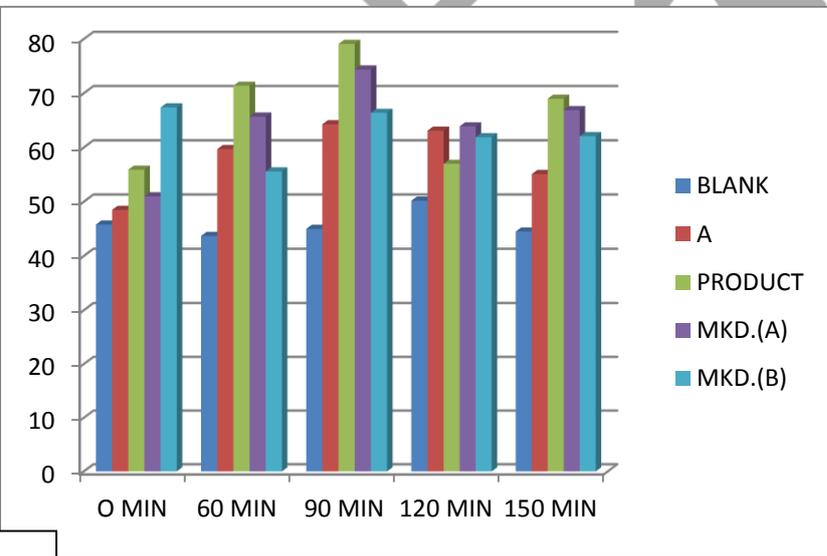
PLATE 2- Subjective study of moisture retention



PLATE 3- Cutometer MPA-580

**Procedure**

- 1) The evaluation for moisture was done on inner forearm of selected subject.
- 2) The volar forearm of subject was cleaned.
- 3) 5 blocks of 2×2cm were drawn on the inner hands of subjects for Blank (Skin Moisture), Control (Base-without actives), Product, Mkd.A and Mkd.B
- 4) The probe head was placed vertically on the skin surface on the marked sites with little pressure for one second and reading as displayed by Corneometer was noted as a blank.
- 5) Similarly the readings were taken for the control, product, Mkd.A, Mkd.B samples at 0 minute, 30 minutes, 60 minutes, 90 minutes up to 150 minutes.
- 6) The average was taken after every interval and graph was plotted.



	BLANK	A	PRODUCT	MKD.(A)	MKD.(B)
0 MIN	45.8	48.5	55.9	51	67.4
60 MIN	43.7	59.7	71.4	65.7	55.6
90 MIN	45	64.3	79.1	74.4	66.4
120 MIN	50.2	63.1	57	63.9	61.9
150 MIN	44.5	55.1	69	66.9	62.1

BLANK	Skin moisture
A	Product without active ingredient
PRODUCT	Moisturizing bar
MKD.(A)	Marketed product-FOOT CREAM
MKD.(B)	Marketed product – POMADE

TABLE 4- Designation of samples

**OBSERVATIONS-**It was observed that the Moisture retention time of the moisturizing bars was more than 120 minutes as compared to other marketed product samples which is 90 minutes.

