



## **Microbial Evaluation of Cosmetic Products**

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### **ABSTRACT**

Cosmetics are the products that help a person look more attractive and beautiful than his or her original appearance. Cosmetic products are used to enhance beauty by taking care of the skin and nourishing the cells. Since the 16th century, the use of cosmetics by both men and women has been common. For the isolation of microorganisms from cosmetic products, some samples were gathered, including those from skin care, hair care, perfume, and lip care. Culture media were prepared for the isolation of microorganisms. Microorganisms grew after incubation, and this growth was used to create pure culture. Microbial identification is done by colony morphology, Gram staining, motility, and biochemical tests. The growth of *Staphylococcus aureus*, *Escherichia coli*, *Aspergillus niger*, *Pseudomonas aeruginosa* was seen. Cosmetics are prepared by using non-sterile material, so they are commonly non-sterile. However, it must not contain any pathogenic organisms that cause infection or disease and must not be harmful to consumers. The goal of these projects is to test the purity of cosmetics as well as the presence of microbial contamination in cosmetic products. Contamination in cosmetic products shows education regarding the use of cosmetic products is necessary. It is found that 54.54% of the samples were contaminated.

**Keywords:**-Cosmetic products, *Staphylococcus aureus*, *Escherichia coli*, *Aspergillus niger*, *Pseudomonas aeruginosa*, contamination etc.

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### **INTRODUCTION**

Plants, animals, synthetic chemicals, and minerals are all used in the production of cosmetics. They are simply makeup products used to enhance beauty, take care of the skin, and nourish it[3]. These products help a person look more attractive and beautiful than their original appearance. These products are for external use, and cosmetics are now very important in a person's daily life. The use of cosmetic products by both men and women is common. These beauty products or makeup products are in demand in the market. Cosmetics are classified into creams, emulsions, lotions, gels, and oils, soaps, bath and shower preparations, deodorants and antiperspirants, and tooth and mouth treatments, depending on their purpose and region of use[1]. Cosmetics are used to take care of skin, hair, the body, the genital area, etc. Before the 1930s, there was not much contact between the fields of cosmetics and microbiology. It has become much more prevalent since the 1940s [10].

Since the 16th century, cosmetics have been used. Since the 1960s, *Pseudomonas aeruginosa*, *Escherichia coli*, *Staphylococcus aureus*, *Aspergillus niger*, and *Enterobacter spp.* have been isolated from cosmetic products. To a certain level, microorganisms can grow and multiply in cosmetic products. These products did not contain any contamination or pathogenic organisms, but it is necessary to check the purity of these products because they have direct contact with human skin, eyes, and hair, so the product must be free from contamination where the skin acts as a barrier and protects us from harmful, toxic elements. When a product is contaminated with pathogenic microorganisms, the risk of infection increases as it spoils and biodegrades. The contamination of original cosmetics increases when we use them and touch them regularly. Preventing product contamination and mitigating the negative effects of preservatives on health are critical steps in the manufacturing of cosmetic products. Cosmetic products do not necessarily need to be sterile; they are even made of non-sterile material. Limit values have been fixed accordingly to the type of cosmetic. Contamination in cosmetic products is reported in many other developed countries. Many cosmetic products like face wash, powder, gels, and creams are contaminated with bacteria and fungi[11]. Cosmetics rarely have serious health side effects and are always safe in use; in fact, they are beneficial for the body and skin. In cosmetics, some substances having antimicrobial activity are used to prevent the growth of microbes[10]. The majority of gel cosmetic products on the market are essentially

