

Medicinal plants in dermatological complaints and disorders

MAJA GRIGOROV^{1,*}, DUŠANKA KITIĆ¹, AND DRAGANA PAVLOVIĆ¹

¹ University of Niš, Faculty of Medicine, Department of Pharmacy, Avenue Zorana Džindića 81, Niš, Serbia

* Corresponding author: maja.grigorov@gmail.com

Published: December 25, 2022

Received: September 4, 2022

Accepted: December 11, 2022

Published on-line: December 22, 2022

The term "phytopreparations" indicates products with active substances obtained from medicinal plants. Herbal medicines, extracts, essential oils, and isolated active principles are present in both cosmetology and dermatology. The new term, "cosmeceutical" refers to cosmetic preparations which also have therapeutic action. A review of relevant literature and legal frames has been done in order to understand the modern use of medicinal herbs in dermatological disorders. There is no single legal framework in this area. In the therapeutic field of skin disorders and minor wounds, there are 31 European Union monographs on herbal medicinal products prepared by the Committee on Herbal Medicinal Products, while the European Scientific Cooperative on Phytotherapy recommends the use of 19 herbal drugs for dermatological disorders, such as acne, dermatitis, eczema, wounds, skin inflammation, insect bites, etc. Most patients assume an herbal product is "safe" and without side effects simply because it's natural. The rational use of herbal cosmetic products requires appropriate knowledge of used plant materials and potential side effects.

Key words: medicinal plant, dermatological complaints, legal frame

<http://dx.doi.org/10.5937/leksir2242060G>

1. INTRODUCTION

The term "phytopreparations" indicates products with active substances obtained from medicinal plants. These products are frequently part of self-medication, mostly used in the prevention and as an additional therapy for some indications (Schulz et al., 2004). Since mankind strives to prevent the onset of disease, slow down the aging process, and achieve or maintain physical attractiveness, the chemical and pharmaceutical industries are constantly working on the development of new products. The new term, "cosmeceutical" refers to cosmetic preparations which also have therapeutic action (González-Minero and Bravo-Díaz, 2018). Besides active components such as α -hydroxyl acids, vitamin E, vitamin C, and coenzyme Q10, active ingredients of plant origin are very often included in their composition (Tamburić and Vuleta, 1997).

First mentioned in 1961 by Reymond Reed, the term "cosmeceutical" describes "active" and science-based cosmetics. It was popularized by Dr. Albert Klingman in the late 1970s, but only in 1996 did the first cosmeceutical products appear on the world market. Cosmeceuticals are not drugs but are claimed to have drug-like effects. Although these claims are unproven, and the term is not recognized by the FDA or any regulatory body, the fact that between 1996 and 2007 the term was used as authentic in over 600 of 837 articles in renowned journals, probably is the first step in recognition (Anuradha et al., 2015;

Darshana et al., 2016).

Many things have not been clarified regarding the status of cosmeceuticals. These preparations are regulated as cosmetics, not as pharmaceuticals, and are sold over the counter. This affects the type of testing they are subject to but also the advertisements they are presented. Although they represent a transition between cosmetics and pharmaceuticals, they are still not recognized by FDA and the term is not recognized by the Federal Food, Drug and Cosmetic Act (Anuradha et al., 2015; Dumbhare et al., 2016).

The concept of herbal cosmetics, which has become increasingly popular recently, is leading to an increase in the use of plant components in cosmetic formulations. This requires a better knowledge of the potential of plant species that are already used in cosmetics but also opens the door to new plant species. It will be up to the regulatory authorities to frame some laws concerning the safety, efficacy, and quality assessment of these new herbal cosmetics (Anuradha et al., 2015; Dumbhare et al., 2016).

Isolated active principles, herbal extracts, essential oils, resins, tinctures, and aromatic waters are used in both cosmetology and dermatology. Since all types of these preparations could be obtained in different production ways, the final products may differ in chemical composition, organoleptic and physicochemical properties (Patri and Silano, 2002).

2. REGULATIONS IN PHYTOPREPARATIONS PRODUCTION

Phytopreparation quality control is complex and includes the control of the raw materials, intermediate products, final product, and packaging (Kovačević, 2004). Characterization of the herbal preparations that are part of the final product include:

- identification of the plant species (full systematic species name including botanical family, genus, species, variety, but also subspecies, author's name, and chemotype if applicable),
- plant part used (e.g. flower, root, leaf ...),
- the preparation process (the method, the solvent, and its content alongside applied conditions),
- data on physicochemical properties, identification of functional principles, possible admixtures, and contaminants (pesticides, solvent residues, heavy metals, presence of microorganisms) (Patri and Silano, 2002).

Additional characterizations may be required depending on the type of preparation: relative density, ethanol content of the final extract, residue after drying; the ratio of starting material to extraction fluid or starting material, and final tincture (Ph.Eur.10, 2019). Drug extract ratio (DER, often given as the actual range) means the ratio between the quantity of starting herbal material and the quantity of herbal preparation obtained and defines one product and allows its comparison with other ones (Ph.Eur.10, 2019).

Organic and natural cosmetic products should follow the requirements of Regulation (EC) 1223/2009 on cosmetic products (Quality, Efficiency, and Safety Regulations) (Vasiljević and Bojović, 2018).

A unique standard for organic and natural cosmetic products does not exist yet, not even in European Union countries (Vasiljević and Bojović, 2018).

The COSMOS-standard was received in January 2010 by five European organizations dealing with the certification of organic and natural products, to define minimum requirements and a common definition of organic and natural cosmetic products (Vasiljević and Bojović, 2018). The latest version of the COSMOS-standard is from 2020 (COSMOS, 2020).

