

Research Article

AROMATIC SUBSTANCES USED IN COSMETIC FIELD

*HulyaCelik, Rahmi Can Şafak

Ağrı Ibrahim Cecen University, Faculty of Pharmacy Basic Pharmaceutical Sciences Department / Fundamental Sciences of Pharmacy 03200 Agri/TURKEY.

Received 10th March 2022; Accepted 11th April 2022; Published online 20th May 2022

ABSTRACT

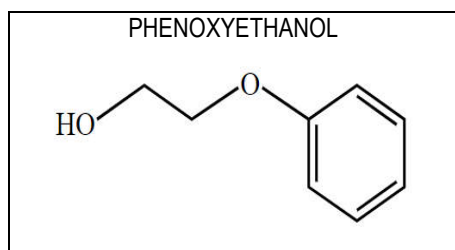
Cosmetic, meaning "master of adornment" in Greek It is derived from the word kosmetikos. Cosmetic products appear in many periods of our lives. Cosmetic products can be classified as products made mainly for the care, treatment and beautification of the person. Since cosmetic products contain water during their manufacture, they have a protective effect at certain concentration values in the world in terms of not changing the formulation and content of cosmetic products. It should not be forgotten that chemicals are used as protective raw materials. Contamination by microorganisms in the content of products may deteriorate and may pose a serious risk factor for the health of consumers. In order to prevent microbial growth in products, it is recommended to add substances with different chemical structures, called preservatives, to the formulations of cosmetic products. In this review, brief information is given about the use, toxic concentrations, usage areas and properties of aromatic ring-containing substances used in the field of cosmetics, both as a preservative and as a main component.

Keywords: Cosmetic, microbial, toxic, aromatic.

INTRODUCTION

The use of cosmetics and personal care products to look beautiful, to remove various traces and to provide care is increasing day by day. Hundreds of chemicals reused in cosmetics and personal care products[1]

Substances Containing Aromatic Rings Used in Cosmetics:



Phenoxyethanol is a glycol ether used as a preservative in cosmetic products and drugs around the world. It is a type of alcohol ester with aromatic properties that can increase the odor of cosmetic products. It is known to have antifungal properties. The substance is a transparent liquid, easily soluble in alcohol, water and oil. Phenoxyetnaol, a phenol ether with molecular form $C_8H_{10}O_2$, is an aromatic alcohol and its boiling temperature is 247 °C. Phenoxyetnaol is generally used in cosmetic products and vaccines. It is also used for preservatives that release formaldehyde. Phenoxythantol has allergen potential. But the most obvious feature of phenoxythantol is that it has a protective chemical property. It has a wide pH scale and has antifungal and antibacterial effects. In medicine, it is given to the patient as an anesthetic drug. It is used to create sedation in the patient. If used in appropriate quantities, it brings with it a widespread use in various sectors due to its lack of damage to the eyes, mucous memos and skin and lack of sensitivity on the skin [2].

Possible Harms to Human Health When Used Above 1% Use of Phenoxyethanol

According to the MSDS information form published by Lobo chemie laboratory reagent & fine chemicals, phenoxyet ethanol has a toxic effect by ingestion and is likely to cause serious eye irritation with eye contact. In accordance with the laws adopted in the EU and many countries regarding cosmetic products; In most countries like America and Japan, max. 1% concentration is considered safe to use and max in personal care products. Concentration usage up to 1% is allowed. However, in Mexico, this value is limited to 0.3%. Up to 1% concentration of the product is described as harmless. Children under the age of 3 are accepted for a maximum of 0.4% use for the gland area. Up to 1% concentration use can be considered safe in the use of protective chemicals by the Scientific Committee of the European Commission on Consumer Safety (SCCS). In addition, it is known that phenoxyettanol is sold with a concentration of 2% in over-the-counter disinfectant products by comparison [3].