watery[5]. Cosmetics contaminated with *Staphylococcus aureus* cause skin infections, skin diseases, and other side effects. Contamination in cosmetics is caused by an unhygienic environment and a lack of awareness regarding cleanliness. A cosmetic product should contain a low level of microbial load whenever it is in use. For the production of cosmetics, good raw materials must be used, the product must be prepared in a sanitary manner, and sterile containers must be used in the packaging process. The presence of favourable nutrients in cosmetic products enhances the growth of microorganisms. Special additives like plant extract, fatty acids, and vitamins are the content of cosmetics. These products may get contaminated, and the special additives may act as a source of nutrients for microorganisms. Cosmetics are manufactured from biological and chemical sources. Cosmetics with a functional component are known as "cosmeceutical"[7]. Rich textures in cosmetics enhance the growth and survival chances of microbes in a product. The preservatives used during the production of cosmetics should be more stable, non-hazardous, and non-toxic and they must be active at a wide range of PH. The aim of these projects is to check for purity and microbial contamination, or the presence of microorganisms, in cosmetic products because microbial contamination is one of the major reasons for the spoilage of products, so the products must be sterile. The term "cosmetic" refers to "anything devising external parts of humans with the sole purpose of differing their appearance, cleansing them, enhancing the beauty of their natural appearance, correcting any kind of foul body odour, or keeping them in a hygienic and well-maintained condition." Another interpretation of the word "cosmetic" can be given as "articles that are used for the purpose of rubbing, sprinkling, spraying, etc." The products that are included in these experiments are shampoo, face wash, powder, aloe vera gel, scrub, conditioner, perfume, lipstick, etc. The products contain a diversity of ingredients to provide the products with their essential functional properties. Such products' PH range is typically within a range on both sides. The brands that are marketed are stored by consumers in a slightly warmer place or at room temperature. Therefore, all the physical and chemical factors that are required for microbial growth are satisfied. Cosmetic products contaminated with microorganisms due to poor manufacturing practices may have a severe adverse effect on human health. We used 11 samples in these projects, 6 of which showed microbial growth and 5 did not. The manufacturing and expiration dates are meticulously recorded. All the cosmetic products are in use. Contamination in cosmetic products shows education regarding the use of cosmetic products is very important.

**Cosmetics are contaminated by microorganisms that contain:**

Primary pollution: This type of pollution occurs in the process of manufacturing cosmetics, due to the use of unsterile raw materials and the course of production.

Secondary pollution: This type of pollution occurs when cosmetics are in use. Contamination of this type occurs when microorganisms in the air settle down on it or when we touch cosmetics with an unclean hand.

**Contamination by microorganisms after the manufacturing process can be avoided by:**

1. Do not touch the cosmetic product unless you wash your hands.
2. Clean the makeup brushes and cosmetic tools after use.
3. Use sterile or packed containers and close them after use.
4. Keep the cosmetics in a dry place.
5. Use cosmetic products as soon as possible.
6. Do not keep cosmetic products under sunlight; keep them in a clean area.

**The reasons behind the growth of microorganisms in cosmetic products are as follows:**

1. Use of ingredients contaminated with bacteria.
2. Use of raw materials of poor quality.
3. Poor manufacturing practices.
4. Touching the cosmetic product with an unclean hand.
5. Specific ingredients support the growth of microorganisms.
6. Microbes grow as a result of poor packing, shipping, or storage.

Microbe growth was observed in local brands when compared to multinational brands. From the oldest to the young once all age groups use cosmetic products, so checking the quality of those products is important.

## **MATERIAL AND METHODS**

### **Materials:-**

11 different cosmetic products are available in India. These are:

#### **Skin Care**

Face wash: Himalaya

Powder : Ponds

Aloe Vera Gel: Patanjali

Scrub : Biotique

### Hair Care

Shampoo: Sunsilk

Conditioner: Tresseme

### Perfume

Royal marriage

Axe

Ramson's extreme sky

### Lip Care

Lipstick : Maybelline

Lipstick : Faces canada

This cosmetics selection is available in Satara City's local Indian market. Their production and expiration dates were meticulously recorded.

### Used media

For the bacterial growth, use Nutrient agar.

For the growth of fungus, use Sabouraud's dextrose agar.

For the isolation of microorganisms, utilise these two agar plates.