The NATRUE standard was received by the Scientific Committee of the NATRUE Organization, which was founded in 2007, to promote and protect natural and organic cosmetic products worldwide (NATRUE, 2021).

The International Organization for Standardization (ISO) gives Guidelines on technical definitions and criteria for natural and organic cosmetic ingredients and products, divided into two parts: Definitions for ingredients (ISO 16128-1:2016, 2016) and Criteria for ingredients and products (ISO 16128-2:2017, 2017). Herbal medicinal products (including well-established use and traditional use) are in the European Union as defined by the Committee on Herbal Medicinal Products of the European Medicinal Agency (EMA/HMPC) and its numerous appropriate documents.

The production of herbal preparations in the Republic of Serbia must comply with the Law on Medicines and Medical Devices (RS Official Gazette, 2010-2017); The Rulebook on the health safety of dietetic products (RS Official Gazette, 2010-2018); as well as the Good Manufacturing Practice Guidelines (Annex 7 - Production of Herbal Medicines) (Mihailović, 2011).

3. HERBAL DRUGS FOR THE TREATMENT OF DERMATOLOGICAL DISORDERS

Since ancient times herbal medicines have been used successfully in dermatological disorders. As natural-based products,

they are favored and commonly used among the population (Bedi and Shenefelt, 2002). Herbal medicinal products are complex mixtures of valuable secondary metabolites and we sorted them by dominant secondary metabolites, which are believed to be responsible for the beneficial effects on skin conditions and disorders (Kovačević, 2004). Table 1 summarizes herbal drugs recommended for dermatological complaints and disorders by both ESCOP and EMA.

3.1. ESCOP Recommendation

The European Scientific Cooperative on Phytotherapy (ESCOP) recommends the use of 19 herbal drugs for the treatment of dermatological disorders (ESCOP, 2021).

3.1.1. Herbal drugs with alkaloids

Pepper - *Capsici fructus*, *Capsicum annuum* L. var. *minimum* and small-fruited varieties of *Capsicum frutescens* L., Solanaceae. Pepper contains capsaicinoids (mainly capsaicin), triglycerides, carotenoids, ascorbic acid, flavonoids, and a complex mixture of volatile compounds. It is recommended in the treatment of pruritus of varying etiology such as in prurigo nodularis or associated with psoriasis (ESCOP, 2009a).

Comfrey root - *Symphyti radix*, *Symphytum officinale* L., Boraginaceae. Carbohydrates, terpenes, allantoin, pyrrolizidine alkaloids, phytosterols, mucopolysaccharides, catechin tannins, sugars, saponins, carotenoids, amino acids, phenolic acids, inulin, are some of the principal constituents of comfrey root (Patri and Silano, 2002). Comfrey root is used as a firming agent and antiperspirant. It also has a hemostatic and calming effect (Patri and Silano, 2002). In healthy volunteers, preparations containing 5-10 % of comfrey root extract effectively reduced UV-B-induced erythema (Dawid-Pać, 2013). It is important to mention, that in folk medicine, comfrey root is used also orally in the form of infusions, for lung diseases, gastritis, and bone fractures (Tucakov, 1997). However, due to the presence of pyrrolizidine alkaloids, oral administration of comfrey root is not recommended, and for dermal administration, there is a limit on exposure to pyrrolizidine alkaloids up to 1 µg daily for 10 days (Drobac et al., 2019).

3.1.2. Herbal drugs with phenol glycosides

Purple coneflower - *Echinacea purpureae herba*, *Echinacea purpurea* L., Asteraceae. The main compounds are alkaloids, caffeic acid derivatives, and polysaccharides. Purple coneflower herb is recommended as an adjuvant for the treatment of superficial wounds (ESCOP, 2009b), but is also used for skin inflammation (Dawid-Pać, 2013).

3.1.3. Herbal drugs with flavonoid glycosides

Red vine - *Vitis viniferae folium*, *Vitis vinifera* L., Vitaceae. The characteristic constituents are phenolic compounds (flavonoids, anthocyanins, condensed tannins, hydroxycinnamic acids, and gallic acid). For external use, the therapeutic indication is a topical treatment of varicosis and couperosis (ESCOP, 2009c). The official indication for well-established use is an herbal medicinal product for the treatment of chronic venous insufficiency. But there are divergent opinions about that. According to some of the HMPC members, the presented evidence in support of this indication is considered inadequate and more clinical studies are needed to definitively confirm the efficacy (EMA, 2017a).

Wild pansy - *Violae herba cum flore*, *Viola tricolor* L., Violaceae. Wild pansy contains flavonoids (violaquercitrin, quercetin, luteolin), polysaccharides, phenolic acids, essential oil, carotenoids, anthocyanins, tocopherols, and tannins (EMA, 2010a). This drug is used to treat mild seborrheic skin conditions (EMA, 2010a; ESCOP, 2021).

3.1.4. Herbal drugs with monoterpene iridoid glycosides

Ribwort plantain – *Plantaginis lanceolatae folium/herba*, *Plantago lanceolata* L., Plantaginaceae. Ribwort plantain leaf/herb is rich in polysaccharides, iridoids, phenolic acids, coumarins (esculetin), flavonoids (apigenin), tannins, alkaloids, and mineral salts (Patri and Silano, 2002). Ribwort plantain leaf/herb has a soothing and astringent effect, and it is used as a cleanser and moisturizer. Fresh juice is a soothing agent for the eyes and insect bites (Patri and Silano, 2002).