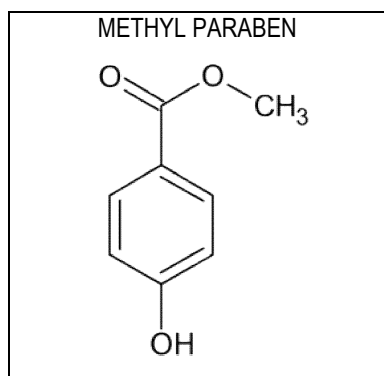
Areas Where Phenoxythantol Is Used in Cosmetics

It is usually used as a preservative in the cosmetic field due to its wide pH range. It is used as a preservative in the manufacture of preparations produced for the removal of skin wrinkles, wet wipes, protein-derived production for hair and skin, and in the manufacture of preparations containing humetan. Studies for phenoxyethanol are also obtained in the data obtained that phenoxyet ethanol is not recommended for use in children due to its toxicological effects causing toxicity in children. Bioavailability was also observed to be rapidly absorbed, dispersed and methodbolized and discarded as a result of studies in human and animal experiments [3]. When a concentration of 1% of phenoxyththanol is used, it is considered safe to use in cosmetics based on existing safety data. Negative systematic effects have been seen only on animals. According.C to the Cosmetic Law no. 5324 of the Official Gazette dated 24/03/2005 published by the Ministry of Health, various sanctions are applied on the grounds of intentional harm to human health in uses above the amount specified in the directorate. In general, studies have shown factors such as urticaria and dermatitis in use above this

*Corresponding Author: HulyaCelik,

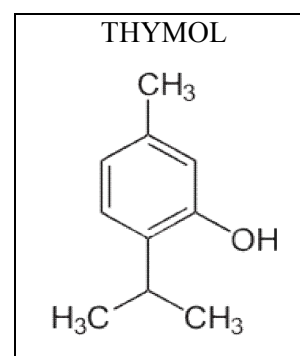
Ağrı Ibrahim Cecen University, Faculty of Pharmacy Basic Pharmaceutical Sciences Department / Fundamental Sciences of Pharmacy 03200 Agri/TURKEY.

concentration based on the concentration value determined by the Cosmetic Director of 1%. Due to these effects, the use of phenoxyet ethanol over the next 10 years may vary on a content basis, its concentration value may be reduced, or its harms such as parabens can be detected more clearly later. It is an organ that progresses on the basis of absorption due to its skin structure, so it should be taken into account that the product may cause accumulation in the skin over time due to the use of phenoxythantol in different concentrations in the product contents. Phenoxythanthanol is generally preferred to be used as a preservative raw material in products with moisturizing content and are used extensively in face-hand areas. The use of this product and the principle of benefit/harm can be determined more clearly in the near future, both in these products used and in the case of the absorption of detergents placed in the content by the skin during use and the ability to create toxic substance accumulation under the skin over time [3].



Methyl paraben, a methyl ether of p-hydroxybenzoic acid, is a stable, non-volatile aromatic compound that has been used as an antimicrobial preservative in foods, medicines and cosmetics for more than half a century. Methyl paraben is easily and completely absorbed from the skin and gastrointestinal tract. Methyl paraben hydrolysis turns into p-hydroxybenzoic acid, conjugated and conjugates are quickly eliminated by urine. There's no evidence of a build-up. Parabens are used in all kinds of formulations and are in more than 13,200 formulations. The concentration rate of parabens is usually less than 0.3%. The most common protective system with 0.3% may be methyl paraben and 0.1% propyl paraben, but it varies up to 1%. Parabens are well formulated because they do not have a detectable smell or taste, are practically neutral, do not cause discoloration and cause hardening or "blurring" [4]. The popular use of parabens in cosmetics and their use as toiletries is due to their low toxicity due to their wide spectrum of activity, biologically feasible and low cost, which is legally accepted worldwide. In addition, excellent chemical stability in relation to Ph and temperature (effective pH from 4.5 to 7.5). As a result, products containing parabens can be safely autoclave, that is, sterile, hydrolysis without significant loss of antimicrobial activity. Other advantages of parabens are their low tendency towards absorption. Material in commonly used plastics of the primary packaging. The percentage decomposition of methyl parabe was 5.5% and 49% of the initial concentration of the solution in the autoclave for 30 minutes at pH 6 and 9, respectively. Sunderland and Watts (1984), the time taken for the 10% loss of the first methyl esters is concentration at 130.5 C and approximately 4 sec, 3 min and 40 min respectively at 10.59, 8.9 pH and 6.58 respectively. This ester therefore has a normal sterilization procedure temperature in the range of 3–6 pH in solution sterilization unless you can stand it enough. As the number of carbons of the parabens' alkyl chain increases, antimicrobial activity and fat resolution increase, but water resolution decreases microbial replication usually occurs in the water phase. Oil/water bases, the amount of parabens dissolved in the water phase usually determines the preservative [3]. In 1981, the

