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R Vidhya
Sree Abirami College of Pharmacy, Coimbatore, Tamil Nadu, India

B Kathirvel
Sree Abirami College of Pharmacy, Coimbatore, Tamil Nadu, India

LV Vigneshwaran
Sree Abirami College of Pharmacy, Coimbatore, Tamil Nadu, India

M Senthil Kumar
Sree Abirami College of Pharmacy, Coimbatore, Tamil Nadu, India

Corresponding Author:
R Vidhya
Sree Abirami College of Pharmacy, Coimbatore, Tamil Nadu, India

Review on natural and synthetic preservatives for herbal face wash formulations

R Vidhya, B Kathirvel, LV Vigneshwaran and M Senthil Kumar

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Abstract
The skin is the most exposed organ liable for providing a barrier to the external environment which will resist a good range of challenges of microbial agents and infectious agents (pathogens). Chemically synthesized drugs and additives were utilized to prepare the herbal formulation like acne face washes, antibiotic gel, and also masks are presently dominating in the market. Surprisingly these synthetic medications have several side effects and fail in treating the disease or compete with pathogenic agents. The microbiological safety has as main goal of consumer protection against potentially pathogenic microorganisms, this is ensured by chemical, physical, or physicochemical strategies. The most common strategy is based on the application of antimicrobial agents, either by using synthetic and natural compounds or multifunctional ingredients. Among the preservatives described in the positive list of regulations there are parabens, isothiasolinone, organic acids, formaldehyde releasers Triclosan and chlorhexidine chemical agents have different of antimicrobial action, this review also concentrate on natural preservatives like lemon, honey, neem, aloe vera, turmeric and sugar.

Keywords: Cosmetic preservatives, microbiological safety, natural preservatives, synthetic preservatives toxic effects preservatives efficacy

Introduction
Preservatives are chemicals or herbs that are applied to things such as food, pharmaceutical medications, paints, cosmetics, wood, and a variety of other items to prevent microbial decomposition. Preservatives prevent food from spoiling and allow it to be preserved in good shape for later use. These compounds can be both natural and synthetic. Preservatives are used in a variety of products, including sunscreens, lotions, and shampoos, as well as cleansers, toothpaste, and cosmetics, to assist prevent contamination and the growth of harmful germs [3].

Fig 1: Natural preservatives

In general, cosmetic items are altered as a result of the presence of microbes or as a result of exposure to ambient oxygen. Antimicrobial preservatives, which operate on bacteria, and antioxidant preservatives, which reduce oxidation events and the generation of free radicals, are two types of chemicals that can be employed to prevent harmful consequences [3]. In regulatory terminology, a preservative is a natural or synthetic compound that is used to prevent the growth of microorganisms [4]. This inhibition should be effective across a broad activity spectrum and last for at least as long as the cosmetic product, if not longer.

Furthermore, the antibacterial action must be effective enough to avoid microorganism adaptation and resistance to the preservation system [6]. Cosmetics are a nutrient-rich milieu that encourages the growth of microorganisms, which influences the efficacy of preservatives [3].

Classification of preservatives

Class I (Natural preservative)
Example; Lemon juice, Neem, Honey, Aloevera, Sugar.
Class II (Chemical or synthetic preservative)
Example; Aldehyde, glycol ether, paraben,

Natural preservatives

Nothing is more relaxing than engaging in a wonderful skincare routine that leaves us feeling soft, clean, and moisturized at the end of the day. Rather than using face washes that contain parabens, phthalates, or scents, we may use natural and organic face cleansers that provide the same results without the hazardous chemicals and irritants. Natural preservatives are substances found in nature that can prevent objects from degrading prematurely without the use of chemical processing or synthesis. Frequently, these medications are both safe and effective. Lemon juice, neem, honey, turmeric, aloe vera, and sugar. For example: lemon juice, neem, honey, turmeric, aloe vera, and sugar [4].

Table 1: Biological names of preservatives

S.no	Preservatives	Biological name	Family
1	Lemon oil	Citrus limon	Rutaceae
2	Neem	Azadirachta Indica Azadirachta juss	Meliaceae
3	Honey	Apis mellifera Apis dorsata	Apidae
4	Turmeric	Curcuma longa	Zingiberaceae
5	Aloe vera	Aloe barbadensis Aloe perryi	Liliacae

1. Lemon

Lemon oil is a volatile oil extracted from the fresh peel of ripe or nearly ripe citrus-limon [L]burm fruits using a non-heating expression procedure (Family: *Rutaceae*). Lemons are native to northern India, although they are also widely produced in nations like Spain, Italy, and Sicily. California, Florida, Jamaica, Australia, and India are among the places where it is grown. Terpenes make up the majority of lemon oil. Limonene and other terpenes make up roughly 90% of the total. 10% of the oil is made up of oxygenated molecules like citral and citronellal. Keep lemon oil away from air and light because it has a tendency to resinify. Lemon oil is used as a flavouring agent as well as in cosmetics [1].