3.1.5. Herbal drugs with tetracyclic triterpenoid saponins

Pot marigold - *Calendulae flos*, *Calendula officinalis* L., Asteraceae. The main constituents of *Calendulae flos* are triterpene saponins, triterpene alcohols, sesquiterpene glycosides, carotenoids, flavonoids, coumarins, volatile oil, water-soluble polysaccharides (EMA, 2018a). Anti-inflammatory and in vitro antimicrobial and immune-modulating effects are documented (Bedi and Shenefelt, 2002).

Gotu kola – *Centellae asiaticae herba*, *Centella asiatica* L., Apiaceae. Triterpene acids, volatile oil, flavonoids, and phytosterols are the main compounds of gotu kola. It is recommended for wound healing (ESCOP, 2009d).

3.1.6. Herbal drugs with tannins

Tormentil - *Tormentillae rhizoma*, *Potentilla erecta* L., Rosaceae. Principal constituents of tormentil are catechin tannins, flavonoids, ellagic acid, triterpene derivatives, sterols, fatty acids, and starch (EMA, 2010b; Patri and Silano, 2002). Tormentil is used as a tonic since it exerts astringent, refreshing effects, antiseptic, anti-irritant, anti-hemorrhoid, and anti-hemorrhagic effects. Glycolic extract at a concentration of up to 5 % is used in products for oily skin (Patri and Silano, 2002). Agrimony - *Agrimoniae herba*, *Agrimonia eupatoria* L., Rosaceae. Principal constituents of agrimony are tannins, flavonoids, essential oils, salicylic acid, palmitic acid, stearic acid, triterpenoids, minerals, vitamins (thiamine, vitamin K, vitamin C) (Al-Snafi, 2015; EMA, 2015a). The indication given by both EMA and ESCOP is wounds (EMA, 2015a; ESCOP, 2021), and the beneficial effects on wound healing have been confirmed in rats (Al-Snafi, 2015).

Witch-hazel – *Hamamelidis aqua*, *Hamamelidis cortex*, *Hamamelidis folium*, *Hamamelis virginiana* L., Hamamelidaceae. The main components in witch-hazel's water (*Hamamelidis aqua*) are carbohydrates, alcohols, aldehydes (phenylacetaldehyde, benzaldehyde, 2-hexanal), phenols (eugenol), monoterpenes (α -terpineol), sesquiterpenes, and terpenoids. Witch-hazel's leaf and bark (*Hamamelidis folium cum cortex*) have slightly different constituents than witch-hazel's water, tannins (up to 12 % α -, β -, γ -hamamelitannin), phlobaphenes, phenolic acids, flavonoids (quercetin, astragalol), saponins, and triglycerides (Patri and Silano, 2002). Witch-hazel's water is frequently applied to skin disorders, primarily due to its astringent, anti-irritant, and soothing effect. Other effects are hemostatic and venous vasoconstrictors (Patri and Silano, 2002). The anti-inflammatory activity of hamamelis water was confirmed in a double-blind study – a comparison of the activities of hamamelis, hydrocortisone, and the corresponding base applied topically to the skin. The hydrocortisone had the best effects, but the effect of witch-hazel was better than the effect of placebo, meaning that such preparations can be used to treat skin diseases, especially atopic dermatitis, at least during the initial stages (Korting et al., 1993).

3.1.7. Herbal drugs with sesquiterpenoids

Arnica - *Arnicae flos*, *Arnica montana* L., Asteraceae. The flowers of *Arnica* species contain especially sesquiterpene lactones which have a pseudo-guaianolide structure, which often may occur as ester derivatives. Besides essential oil compounds,

other constituents are flavonoids, hydroxycoumarins, and phenyl acrylic acids (EMA, 2014a). This herbal medicinal product is recommended for the treatment of abrasions, bruises, and insect bites (ESCOP, 2021). EMA recommends it for the relief of bruises but also sprains and localized muscular pain (EMA, 2014b).

3.1.8. Herbal drugs with essential oils

Yarrow - *Millefolii Herba*, *Achillea millefolium* L., Asteraceae. *Millefolii herba* contains essential oil (the major components of which are sesquiterpenes of the guaianolide type (chamazulene)), tannins, and flavonoids (luteolin, apigenin, rutin). Yarrow is recommended as a supportive treatment of small wounds and mild inflammations of the skin (Dawid-Pač, 2013).

Roman chamomile - *Chamomillae romanae flos*, *Chamaemelum nobile* (L.), Asteraceae. Dried flowers from the species *Chamaemelum nobile* contain volatile oils, sesquiterpenes, flavonoids, phenolic acids, coumarins, catechins, fatty acids, and polysaccharides (EMA, 2011a; Patri and Silano, 2002). Roman chamomile flower has soothing, refreshing, anti-inflammatory, anti-irritant, and healing effects. Also, it works against itching (Patri and Silano, 2002).

German chamomile - *Matricariae flos*, *Matricaria recutita* L., Asteraceae. *Matricariae flos* contains essential oil (the major components of which are α -bisabolol and its oxides and matricin) and flavone derivatives: apigenin, luteolin, and apigenin-7-glucoside (Dawid-Pač, 2013). Indications given by ESCOP are dermatitis and skin inflammation (ESCOP, 2021). EMA recommends the use of *Matricariae flos* in the treatment of minor ulcers and minor inflammation of the skin (sunburn), superficial wounds, and small boils (EMA, 2015b).

Both *Chamaemelum nobile* and *Matricaria recutita* are traditionally used for different skin disorders and are named chamomile. The effectiveness of the topical application of chamomile in the treatment of atopic eczema has been proven (60 % efficiency versus 0.25 % hydrocortisone). The efficacy of topical application of chamomile to improve wound healing was examined in a double-blind trial of 14 patients in whom skin changes were caused by tattoos. The treated group showed significantly better wound healing compared to the control, as well as faster epithelialization (Srivastava et al., 2010).

