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"PRESERVATIVE SYSTEMS IN HERBAL COSMETICS: A REVIEW OF MARKETED PRESERVATIVES AND THEIR EFFECTIVENESS"

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Abstract: This review explores the various preservation systems used in herbal cosmetics, with a focus on both natural and synthetic preservatives currently available in the market. Natural preservatives such as lemon oil, neem, honey, turmeric, and aloe vera are examined for their antimicrobial properties and compatibility with cosmetic formulations. The article also discusses commonly used synthetic preservatives, including parabens, aldehydes, and glycol ethers, highlighting their mechanisms, effectiveness, and safety concerns. An ideal preservative should be stable, non-toxic, and effective at low concentrations, with broad-spectrum antimicrobial activity. Although synthetic preservatives remain widely used, natural alternatives are gaining popularity due to perceived safety and consumer preference. The review concludes by emphasizing the need for further research into optimized combinations of natural preservatives that meet regulatory standards and consumer expectations.

Keywords: Herbal cosmetics, Natural preservatives, Synthetic preservatives, Antimicrobial activity, Safety concerns.

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Introduction

Cosmetics are defined by the US Food and Drug Administration (FDA) as "substances intended for cleansing, beautifying, promoting attractiveness, or altering appearance".[1,2] Cosmetics are goods that are designed to be applied externally to the human body, including the skin, hair, nails, lips, or genitalia. The European Cosmetics Directive (76/768/EEC) states that its main purposes are to clean, add fragrance, alter appearance, hide odors, and protect different body regions. Otherwise, cosmetics including foundations, compact powder, lipstick, eye liner, eyeshadow, and brushes can be harmful to skin health due to their tendency to harbor bacteria and transmit diseases [3].

In its notes of recommendations, the Scientific Committee on Consumer Products (SCCP) separated cosmetics into two groups: (a) products meant for application to the eye area or mucous membranes in children younger than three years old, and (b) other cosmetic products [4]. Cosmetic product contamination is a major risk to the business and may lead to losses in terms of both goods and cash. The color, viscosity, and smell of an object can be changed by microbes since they have access to water and nutrients [5].

The Principle of Preservation:

The process of preservation entails the use of both natural and artificial chemical preservatives in cosmetic preparations to stop microbial development-induced spoiling without changing the properties of the final product [6]. In addition, preservatives are employed to preserve the cosmetics' microbiological purity throughout manufacturing, packaging, and storage—especially for the duration of usage [7]. Self-preservation, also known as free preservation, is a technique for cosmetic preservation that does not call for the use of a preservative or other chemical element.

Types of Preservatives:

Class I (Natural preservative)

- Lemon juice
- Neem
- Honey
- Aloevera
- Sugar.

Class II (Chemical or synthetic preservative)

- Aldehyde
- Paraben
- Glycol ether

MARKET AVAILABLE HERBAL PRESEVATIVES

Natural preservatives:

Having a fantastic skincare routine that leaves us feeling clean, soft, and moisturized at the end of the day is the most soothing thing we can do. Instead of using face washes that include phthalates, parabens, or fragrances, we may use natural and organic face cleansers that work just as well without the potentially harmful chemicals and irritants.

Without the need for chemical production or processing, natural preservatives are compounds that occur naturally and can stop items from deteriorating too quickly. In many cases, these drugs are both safe and efficient. Lemon juice, sugar, aloe vera, turmeric, honey, and neem. For instance, aloe vera, sugar, honey, turmeric, neem, and lemon juice [8].

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S/NO	Preservatives	BiologicalName	Family
1.	Lemo oil	*Citrus limon*	Rutaceae
2.	Neem	*Azadirachta Indica Azadirachta juss*	Meliaceae
3.	Honey	*Apis mellifera* *Apis dorata*	Apidae
4.	Turmeric	*Curcuma longa*	Zingiberaceae
5.	Aloe vera	*Aloe barbadensis* *Aloe perryi*	Liliaceae

Table 1: Biological Names of preservatives

1.Lemon Oil:

Lemon oil is a volatile oil that is extracted using a nonheating expression method from the fresh peel of citrus-limon [L]burm fruits that are ripe or almost ripe (Family: Rutaceae). Originally from northern India, lemons are also cultivated in large quantities in countries like Sicily, Italy, and Spain. In addition to California, it is grown in Florida, Jamaica, Australia, and India. The main component of lemon oil is terpenes. Of the total, limonene and other terpenes comprise about 90%. Citral and citronellal are examples of oxygenated molecules that make up 10% of the oil. Lemon oil has a propensity to resinify, so keep it out of direct sunlight and air. In addition to being used in cosmetics, lemon oil is utilized as a flavoring [9].