### Procedure:-

1. All the samples of cosmetic products were gathered.
2. Nutrient Agar and Sabouraud's Dextrose Agar plates were prepared.
3. Under aseptic conditions, samples were serially diluted from  $10^{-1}$  to  $10^{-5}$  for the isolation of unknown microorganisms.
4. While preparing serial dilutions, 1 gram or 1 ml samples are taken.
5.  $10^{-4}$  and  $10^{-5}$  dilution samples were taken and spread on Nutrient Agar and Sabouraud's Dextrose Agar using the spread plate technique.
6. After that, these plates are kept in an incubator for 24 hours at 37 °C.
7. Microorganism growth was observed on agar plates after 24 hours.
8. And that expansion was used to create pure culture.
9. After that, Gram staining and motility and biochemical tests were performed.
10. Catalase test, Oxidase test, Methyl Red test, Voges-Proskauer test, Indole test, Citrate test, Urease test, Nitrate test, H<sub>2</sub>S test, by performing these tests, microbial identification was done.

### Streaking Method:-

During the first process of streaking, the spread plate method was used.

During the preparation of pure culture, the four-quadrant streaking method was used.

### Microbial Identification: -

Microbial identification is done by colony morphology, Gram staining, motility, and biochemical tests.

## RESULT

Table 1: Microorganism Identifications from different cosmetics

Cosmetic used	Bacteria isolated
<b>Skin care</b>	
Face wash - Himalaya	<i>Staphylococcus aureus</i>
Face powder - Ponds	<i>Escherichia coli</i>
Aloe vera gel - Patanjali	<i>Aspergillus niger</i>
Scrub – Biotique	<i>Staphylococcus aureus</i>
<b>Hair Care</b>	
Shampoo – Sunsilk	<i>Pseudomonas aeruginosa</i>
Conditioner - Tresseme	<i>Aspergillus niger</i>
<b>Lip Care</b>	
Lipstick - Maybelline	No Growth
Lipstick - Faces Canada	
<b>Perfume</b>	
Royal Marriage	No Growth
Ramsons extreme sky	
AXE	

## Colony Morphology:

Table 2: Microbial Morphology in six starin

Strain	Shape	Color	Margin	Elevation	Opacity	Consistency
1	Circular	Yellow	Curled	Flat	Transparent	Smooth
2	Circular	Pink	Entire	Flat	Opaque	Smooth
3	Filamentous	White	Undulate	Flat	Opaque	Dry
4	Circular	Yellow	Curled	Flat	Transparent	Smooth
5	Circular	Cream Yellow	Entire	Convex	Opaque	Moist
6	Filamentous	White	Undulate	Flat	Opaque	Dry

Table 3: Microbial identification Test done in all six starin

Strain	MR	VP	Cit	Cat	Oxi	Urea	Lac	Glu	N2	Ind	Species Name
1	-	-	-	+	-	+	+	+	-	-	<i>Staphylococcus aureus</i>
2	+	-	-	-	+	-	+	+	-	+	<i>Escherchia coli</i>
3	N	N	N	N	N	N	+	+	N	N	<i>Aspergillus niger</i>
4	-	-	-	+	-	+	+	+	-	-	<i>Staphylococcus aureus</i>
5	+	+	+	+	+	-	+	+	+	+	<i>Pseudomonas aeruginosa</i>
6	N	N	N	N	N	N	+	+	N	N	<i>Aspergillus niger</i>

Six of the 11 cosmetic products tested positive for microbial growth, while the other five tested negative. It was found that 54.54% of the samples were contaminated with microorganisms. Also, 45.45% of the samples are not contaminated with microorganisms. The growth of microorganisms was seen in locally manufactured products.

## Discussion

In recent years, there has been an increasing concern regarding the bio-contamination of cosmetic products. Numerous studies have been conducted to investigate microbial contamination in cosmetics, a phenomenon attributed to the "Age of Consumerism." The proliferation of personal care products has outpaced the growth of the consumer population significantly. Consequently, the hygienic standards required for these products have become more critical. To maintain the hygiene of cosmetic items, it is advisable to refrain from sharing them and to avoid their use in public restrooms. Several factors influence the growth of microorganisms in cosmetics, including pH levels, temperature, water availability, and the presence of preservatives. Products with high water content are particularly susceptible to microbial contamination, which can lead to alterations in their composition and potentially pose health risks to consumers.

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