Sage - *Salviae folium*, *Salvia officinalis* L., Lamiaceae. Besides essential oil (rich in monoterpenes), the sage leaf contains phenolic acids (rosmarinic acid), triterpenoids acids (ursolic and oleanolic acid), and catechin-type tannins (salviatannin). Astringent, bactericidal, and anti-inflammatory effects have been reported (Dawid-Pač, 2013).

Peppermint - *Menthae piperitae aetheroleum*, *Mentha piperita* L., Lamiaceae. The main components of this essential oil are menthol (principally in the form (-)-menthol, with smaller amounts of stereoisomers such as (+)-neomenthol, (+)-isomenthol), and menthone. A small number of sesquiterpenes have also been identified in the oil. Therapeutic indications for external use are pruritus, urticaria, and pain in irritable skin conditions (ESCOP, 2003).

Lemon balm – *Melissae folium*, *Melissa officinalis* L., Lamiaceae. Principal constituents of lemon balm's leaf are monoterpenes (citral, geraniol, eugenol acetate, linalool, limonene) and sesquiterpenes (β -caryophyllene), flavonoids, phenylpropanoids, tannins, terpenes (EMA, 2013a; Patri and Silano, 2002). Lemon balm's leaf is used as a tonic and aroma corrigent, and it has beneficial effects on inflammation and irritation. It also possesses anti-irritant, antiseptic, and stimulatory activity (Patri and Silano, 2002). ESCOP recommends its use for cold sores and *Herpes labialis* (ESCOP, 2021). Lemon balm's

Table 1. Herbal drugs recommended in dermatological complaints and disorders by ESCOP and EMA

Herbal drug	Indication by ESCOP	Indication by EMA
Pepper fruit - <i>Capsici fructus</i> , <i>Capsicum annuum</i> L. var. <i>minimum</i> and small-fruited varieties of <i>Capsicum frutescens</i> L., Solanaceae	pruritus (ESCOP, 2009a)	/
Comfrey root – <i>Symphyti radix</i> , <i>Symphytum officinale</i> L., Boraginaceae	bruises, insect bites, wounds, inflammation (ESCOP, 2021)	symptomatic relief of minor sprains, bruises (EMA, 2015c)
Purple coneflower herb – <i>Echinaceae purpureae herba</i> , <i>Echinaceae purpurea</i> L., Asteraceae	as an adjuvant for the treatment of superficial wounds (ESCOP, 2009b)	small superficial wounds (EMA, 2015d)
Red vine leaf – <i>Vitis viniferae folium</i> , <i>Vitis vinifera</i> L., Vitaceae	topical treatment of varicosis and couperosis (ESCOP, 2009c)	treatment of chronic venous insufficiency (EMA, 2017a)
Wild pansy – <i>Viola herba cum flore</i> , <i>Viola tricolor</i> L., Violaceae	acne, dermatitis, eczema, seborrhea (ESCOP, 2021)	mild seborrheic skin conditions (EMA, 2010a)
Ribwort plantain leaf/herb – <i>Plantaginis lanceolatae folium/herba</i> , <i>Plantago lanceolata</i> L., Plantaginaceae	wounds (ESCOP, 2021)	/
Calendula flower - <i>Calendulae flos</i> , <i>Calendula officinalis</i> L., Asteraceae	dermatitis, skin inflammation, wounds (ESCOP, 2021)	the symptomatic treatment of minor inflammations of the skin (such as sunburn), as an aid in the healing of minor wounds (EMA, 2018a)
Centella – <i>Centellae asiaticae herba</i> , I L., Apiaceae	wound healing (ESCOP, 2009d)	/
Tormentil - <i>Tormentillae rhizoma</i> , <i>Potentilla erecta</i> L., Rosaceae	dermatitis, skin inflammation (ESCOP, 2021)	/
Agrimony - <i>Agrimoniae herba</i> , <i>Agrimonia eupatoria</i> L., Rosaceae	wounds (ESCOP, 2021)	the symptomatic relief of minor skin inflammation, small, superficial wounds (EMA, 2015a)
Hamamelis water/bark/leaf – <i>Hamamelidis aqua</i> , <i>Hamamelidis cortex</i> , <i>Hamamelidis folium</i> , <i>Hamamelis virginiana</i> L., Hamamelidaceae	leaf and cortex - dermatitis and inflammation; leaf – bruises; water - bruises, insect bites, sunburns, inflammation (ESCOP, 2021)	leaf and cortex - skin inflammation, dry skin; cortex - symptomatic relief of hemorrhoid-connected problems (EMA, 2009a; 2011b).
Arnica flower - <i>Arnicae flos</i> , <i>Arnica montana</i> L., Asteraceae	abrasions, bruises, insect bites (ESCOP, 2021)	the relief of bruises, sprains, localized muscular pain (EMA, 2014a)
Yarrow - <i>Millefolii Herba</i> , <i>Achillea millefolium</i> L., Asteraceae	insect bites, skin inflammation, wounds (ESCOP, 2021)	the treatment of small superficial wounds (EMA, 2020a)
Roman chamomile flower - <i>Chamomillae romanae flos</i> , <i>Chamaemelum nobile</i> (L.), Asteraceae	dermatitis, skin inflammations (ESCOP, 2021)	/
Matricaria flower - <i>Matricariae flos</i> , <i>Matricaria recutita</i> L., Asteraceae	dermatitis, skin inflammation (ESCOP, 2021)	minor ulcers and minor inflammation of the skin (sunburn), superficial wounds, small boils (EMA, 2015b)
Sage leaf - <i>Salviae folium</i> , <i>Salvia officinalis</i> L., Lamiaceae	hyperhidrosis (ESCOP, 2021)	minor skin inflammations (EMA, 2016a)
Peppermint oil - <i>Menthae piperitae aetheroleum</i> , <i>Mentha piperita</i> L., Lamiaceae	pruritus, urticaria, pain in irritable skin conditions (ESCOP, 2003)	symptomatic relief of localized pruritic conditions in intact skin (EMA, 2020b)
Lemon balm leaf – <i>Melissae folium</i> , <i>Melissa officinalis</i> L., Lamiaceae	cold sores, <i>Herpes labialis</i> (ESCOP, 2021)	/
Tea tree oil – <i>Melaleuca aetheroleum</i> , <i>Melaleuca alternifolia</i> (Maiden and Betche) Cheel, Myrtaceae	bacterial and fungal infections of the skin, including furunculosis, tinea pedis, onychomycosis, dandruff (ESCOP, 2009e)	small superficial wounds and insect bites; small boils (furuncles and mild acne) and for the relief of itching and irritation in cases of mild athlete ' s foot (EMA, 2015e)