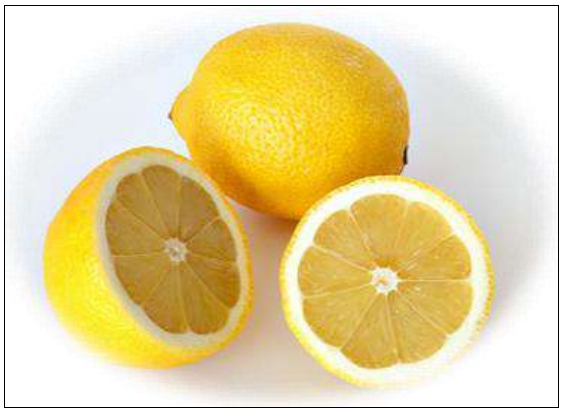

Fig 2: Lemon

2. Neem

It is made up of *Azadirachta indica*, *A. juss*, Syn: *Melia azadirachta* leaves and other aerial parts. Meliaceae is a family of plants. It is native to India and is widely grown there. It can be found growing in a variety of topical and subtopical places around the world. Different elements are found in different areas of the neem tree. Azadirachtin, saline, and meliantriol are the active components. Nimbosterol and quercetin are found in neem leaves. Nimbosterol, nimbin, nimbinin, nimbidin, nimbosterol, and margosine are all found in the trunk bark. Neem oil is derived from seeds and primarily consists of oleic acid glycerides (50%) and stearic acid glycerides (20%). Neem leaves and oil are commonly used as antiseptics [1].

Fig 3: Neem

3. Honey

Honey is a sugar secretion deposited in honey comb bees, *Apis mellifera*, *Apis dorsata.* And other species of Apis belong in to family: *Apidae* order hymenoptera. Honey is produced in Africa, Australia, New Zealand, California and India. Honey is a aqueous solution of glucose 35%, fructose 45% and sucrose about 2% and the other constituents of honey are maltose, gum, traces of succinic acid, acetic acid, dextrin and formic acid, colouring matters, enzymes and traces of vitamins and various flowers are also found in honey. Honey is used as a demulcent and sweetening agent, it s used in the preparation of creams, lotions and etc [1].

Fig 4: Honey

4. Turmeric

It consists of dried, as well as, fresh rhizomes of plant known as *Curcuma longa*, belonging to family: *Zingiberaceae*, It contains not less than 1.5% of curcumin, if is found throughout the tropical countries and especially cultivated in West Pakistan, India, Malayisa and China. Turmeric contains about 5% of volatile oils, resin, abunt and zingiberaceous starch grains and yellow colouring substance known as curcuminoids, curcumin is reported to possess anti-microbial and anti-inflammatory actions used as an antiseptic, expectorant a condiment or spice, and especially for ointments and creams [1].

Fig 5: Turmeric

5. Aloe

It is the dried juice of the leaves of *Aloe barbadensis*, *Aloe perryi* and belong in to family: *Liliaceae*, most of the speices of aloe are indigenous to Africa but now introduced in to west India, Europe, aloe contain yellow coloured crystalline substance known as barbaloin, resin and aloe emodin. isobarbalin ispresent in curaco and cape aloes, due to aloe in (anthroquinone derivatives) it is used as an irritant purgative and anti-fertility agent [1].

Fig 6: Aloe

Natural preservatives and their uses

Table 2: Preservatives and its uses

S. No	Natural preservatives	Uses
1	Lemon oil	Lemon oil extracted is used as a flavoring agent and The Juice is used as a source of citric acid and Vitamin C concentrates.
2	Neem	Neems are used as anthelmintic, anti-fungal, anti-diabetic, anti-bacterial, anti-viral, contraceptive and sedative. Neem oil is used in soap, shampoo, balms and Cream as well as toothpaste. Neem gum is used as a preparation of special purpose food (For diabetic)
3	Honey	It is used to antiseptic and applied to burns and wounds. It is used in preparation of creams, lotions and soft drinks.
4	Turmeric	1. Anti-inflammatory agent. 2. Stimulant, tonic. 3. Aromatic and carminative.
5	Aloe vera	Aloe causes griping and is usually combined with carminatives or antispasmodic like belladonna or hyoscyamus.

Advantage of natural preservatives

Natural preservatives cover a broad pH range, consumers generally prefer natural preservatives over synthetic preservative, manufactures use natural preservatives to extend the shelf life of their produces, reduces spoilage and retin smell or taste, after all the goods need to survive the shipping process and they might be sitting in a store or warehouse for a while before someone buys them [7].

Drawbacks to natural preservatives

Fewer options available, often don't always inhibit microbial growth as well as synthetic counterparts, often lack broad spectrum activity (for example, a natural preservative may inhibit the growth of *Staphylococcus aureus* or Steph in a formulation but not mould), and can cause skin sensitization and immunological reaction to the natural preservatives that increases over time [8].