FDA had maximum concentrations of use for methyl parabens and 6606% and 25% respectively (FDA, 1981). In general, formulations containing parapens are used at a concentration of 1%. Methyl parabens alone or with others parabens are used in all 13 product formulation categories. Products containing these components include skin, hair and scalp, lips, mucous memos (oral, ocular and vaginal), axillaries and nails. Products containing parabens can be used occasionally or daily, and their use can span many years. Frequency application and exposure time may change continuously. Methyl paraben is the most commonly used preservative in cosmetics. Rastogi *et al.*, (1995) determined the content of parabens in cosmetic products to illuminate concentration and the frequency of use of different parabens to monitor whether the products are suitable for Denmark and EEC regulations. In the examination of 215 cosmetic products, a maximum of 0.32% methyl paraben was present in paraben-positive cosmetics. All tested cosmetics containing parabens contained 98% methyl parabens. Preferential methyl ethyl propyl butyl benzyl use paraben, reported in various cosmetic product groups [4]. Cosmetic product application was determined as the main application. According to a study by the Danish Environmental Protection Agency (EPA), the source of total human exposure to parabens is; Nevertheless, the question of whether it is the main source of systemic diseases remains. The absorption of parabens is highly affected. Through normal pristine human skin with minimal penetration, skin integrity and barrier function. Parabens' different abilities in penetrating unspoiled human skin (depending on structure and side chain characteristics) and the reported dermal intake of paraben metabolism (largely hepatic) can be very effective with small amounts of intact parabens found in blood and urine [5]. Topically applied parabens are known to be hydrolyzed effectively. Parabens are alkyl ester compounds of p-hydroxybenzoic acid, which are widely used as preservatives in food, cosmetics, toiletries and pharmaceuticals [6]. Parabens are chemicals commonly used in cosmetics as a preservative against the growth of bacteria and fungi. Paraben derivatives are known to be endocrine disruptors. However, according to limited data, the use of paraben-containing products is associated with contact dermatitis and allergies. Chemically parabens are esters of hydroxybenzoic acid, also known as methylparaben, ethylparaben, npropilparaben, isopropylparaben, phydroxybenzoic acid (PHBA) [6].

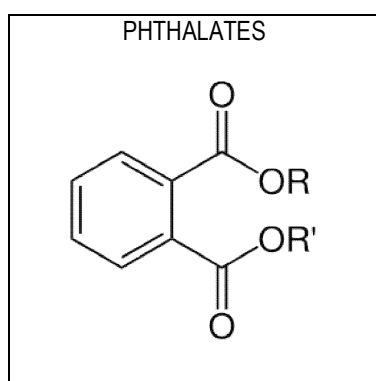


Thymol (2-isopropyl-5-methylphenol) is the main monoterpen phenol found in essential oils. Timol (5-methyl-2-isopropylphenol) is a phenolic compound used to inhibit bacteria orally [7], isolated from plants belonging to the Lamiaceae family (Thymus, Ocimum, Origanum and Monarda). And other plants, such as those belonging to Verbenaceae, Scrophulariaceae, are obtained from the ranunculaceae and apiaceae families. Thymol is used in the perfumery and cosmetics industry to treat problematic skin. Thymol has had many different activities such as antioxidant, anti-inflammatory, local anesthetic anti nosiseptive psycho critical antiseptic, and especially antibacterial and antifungal properties. Thymol is an interesting substance due to its various properties. It

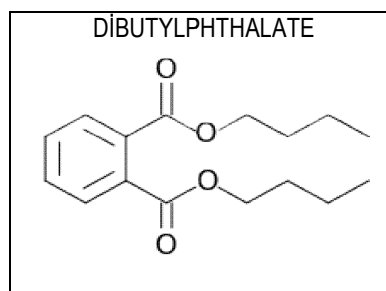
has potential applications in various fields. The results from numerous studies conducted over the past decade promoted the use of thymol and timol-rich essential oils in the food and cosmetic industries [7]. Experiments with timol encapsulated in nanoparticles, better dispersion of this compound in water, development of antimicrobial gel and cream formulations. Because in its spectrum, timol can have a beneficial role in certain types of infections and other environments (food, agriculture and cosmetic industries). However, specific studies are needed to verify whether there are enough antimicrobials due to its potential toxicity on humans. Activity can be achieved using non-toxic concentrations of thymol. Thyme (*Thymus vulgaris* L.), its main natural source, is used for positive antioxidants, anti-inflammatory, local anesthetic, antinospasmodic, scathing, antiseptic, antibacterial, and antifungal properties, as well as beneficial effects on the cardiovascular system.