Linseed – <i>Lini semen, Linum usitatissimum</i> L., Linaceae	dermatitis, skin inflammations (ESCOP, 2021)	/
Burdock root – <i>Bardanae radix, Arctium lappa</i> L., Asteraceae	acne, eczema, psoriasis (ESCOP, 2021)	/
Myrrh – Myrrha, <i>Commiphora molmol</i> Engler., Burseraceae	abrasions, wounds, skin inflammation (ESCOP, 2021)	minor wounds, abrasions, furuncles, skin inflammations (EMA, 2010c)
Equisetum stem (horsetail stem) – <i>Equiseti herba, Equisetum arvense</i> L., Equisetaceae	superficial wounds (ESCOP, 2021)	superficial wounds (EMA, 2016b)
Oak bark – <i>Quercus cortex, Quercus robur</i> L., Fagaceae	/	minor inflammation of the skin (EMA, 2010d)
Melilot – <i>Meliloti herba, Melilotus officinalis</i> L., Fabaceae		minor inflammations of the skin (EMA, 2017b)
St. John's wort – <i>Hyperici herba, Hypericum perforatum</i> L., Hypericaceae		first degree burns, sunburn, wound healing (EMA, 2009b)
Yarrow flower – <i>Millefoli flos, Achillea millefolium</i> L., Asteraceae		small superficial wounds (EMA, 2020a)
Majoram – <i>Origanum majoranae herba, Origanum majorana</i> L., Lamiaceae		irritated skin around the nostrils (EMA, 2016c)
Rose flower - <i>Rosae flos, Rosa centifolia</i> L., Rosaceae		minor skin inflammation (EMA, 2022)
Dittany of Crete herb – <i>Origanum dictamnii herba, Origanum dictamnus</i> L., Lamiaceae		minor skin inflammations, bruises (EMA, 2014e)
Fenugreek – <i>Trigonellae foenugraeci semen, Trigonella foenum-graecum</i> L., Fabaceae		minor inflammations of the skin (EMA, 2021)
Oat fruit – <i>Avenae fructus, Avena sativa</i> L., Poaceae		minor inflammations of the skin (such as sunburn), as an aid in healing of minor wounds (EMA, 2008)
Matricaria essential oil – <i>Matricariae aetheroleum, Matricaria recutita</i> L., Asteraceae		irritations of skin (EMA, 2015b)
Walnut leaf – <i>Juglandis folium, Juglans regia</i> L., Juglandaceae		minor inflammatory conditions of the skin (EMA, 2013b)
Evening primrose oil – <i>Oenotherae oleum, Oenothera biennis</i> L., Onagraceae		symptomatic relief of itching in acute and chronic dry skin conditions (EMA, 2018b)
Soya-bean oil, refined – <i>Soiae oleum raffinatum, Glycine max</i> L., Fabaceae		symptomatic relief of dry skin conditions associated with mild recurrent eczema (EMA, 2017c)
Woody nightshade stem – <i>Solani dulcamarae stipites, Solanum dulcamara</i> L., Solanaceae		symptomatic relief of mild recurrent eczema (EMA, 2013c)
Purple coneflower root – <i>Echinaceae purpureae radix, Echinaceae purpurea</i> L., Asteraceae		relief of spots and pimples due to mild acne (EMA, 2017d)
Mastic – <i>Pistaciae lentisci resina, Pistacia lentiscus</i> L., Anacardiaceae		minor inflammations of the skin and as an aid in healing of minor wounds (EMA, 2016d)

leaf can be also used to treat *Herpes simplex* and minor wounds. In patients with herpetic lesions, the administration of 1 % of the lemon balm's extracts 5 times per day led to a recovery in 96 % of the lesions 8 days after the beginning of the treatment (Bedi and Shenefelt, 2002).

Tea tree oil – *Melaleuca aetheroleum*, *Melaleuca alternifolia* [(Maiden & Betche) Cheel], Myrtaceae. The major components are monoterpenes and sesquiterpenes. Therapeutic indications for tea tree oil are bacterial and fungal infections of the skin, including furunculosis, tinea pedis, onychomycosis, and dandruff (ESCOPE, 2009e). It is used in the treatment of small superficial wounds and insect bites; small boils (furuncles and mild acne) and for the relief of itching and irritation in cases of mild athlete's foot (EMA, 2015e). Tea tree oil is a common contact allergen and extremely poisonous when taken orally (for example accidentally by children) (Bedi and Shenefelt, 2002; EMA, 2014d). Therefore, there are conflicting opinions when it comes to the use of tea tree oil, and some even believe that these are serious arguments to reject the essential oil of *Melaleuca* as safe herbal medicine (EMA, 2014d).