Synthetic preservatives

Artificial preservatives are chemical substance which are commonly derived from acids and their main preservatives function is by raising the acidity of cosmetics which kills the microorganisms. Artificial preservatives are mostly considered as to be safe but several have negative and potentially life –threatening side effects such as. Examples: benzoates, parabens, phenoxyethanol [6].

Common synthetic preservatives found in cosmetic products

Organ halogen compounds

Organ halogen compounds are large classes of natural and synthetic chemical that contain halogens. Examples: Triflocin, methyl isothiazolinone, chlorphenamine, chloroxylenol.

Aldehyde

Aldehydes are organic compounds in which a carbon atom forms a double bond with an oxygen atom and a single bond with another atom, known as group atoms. Examples: Formaldehyde, imaidazolidinylurea, sodium hydroxyl methyl glycinate, benzyl semiformal, and diazolidine urea are other examples [6].

Paraben

Parabens are a series of para-hydroxybenzoate are esters of para-hydroxybenzoic acid. They are refers to as preservatives and used for their bactericidal and fungicidal properties. Parabens are active against a broad spectrum of microorganisms. Although some are identical to those found in nature, all commercially used parabens are synthesised by esterifying para-hydroxybenzoic acid with a suitable alcohol, such as methanol, ethanol, or n-propanol. methylparaben, ethylparaben, butylparaben, and isobutylparaben are some examples [6].

Glycol ether

Glycol ether are a group of solvents based on alkyl ethers of ethylene glycol are propylene glycol. Examples: phenoxyethanol, 2-butaoxyethanol [6].

Advantages of synthetic preservatives

Using synthetic preservatives allows you to possess an

honest understanding of the security and toxicity profile of the ingredient. Low concentrations of synthetic preservatives effectively presser the merchandise and also synthetic preservative have a broad spectrum of activity against bacteria and fungi. And also they are cheaper than natural preservatives.

Table 3: Common effects of synthetic preservatives

Trade name	Ingredients	pH range	Active against
Benzoate	Capryl hydroxamic acid Benzyl alcohol	Wide pH range	Gram positive Gram negative fungi
Euxyl k940	Phenoxyethanol	Up to 12	Gram positive Gram negative fungi
Liquid germal plus	Propylene glycol Iodopropynyl	3 to 8	Gram positive Gram negative
Phenoxyethanol	Propylene glycol	3 to 10	Gram positive Gram negative
Geogard 221	Dehydroacetic acid Benzyl alcohol	2 to 6	Gram positive Gram negative(poor)
Ethox	Ethylhexy glycerin	Up to 9	Gram positive Gram negative

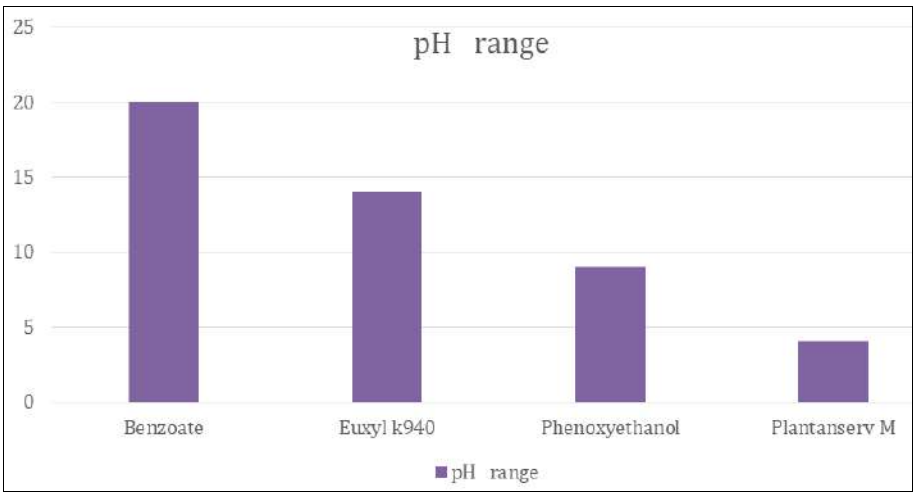

Fig 7: pH range of synthetic preservatives

Conclusion

In India, quite 70% of the population use herbal products for their health care, herbal face wash are prepared using cosmetics ingredients to make the bottom in which one and other herbal ingredients are wont to treat different skin ointment. Synthetic preservatives are around for any years which successfully preserved the aid of cosmetics, lately. The market has been driven to natural preservatives by evidence of toxicity of certain synthetic preservatives, unfortunately. Selection of natural preservative is restricted, they can vary in terms of potency form manufacturer to manufacturer and batch to batch, and some time affect other aspects of the formulation in an undesirable way.

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