Type of sample	Bacteria and Fungi	Main results
	<i>S. aureus</i> (ATCC 25923), <i>S. epidermidis</i> (ATCC 14990), <i>S. pyogenes</i> (ATCC 12344), <i>S. agalactiae</i> (ATCC 27956), <i>B. subtilis</i> (ATCC 6051) <i>A. baumannii</i> (ATCC BAA 747), <i>P. aeruginosa</i> (ATCC 27853), <i>Klebsiella pneumoniae</i> (ATCC 700603), <i>E. coli</i> (ATCC 25922), <i>E. coli</i> O157:H7 (ATCC 35150), 10 clinical isolates of MRSA and 13 clinical isolates of Gram-negative bacteria	-Gram-negative MIC values ranged from 60 to 4000 µg/ml
Thymol	23 isolates of the oomycete <i>Pythium insidiosum</i>	Regarding thymol activity: MIC range: 160-320 µg/ml

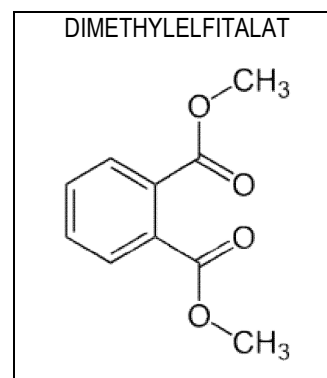
Finally, about the actual efficacy of thymol as an antimicrobial substance, although it is very difficult to draw a clear conclusion, since it is often difficult to compare antimicrobial activities, the data contained in the literature are compounds and/or microbial strains that are obtained by different methods and tested in different quantities. However, the reported studies of the findings can be considered as a basis for detailed information. Investigation of the antibacterial properties of timol in vivo and essential oils rich in timol. In fact there is a deficiency in in vivo studies and clinical trials that investigate pharmacological properties in the treatment of thymol and thymol-rich essential oils in human infections and promising effects recorded as in vitro tests should encourage further research into its use. Moreover, given the potential use in the treatment of human diseases, extensive studies on chronic and acute toxicity, as well as teratogenicity, are recommended [8].



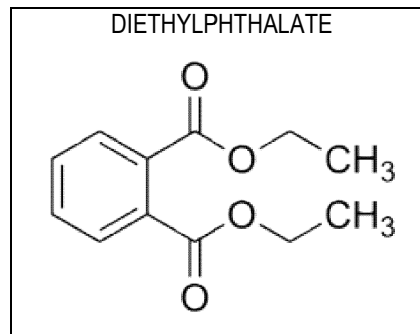
Phthalates, toys, vinyl floors are found in numerous products such as wall coverings, detergents, food packaging, medicines, blood bags and are a group of aromatic chemicals used in personal cosmetic products such as aftershave lotions, soaps, shampoos, perfume, nail polish and hairspray [9]. Low molecular weight phthalates such as dimethylate (DMP), diethylfitalat (DEP) and di-n-butyl phthalate (DBP) have a wide range of uses. These are aromatic substances used in personal cosmetic products such as cosmetics, detergents, soaps, shampoos, perfumes, food packaging, and childcare products such as pacifiers and bottles [9].



It is the primary phthalate used in cosmetics, it is used as a plasticizer in products such as dibutylphthalate nail polishes. They have cracking-reducing effects by reducing the fragility of the product they are used in [9].

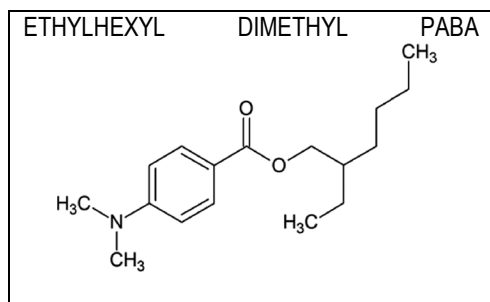


Dimethylelfitalat, which is used in hair sprays, is used to help prevent hair stiffness. This effect is made by allowing them to create a flexible film on the hair [10].