3.1.9. Herbal drugs with heteropolysaccharides

Linseed – *Lini semen*, *Linum usitatissimum* L., Linaceae. Linseed contains oil, viscous fibers rich in lignan (mucus), proteins (albumin, globulins), vitamins and minerals (vitamin A, B1, B2, C, D, E, potassium, phosphorus, magnesium, calcium, sodium, iron, zinc). Fiber and mucus, which promote healthy intestinal flora, are found in large quantities in this drug (Madhusudhan, 2009). Linseed preparations are valued for wound healing due to their high fatty acid content (de Souza Franco et al., 2012). Burdock root – *Bardanae radix*, *Arctium lappa* L., Asteraceae. Burdock root is rich in sesquiterpenes, triterpenes, polysaccharides - up to 45 % (inulin), phytosterols (β -sitosterol, stigmasterol), phenolic acids (caffeic acid), tannins, bitter substances, fatty acids 0.4-0.8 % (palmitic, stearic acid), adhesives, and mineral salts (EMA, 2010e; Patri and Silano, 2002). Burdock root has an emollient, soothing, antiseptic effect, it is used as a cleanser (Patri and Silano, 2002). Burdock root is a traditional herbal medicine used in the treatment of seborrheic skin diseases and rheumatism (EMA, 2010f; Patri and Silano, 2002). ESCOP recommends its use in acne, eczema, and psoriasis as well (ESCOPE, 2021). The antiallergic activity of the butanol extract of *Arctium lappa* allows for its use in various forms of allergic inflammation, including atopic dermatitis (Sohn et al., 2011). The positive effects of *Arctium lappa* in *Acne vulgaris* were shown in a human study in India (Migliani and Manchanda, 2014).

Myrrh – *Commiphora molmol* Engler, Burseraceae. Myrrh contains polysaccharides (arabinose, galactose), proteins, organic acids, and furanosesquiterpenes (Patri and Silano, 2002). Myrrh has an astringent effect; it is used as a tonic and cleanser, for abrasions, minor wounds, and skin inflammation (EMA, 2010c; ESCOP, 2021). It also acts as a stimulant, antiseptic, and breath freshener (Patri and Silano, 2002).

3.1.10. Herbal drugs with minerals

Equisetum stem (horsetail stem) – *Equiseti herba*, *Equisetum arvense* L., Equisetaceae. Principal constituents of the Equisetum stem are silica (5-7 %), saponins (equisetonin up to 5 %), flavonoids, small amounts of alkaloids (nicotine), triglycerides (oleic acid, stearic, and linoleic acid), malic and oxalic acids, vitamin C, phytosterols, phenolic acids, tannins, and minerals (potassium). Equisetum stem acts as an astringent and sebostatic and increases the elasticity of the skin. Anti-haemorrhagic and remineralizing effects have also been observed (Patri and Silano, 2002). Equisetum stem is a traditional herbal medicine for the treatment of superficial wounds (EMA, 2016b; ESCOP, 2021). It is also used for nail breakage and hair

loss, as well as for poorly healing wounds and swelling (Al-Snafi, 2017).

3.2. EMA Recommendation

The European Medicines Agency (EMA) recommends the use of 31 herbal drugs for the treatment of skin disorders and minor wounds (EMA, 2022):

- Wild pansy – *Violae herba cum flore*, *Viola tricolor* L., Violaceae
- Myrrh – *Commiphora molmol* Engler, Burseraceae
- Burdock root - *Bardanae radix*, *Arctium lappa* L., Asteraceae
- Hamamelis bark – *Hamamelidis cortex*, *Hamamelis virginiana* L., Hamamelidaceae
- Hamamelis leaf – *Hamamelidis folium*, *Hamamelis virginiana* L., Hamamelidaceae
- Hamamelis distillate – *Hamamelidis folium et cortex aut ramunculus destillatum*, *Hamamelis virginiana* L., Hamamelidaceae
- Agrimony - *Agrimoniae herba*, *Agrimonia eupatoria* L., Rosaceae
- Matricaria flower – *Matricariae flos*, *Matricaria recutita* L., Asteraceae
- Sage leaf – *Salviae officinalis folium*, *Salvia officinalis* L., Lamiaceae
- Yarrow – *Millefoli herba*, *Achillea millefolium* L., Asteraceae
- Pot marigold flowers – *Calendulae flos*, *Calendula officinalis* L., Asteraceae
- Purple coneflower herb – *Echinaceae purpureae herba*, *Echinaceae purpurea* L., Asteraceae
- Tea tree oil – *Melaleuca aetheroleum*, *Melaleuca alternifolia* [(Maiden and Betche) Cheel], Myrtaceae
- Centella – *Centellae asiaticae herba*, *Centella asiatica* L., Apiaceae
- Oak bark – *Quercus cortex*, *Quercus robur* L., Fagaceae
- Melilot – *Meliloti herba*, *Melilotus officinalis* L., Fabaceae
- St. John's wort – *Hyperici herba*, *Hypericum perforatum* L., Hypericaceae
- Yarrow flower – *Millefoli flos*, *Achillea millefolium* L., Asteraceae
- Majoram – *Origani majoranae herba*, *Origanum majorana* L., Lamiaceae
- Rose flower - *Rosae flos*, *Rosa centifolia* L., Rosaceae
- Dittany of Crete herb – *Origani dictamni herba*, *Origanum dictamnus* L., Lamiaceae
- Fenugreek – *Trigonellae foenugraeci semen*, *Trigonella foenum-graecum* L., Fabaceae
- Oat fruit – *Avenae fructus*, *Avena sativa* L., Poaceae
- Matricaria oil – *Matricariae aetheroleum*, *Matricaria recutita* L., Asteraceae
- Walnut leaf – *Juglandis folium*, *Juglans regia* L., Juglandaceae
- Evening primrose oil – *Oenotherae oleum*, *Oenothera biennis* L., Onagraceae
- Soya-bean oil, refined – *Soiae oleum raffinatum*, *Glycine max* L., Fabaceae
- Woody nightshade stem – *Solani dulcamarae stipites*, *Solanum dulcamara* L., Solanaceae
- Purple coneflower root – *Echinaceae purpureae radix*, *Echinaceae purpurea* L., Asteraceae
- Mastic – *Pistaciae lentisci resina*, *Pistacia lentiscus* L., Anacardiaceae
- Peppermint oil – *Menthe piperite aetheroleum*, *Mentha piperita* L., Lamiaceae