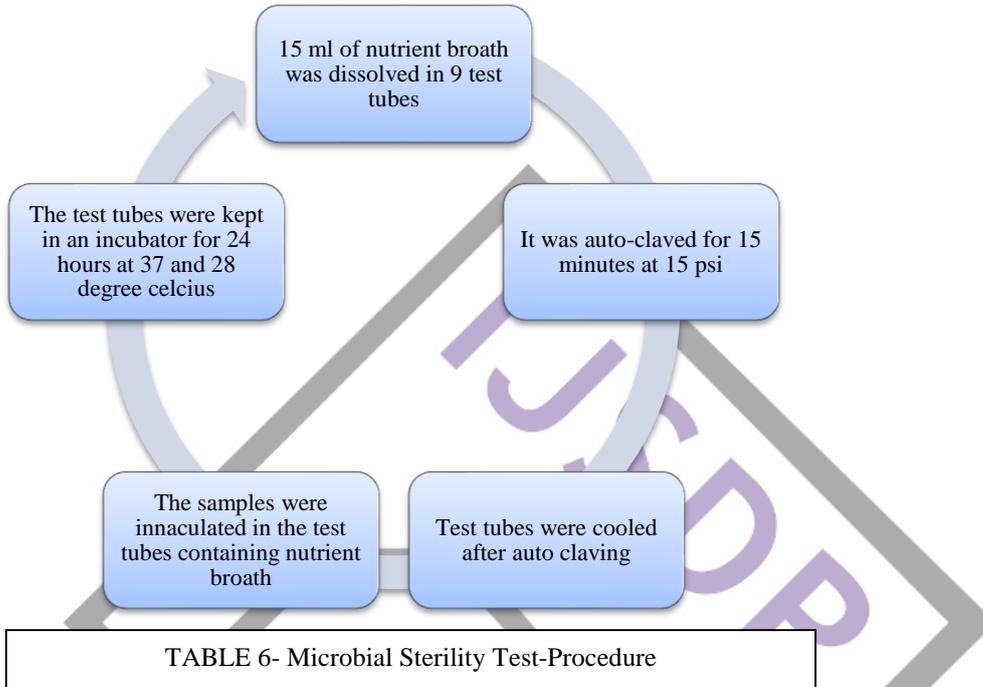
**CONCLUSION-** A highest moisture retention was observed after 90 minutes, which is maximum for the product- moisturizing bar than any other product. Further the moisturization effect was declined which is normal behavior pattern of skin. But even after 150 minutes also as compared with marketed one, the moisturizing bar still shows maximum retention.

**TO CHECK THE MICROBIAL STERILITY OF THE PRODUCT**

For a cosmetic product as a topical application form it is very important to check the sterility of the product. Sterility testing is designed to demonstrate the presence or absence of extraneous viable contaminating microorganisms in biological par enterals designed for human use. [40]

**TABLE 5-PREPARATION OF NUTRIENT BROTH-**

Sr.No.	CHEMICALS	1g/1000ml	g/150 ml
1.	Peptic Digest	5	0.75
2.	NaCl	5	0.75
3.	Beef Extract	1.5	0.225
4.	Yeast Extract	1.5	0.225



**TABLE 6- Microbial Sterility Test-Procedure**



**OBSERVATION TABLE 7-**

Sr.No.	SAMPLES	BACTERIAL GROWTH (37 temp)	FUNGAL GROWTH (28 temp)
1.	October 17	Nil	Nil
2.	November 17	Nil	Nil
3.	December 17	Nil	Nil

**RESULT-**

1. No bacterial growth was observed in the product sample.
2. No fungal growth was observed in the product sample in this study.

**CONCLUSION-** Hence the product is sterile and thus suitable and safe for usage as a foot care cosmetic for topical administration

**ADVANTAGES AND DISADVANTAGES OF THE PRODUCT-**

<b>ADVANTAGES</b>	<b>DISADVANTAGES</b>
Good moisturizing properties	Slightly greasy
Long Lasting	
Water proof	
Ease of Application	
Spill proof	
Paraben free	
Purity: No harmful chemicals and preservatives	
Low power consumption	
Portable	
Eco-Friendly packaging	

**DISCUSSION AND CONCLUSION-**

The product helps to prevent water loss from the skin. The product is Chemicals free also does not contain harmful preservatives and antioxidants like parabens, BHA and BHT. After a short stability study of 3 months it was found that the product was stable retaining its properties, efficacy and not showing any microbial activity over the period. When the product was tested with volunteers for its moisturizing effect and compared with other marketed products such as foot creams, pomade; it was found that moisture retention property was significantly more (upto 120 minutes) than those marketed product samples. Thus it is concluded that this product gives long lasting protection from dryness. Also the product is available in eco-friendly packaging hence environmental footprint providing future scope of innovation and ecofriendly market.

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