A 2002 study by the Cosmetic Ingredients Review, an independent research organization, found that phthalates were low in toxicity to experimental animals given for cosmetic purposes. However, when the babies and children are taken into account, it has been observed that phthalates can be exposed not only through cosmetic products, but also with pacifiers and plastic toys. Especially in infants of developmental age, there is exposure to ingestion, dermal contact and respiratory phthalates by leaking into liquids. In this group between the ages of 0-3 years, certain behavioral habits (hand-mouth contact, sucking and chewing toys, etc.) cause a high degree of exposure to phthalate esters. However, there is limited data on mediated phthalate exposure to cosmetic products used in infants. According to a 2008 study; The use of lotion, baby powder and baby shampoo in infants could mediate exposure to phthalates. According to the analyses, phthalate metabolites detected in baby urine; concentrations of monoethyl phthalate, monomethyl phthalate and monoisobutyl phthalate were significantly associated with the use of these products; This effect was found to be more pronounced in infants 8 months and younger. Although the latest data suggests that some phthalates may adversely affect human male reproductive function, there are few studies that characterize phthalate biomarkers

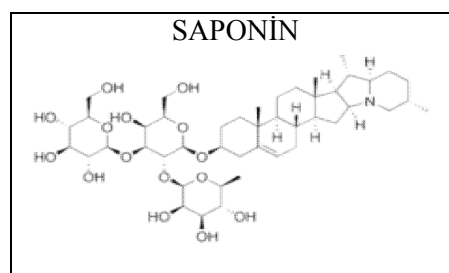
or sources of exposure in infants and young children. A study by Lampel and Jacob (2011) examined some moisturising, sunscreen and lotion products for infant use and found that phthalate concentrations in more than 10% of these products ranged from 3 to 40 times higher than the reported limit. These studies on baby products show that babies are more vulnerable to potential side effects of phthalates due to their increased dosages per body surface area, metabolic potential and developing endocrine and reproductive systems [10]. However, according to current data, diethylphthalate derivatives are more widely used in cosmetics, but the use of dimethyl and diethyl derivatives is rare. Today, phthalates are widely used in cosmetics to provide viscosity control. Phthalates are also used to provide flexibility in the structure of the packaging of these products [10].



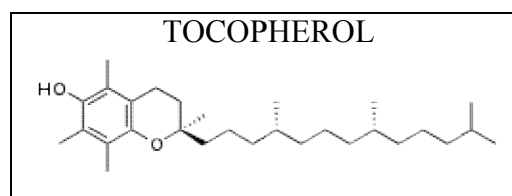
Ethylhexyl dimethyl PABA (CAS No. 21245-02-3) is an organic derivative of water-soluble PABA (4-aminobenzoic acid) found in sunscreen and other cosmetic products. This is acidity created by intensifying the oily liquid 2-ethylhexanol and dimethylaminobenzoic, which is insoluble in yellow water with an ester bond. Ethylhexyl dimethyl PABA padimat O is also known as OD-PABA or octyl dimethyl. The Department of Food and Drug Safety (MFDS) and the U.S. Food and Drug Administration (FDA) have determined that the concentration of any cosmetic product cannot exceed 8%. Previous animal studies have shown that high concentrations of ethylhexyl dimethyl can be toxic to PABA epididymis and should be taken care of. This substance should be used when applying to babies under six months of age, as a lack of understanding may occur due to metabolism and absorption. (HSDB (2011) Hazardous Substances Data Bank) Previous risk assessment data and national and international regulations for ethylhexyl dimethyl PABA contain potential toxicity. This study summarizes a risk assessment. Cosmetic concentrations permitted by local authorities, including the determination of safety margin (MOS), a summary of existing experimental toxicity data and exposure data associated with the amount of domestic use [11].

Use in cosmetics:

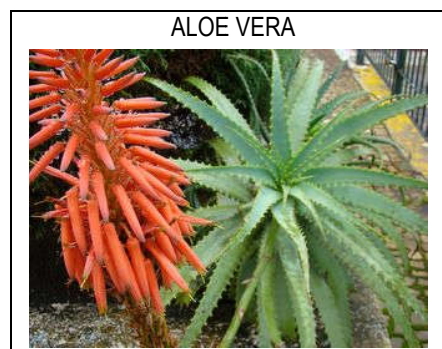
Ethylhexyl dimethyl PABA, sunscreen and various beauty products. Products such as lipstick, conditioner, shampoo, antiaging are used in cosmetics such as agents, hairspray and sunscreen. Ethylhexyl dimethyl PABA is an organic derivative of water-soluble PABA (4-aminobenzoic acid) found in sunscreen and other cosmetics. The chemicals we use to protect our skin from the harmful ultraviolet rays of the sun are regularly found in the cosmetic product. These chemicals, which are added to cosmetics at concentrations of 10.0% or higher, accumulate in the body due to their ability to store as fat. These substances, which are used as sun-blocking agents in cosmetics such as bezofenon3, homosalat, methylbenzili to kaffur, octylmetoxynamat and octyl PABA, are absorbed directly through the skin and transferred to urine and breast milk. These chemicals have been shown to have estrogenic effects in in vivo and in vitro studies [12].



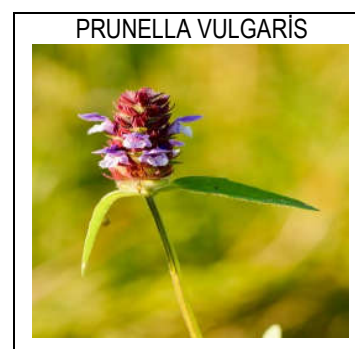
The name saponin is derived from the word "sapo" and means soap in Latin. It is a glucose that can hemolyze the red blood cell, which forms a permanent foam when the aqueous solution of saponins is mixed. the aqueous solution usually contains aglicon triterpenes or steroids. In addition to these basic properties in the definition, saponin is notable for complexing with cholesterol, being toxic to cold-blooded animals such as fish, having antifungal activity and antibiotics[13]. It has antioxidant, anti-bacterial, foam agent, emulsifyingphonesion. It has application in hair products, anti-aging, moisturizing products [14].



Tocopherol is an important additive used in both the food, pharmaceutical and cosmetic industries. It plays an important role in the protection of food and the prevention of diseases. Tocopherols reduce the production of cholesterol in the liver, protect against cancer, strengthen the body's immune system and reduce cellular aging. Tocopherols can also prevent heart disease, alzheimer's disease and arthritis. Its cosmetic property is that it protects against UV rays or oxidative damage [15] [16].



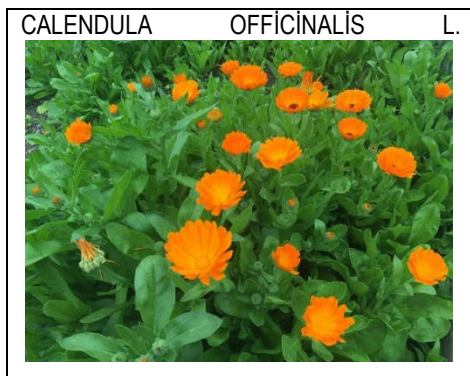
Aloe vera plant has been used for centuries due to its health, beauty, medical and skin care properties. With Aloe's ability to regulate the skin barrier, it was found to be widely used as a dermocosmetic to treat dry skin [17]. It is used as a moisturizer and softener in cosmetics [18].



There are patented compositions of *Prunella* species used in cosmetology. In Far Eastern countries, patented preparations of *P. vulgaris* and *P. asiatica* of the *Prunella* type, which are used in cosmetics as hair loss prevention, conditioner and skin softener, were also arranged [19].



It is widely used in hair and skin care products. It has a soothing, softening and firming effect on irritated skin. It has a hair color enhancer [20].



Exhausted constant oil is included in creams as a moisturizer. It has its use in baby shampoo and soap [17]. It is also used as toothpaste, skin care and baby oil [21].

RESULT

Medicinal Aromatic plants have helped people protect their health and heal their diseases throughout history, and they have preserved their importance as personal care and hygiene products until today. Aromatic substances are additives in cosmetic products, cosmetics and It is frequently used in the perfumery industry. Aromatic substances are used in cosmetic products such as creams, lipsticks, powders, perfumes, hair care products. Aromatic substances are generally used as preservatives to maintain the stability of the product. The medicine, pharmacy and cosmetics industry uses these natural resources as they are, either as a source of extracts or active ingredients, or as a model for more effective synthetic substances.

Acknowledgement

This study was prepared from Rahmi Can Şafak's Aromatic Compounds Course Research Project

REFERENCES

[1]. Çağlar, A. B., & Saral, S. (2014). Kozmetolojide Toksikite Sorunu. Turk J Dermatol, 4, 248-51. Erişim: http://cms.galenos.com.tr/Uploads/Article_9966/248-251.pdf.