The most common indications given by the EMA are very similar to the ESCOP indications (Table 1): inflammation, irritation, dry skin, eczema, wounds, acne (*Echinaceae radix*),

insect bites (*Melaleuca aetheroleum*), bruises (*Origan dictamnii herba*), wounds (*Millefoli herba*, *Millefoli flos*) (EMA, 2022).

4. CONTRAINDICATIONS, SIDE EFFECTS, POTENTIAL TOXICITY

Most patients assume an herbal product is "safe" and without side effects simply because it's natural. Often, health professionals don't ask patients about the use of herbal products or patients don't mention all the herbal products they are using (Bedi and Shenefelt, 2002).

The most common side effect of herbal preparations is allergic contact dermatitis (Monk, 1986). However, systemic side effects (such as hepatotoxic effects, renal failure, and agranulocytosis) can sometimes occur after using herbal remedies to treat dermatological disorders (Bedi and Shenefelt, 2002). The use of herbal preparations is contraindicated in all patients suspected of having an allergy to any of the ingredients of the preparation.

The toxicity that plants can exhibit may be conditioned by the content of toxic compounds in the plant (e.g. *Menthae pulegium aetheroleum* contains pulegone, which has an abortive effect and leads to liver and kidney failure and even death), by contamination of the plant with some environmental component (recorded in the case of lead poisoning when using certain plant species), some plant species become toxic when used with particular drugs (may increase or decrease the absorption, metabolism, excretion and pharmacological effects of drugs), and the unintended replacement of one plant species by another (which is toxic) (Hussin, 2001).

Health professionals have to become aware of the most common and serious side effects of herbal medicines in order to counsel and educate their patients (Bedi and Shenefelt, 2002).

CONCLUSION

The use of herbs in medicine, especially in dermatology, is constantly increasing. There are no adequate clinical trials to confirm individual plant species' efficacy in many of the indications in which they are traditionally mentioned and appreciated. However, many of these species have been used for decades, even centuries, which speaks in favor of their efficiency. Future clinical trials of different plant species, traditionally used in the treatment of skin conditions, skin disorders, mucous membranes, and skin adnexa, will determine their effects and the ability to apply them safely and rationally. Herbal raw materials are also highly valued ingredients in many cosmetic and "cosmeceutical" products. With the increasing trend of "natural cosmetics" their use and importance in the cosmetic industry will grow.

Since the line between dermatologic, cosmetic, and cosmeceutical preparations is very thin, knowing the possibilities of safe and effective application of herbal products to the skin and skin annexes is of great importance.

ACKNOWLEDGMENTS

This work was supported by the Ministry of Education and Science of the Republic of Serbia (project no. 451-03-68/2022-14/200113 and 451-03-68/2022-14/200003).

REFERENCES

Al-Snafi, A. (2015). The pharmacological and therapeutic importance of *Agrimonia eupatoria* – a review, *Asian Journal of Pharmaceutical Science and Tehchnology* 5(2): 112–117.

Al-Snafi, P. D. A. E. (2017). The pharmacology of *Equisetum arvense* - A review, *IOSR Journal of Pharmacy (IOSRPHR)* 7(2): 31–42.

Anuradha, S., Ganasan, A., Joobi, A. and S., A. (2015). "Cosmeceuticals": An opinion in the direction of pharmaceuticals, *Asian J Pharm Clin Res* 8: 64–69.

Bedi, M. K. and Shenefelt, P. D. (2002). Herbal therapy in dermatology, *Archives of Dermatology* 138(2).

COSMOS (2020). Cosmetics organic and natural standard (Version 3.1), COSMOS-standard AISBL, Brussels, Belgium.

Darshana, R., Nalanda, T., Nilesh, M., Fahimuddin, S. and Ujjawala, N. (2016). An opinion on cosmeceuticals to provide a biological effect, *Human Journals* 6(4): 282–296.

Dawid-Pač, R. (2013). Medicinal plants used in treatment of inflammatory skin diseases, *Advances in Dermatology and Allergology* 3: 170–177.

de Souza Franco, E., de Aquino, C., de Medeiros, P., Evêncio, L., da Silva Góes, A. and de Souza Maia, M. (2012). Effect of a semisolid formulation of *Linum usitatissimum* L. (linseed) oil on the repair of skin wounds. , *Evidence-Based Complementary and Alternative Medicine* p. 270752.

Drobac, M., Arsenijević, J. and Marčetić, M. (2019). Safety aspects of herbal products containing compounds with a potential risk, *Arhiv za farmaciju* 69(4): 307–321.

Dumbhare, R., Rangari, T., Mahajan, M., Kazi, S. and Mahajan, N. (2016). An opinion on cosmeceuticals to provide a biological effect, *International Journal of Pharmacy and Pharmaceutical Research* 6(4): 281–296.