Fig 1: Lemon

2.Neem:

It is composed of leaves and other aerial parts of Azadirachta indica, A. juss, and Syn: Melia azadirachta. Plants of the Meliaceae family. It is indigenous to India and is grown extensively there. It grows in a wide range of topical and subtopical locations worldwide. The neem tree has several components in different places. Meliantriol, saline, and azadirachtin are the active ingredients. Neem leaves are a source of quercetin and nimbosterol. Trunk bark is a source of nimbosterol, nimbin, nimbinin, nimbidin, and margosine. Stearic acid glycerides (20%) and oleic acid glycerides (50%) make up the majority of neem oil, which is extracted from seeds. Common antiseptic applications include neem oil and leaves.[9]

Fig 2: NEEM

3.Honey:

Honeycomb bees (*Apis mellifera* and *Apis dorsata*) secrete honey, a sugary substance. Additionally, the Apidae order of hymenoptera includes other Apis species. India, California, Australia, New Zealand, and Africa are the countries that produce honey. Honey is an aqueous mixture of 35% glucose, 45% fructose, and 2% sucrose. It also contains gum, maltose, traces of succinic acid, acetic acid, dextrin, and formic acid, coloring agents, enzymes, trace amounts of vitamins, and different flowers. Creams, lotions, and other products are made with honey, which also serves as a sweetening and soothing ingredient [9].

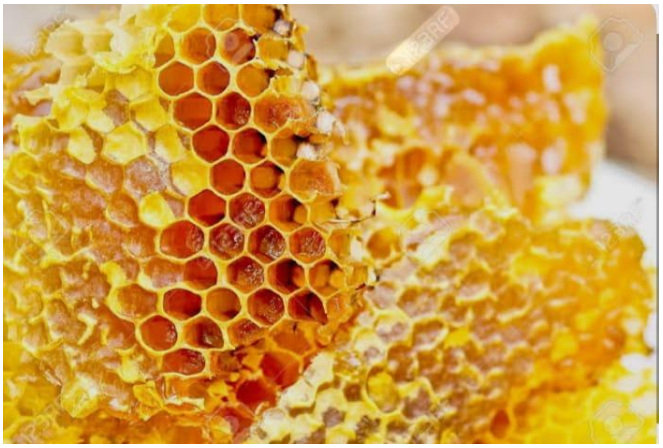

Fig 3: HONEY

4.Turmeric:

The Zingiberaceae family includes the plant *Curcuma longa*, which has both fresh and dried rhizomes. It has at least 1.5% curcumin and is cultivated in China, Malaysia, India, and West Pakistan. It can be found in every tropical nation. Curcuminoids, a yellow coloring agent, resin, copious and zingiberaceous starch grains, and volatile oils make up around 5% of turmeric. Curcumin is used as an antiseptic, expectorant, condiment, or spice, especially for ointments and lotions, and is thought to possess anti-inflammatory and anti-microbial qualities[9].

Fig 4: TURMERIC

5. Aloe Vera:

A yellow-colored crystalline substance called barbaloin, resin, and aloe emodin is found in aloe, which is the dried juice of the leaves of *Aloe barbadensis* and *Aloe perryi*, which belong to the Liliaceae family. The overwhelming majority of aloe pieces are native to Africa but are now distributed to west India and Europe. Because aloe contains anthroquinone derivatives, isobarbalin, which is found in curaco and cape aloes, is used as an irritant, purgative, and anti-fertility agent [9].

Fig 5: ALOE VERA

Synthetic preservatives:

The primary function of artificial preservatives, which are chemical substances typically produced from acids, is to increase the acidity of cosmetics, so eliminating bacteria. Although artificial preservatives are generally thought to be harmless, some of them have unfavorable and even fatal adverse effects. Examples include phenoxyethanol, parabens, and benzoates [10].

Typical artificial preservatives used in cosmetics products:

Halogen compounds in organs:

Large families of synthetic and natural chemicals that contain halogens are known as organ halogen compounds. Triflocin, methyl isothiazolinone, chlorphenamine, and chloroxylenol are a few examples.

The aldehyde:

Known as group atoms, aldehydes are organic compounds in which a carbon atom creates a single bond with another atom and a double bond with an oxygen atom. Other examples are diazolidine urea, sodium hydroxylmethyl glycinate, benzyl semiformal, imaidazolidinylurea, formaldehyde[10].

Paraben:

As esters of para-hydroxybenzoic acid, parabens are a class of para-hydroxybenzoates. Their bactericidal and fungicidal qualities make them known as preservatives. All commercially used parabens, though some are exactly like those in nature, are made by esterifying para-hydroxybenzoic acid with an appropriate alcohol,likemethanol, ethanol,or n-propanol.

Examples are butylparaben, isobutylparaben, methylparaben, and ethylparaben [10].

Glycol Ether:

A class of solvents known as glycol ethers is derived from the alkyl ethers of propylene and ethylene glycol. Examples are 2-butaoxyethanol and phenoxyethanol [10].

PRESERATIVES SHOULD HAVE IDEAL PROPERTIES:

1)Not irritating to the skin.

2) It must not be harmful.

3) It must continue to be stable both chemically and physically[11].

4) The preservatives and the other ingredients in the formulation need to work well together [12].

5) It should have a wide range of activity and work well as an antibacterial agent [13].

6) Even at low doses, it ought to be a powerful preservative.

7) It should remain effective during the course of the product's manufacturing, shelf life, and several applications.

8) It should have broad antibacterial action against fungi and bacteria [14].

9) When utilized in cosmetic products at low concentrations, it ought to exhibit remarkable antibacterial efficacy [15].

Conclusion

Herbal cosmetics must be preserved to guarantee their efficacy, safety, and market stability. Consumer trends favor natural alternatives because of safety concerns, even though synthetic preservatives are still effective. Future studies should concentrate on natural preservative blends that have been optimized and shown to be effective, acceptable by consumers, and approved by regulators.

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