[2]. Phenoxyethanol (Fenoksietanol) Analizi Saniter. <https://www.Saniter.com.tr/phenoxyethanol-fenoksietanol-analizi>

[3]. Hüma Arabacı (2021) Fenoksietanol'ün deri üzerindeki olası etkileri ve fenoksietanol kimyasalının kozmetikte koruyucu madde olarak kullanımı. International Marmara SciencesCongress (Spring)

[4]. M.G. Sonia, S.L. Taylorb, N.A. Greenbergc, G.A. Burdocka (2002) Evaluation of the health aspects of methyl paraben: a review of the published literature Food and Chemical Toxicology 40 1335–1373

[5]. Fransway, A. F., Fransway, P. J., Belsito, D. V., & Yiannias, J. A. (2019). Paraben toxicology. *Dermatitis*, 30(1), 32-45.

[6]. Shinshi Oishi Effects of butyl paraben on the male reproductive system in mice 4 March 2002 /Accepted: 22 April 2002/ Published online: 13 June 2002

[7]. Jeff D. Evans, Scott A. Martin Effects of Thymol on Ruminant Microorganisms 2000

[8]. Anna Marchese a, İlkay Erdogan Orhan b, Maria Daglia c, Ramona Barbieri a, Arianna Di Lorenzo c, Antibacterial and antifungal activities of thymol: A brief review of the Literature Food Chemistry 210 (2016) 402–414

[9]. The Safety of Cosmetic Products for Babies and Children Hacettepe University Journal of the Faculty of Pharmacy Volume 41 / Number 2 / July 2021 / pp.117-132

[10]. Gözde Karabulut (2020) Investigation with in vivo and in vitro methods for possible effects of mono ethylhexylphthalate and mono butylphthalate and their metabolites frequently used in daily life. Hacettepe Üniversitesi

[11]. Sung, C. R., Kim, K. B., Lee, J. Y., Lee, B. M., & Kwack, S. J. (2019). Risk assessment of ethylhexyldimethyl PABA in cosmetics. *Toxicological Research*, 35(2), 131-136.

[12]. Semra Kocaöz, (2014) Rhyme Eroglu Cosmetic Products and Women's Health 2014

[13]. İsmail Küçük Kurt, A. Fatih Fidan, Saponinler ve Bazı Biyolojik Etkileri Kocatepe Vet J (2008) 1: 89-96

[14]. Sena İstanbulluoğlu, Selin Seda Timur, R. Neslihan Gürsoy, Biotechnological Active Ingredients and Excipients Used in Cosmetics. Hacettepe University Journal of the Faculty of Pharmacy Volume 39 / Number 2 / July 2019 / pp. 98-112

[15]. Atalan, Sümeyye (2018). Mısırozü yağı deodorizasyon distilatı antokoferol vitaminlerinin izolasyonu. Yayınlanmamış Yüksek lisans tezi, İnönü Üniversitesi, Malatya. 1-68 ss

[16]. Della Penna, D., & Pogson, B. J. (2006). Vitamin synthesis in plants: tocopherols and carotenoids. *Annu. Rev. Plant Biol.*, 57, 711-738.

[17]. Tansel Çomoğlu, Kozmetikler. Marmara Pharmaceutical Journal 16: 1-8, 2012.

[18]. Belma Türsen, Ümit Türsen, Dermatolojide Aloe Vera 2014 doi: 10.15624.dermatoz14054d1

[19]. Özlem Göktaş, Betül Gıdık, Bayburt Üniversitesi Fen Bilimleri Dergisi Tıbbi ve Aromatik Bitkilerin Kullanım Alanları 2009

[20]. Jehad H. Ahmed, Nurten Ezer, *Prunella L.* Türlerinin Kimyasal Bileşikleri ve Biyolojik Aktiviteleri Hacettepe Üniversitesi, Eczacılık Fakültesi Dergisi Cilt 28 / Sayı 1 / Ocak 2008 / ss. 93-113

[21]. Okur, N. Ü., Karadağ, A. E., İpekçi, E., & Bülbül, E. (2020). Kozmetik Preparatlar ve Kozmetik Preparatlarda Kullanılan Bitkiler. *Literatür Eczacılık Bilimleri Dergisi*, 9(3), 292-303.