EMA (2008). Community herbal monograph on *Avena sativa* L., *fructus*, EMEA/368600/2007 Committee on Herbal Medicinal Products (HMPC).

EMA (2009a). Community herbal monograph on *Hamamelis virginiana* L., *folium*, EMA/114586/2008 Committee on Herbal Medicinal Products (HMPC).

EMA (2009b). Community herbal monograph on *Hypericum perforatum* L., *herba* (traditional use), EMEA/745582/2009 Committee on Herbal Medicinal Products (HMPC).

EMA (2010a). Assessment report on *Viola tricolor* L. and/or subspecies *Viola arvensis* Murray (Gaud) and *Viola vulgaris* Koch (Oborny), *herba cum flore.*, EMA/131735/2009 Committee on Herbal Medicinal Products (HMPC).

EMA (2010b). Assessment report on *Potentilla erecta* (L.) Raeusch, *rhizoma*, EMA/5511/2010 Committee on Herbal Medicinal Products (HMPC).

EMA (2010c). Assessment report on *Commiphora molmol* Engler, *gummi-resina*, EMA/96910/2010 Committee on Herbal Medicinal Products (HMPC).

EMA (2010d). Community herbal monograph on *Quercus robur* L., *Quercus petraea* (Matt.) Liebl., *Quercus pubescens* Willd., *cortex*, EMA/3203/2009 Committee on Herbal Medicinal Products (HMPC).

EMA (2010e). Assessment report on *Arctium lappa* L., *radix*, EMA/246764/2009 Committee on Herbal Medicinal Products (HMPC).

EMA (2010f). Community herbal monograph on *Arctium lappa* L., *radix*, EMA/246763/2009 Corr.11 Committee on Herbal Medicinal Products (HMPC).

EMA (2011a). Assessment report on *Chamaemelum nobile* (L.) All., *flos*, EMA/560906/2010 Committee on Herbal Medicinal Products (HMPC).

EMA (2011b). Community herbal monograph on *Hamamelis virginiana* L., *cortex*, EMA/114583/2008 Corr.1 Committee on Herbal Medicinal Products (HMPC).

EMA (2013a). Assessment report on *Melissa officinalis* L., *folium*, EMA/196746/2012 Committee on Herbal Medicinal Products (HMPC).

EMA (2013b). Community herbal monograph on *Juglans regia* L., *folium*, EMA/346737/2011 Committee on Herbal Medicinal Products (HMPC).

EMA (2013c). Community herbal monograph on *Solanum dulcamara* L., *stipites*, EMA/734361/2011 Committee on Herbal Medicinal Products (HMPC).

EMA (2014a). Assessment report on *Arnica montana* L., *flos*, EMA/198794/2012 Committee on Herbal Medicinal Products (HMPC).

EMA (2014b). Community herbal monograph on *Arnica montana* L., *flos*, EMA/198793/2012 Committee on Herbal Medicinal Products (HMPC).

EMA (2014d). Opinion of the HMPC on a European Union herbal monograph on *Melaleuca alternifolia* (Maiden and Betch) Cheel, *M. linariifolia* Smith, *M. dissitiflora* F. Mueller and/or other species of *Melaleuca aetheroleum.*, EMA/711718/2014 Committee on Herbal Medicinal Products (HMPC).

EMA (2014e). Community herbal monograph on *Rosa gallica* L., *Rosa centifolia* L., *Rosa damascena* mill., *flos*, EMA/137299/2013 Committee on Herbal Medicinal Products (HMPC).

- EMA (2015a). Assessment report on *Agrimonia eupatoria* L., *herba*, EMA/680595/2013 Committee on Herbal Medicinal Products (HMPC).
- EMA (2015b). European Union herbal monograph on *Matricaria recutita* L., *flos*, EMA/55843/2011 Committee on Herbal Medicinal Products (HMPC).
- EMA (2015c). Assessment report on *Symphytum officinale* L., *radix*, EMA/437450/2017 Committee on Herbal Medicinal Products (HMPC).
- EMA (2015d). European union herbal monograph on *Echinacea purpurea* (L.) moench, *herba recens*, EMA/48704/2014 Committee on Herbal Medicinal Products (HMPC).
- EMA (2015e). European Union herbal monograph on *Melaleuca alternifolia* (Maiden and Betch) Cheel, *M. linariifolia* Smith, *M. dissitiflora* F. Mueller and/or other species of *Melaleuca*, *aetheroleum*, EMA/320930/2012 Committee on Herbal Medicinal Products (HMPC).
- EMA (2016a). European Union herbal monograph on *Salvia officinalis* L., *folium*, EMA/277152/2015 Committee on Herbal Medicinal Products (HMPC).
- EMA (2016b). European Union herbal monograph on *Equisetum arvense* L., *herba*, EMA/278091/2015 Committee on Herbal Medicinal Products (HMPC).
- EMA (2016c). European Union herbal monograph on *Origanum majorana* L., *herba*, EMA/166517/2015 Committee on Herbal Medicinal Products (HMPC).
- EMA (2016d). European Union herbal monograph on *Pistacia lentiscus* L., *resina* (mastic), EMA/46758/2015 Committee on Herbal Medicinal Products (HMPC).
- EMA (2017a). Opinion of the HMPC on a European Union herbal monograph on *Vitis vinifera* L., *folium*, EMA/338763/2017 Committee on Herbal Medicinal Products (HMPC).
- EMA (2017b). European Union herbal monograph on *Melilotus officinalis* (L.) lam., *herba*, EMA/44166/2016 Committee on Herbal Medicinal Products (HMPC).
- EMA (2017c). European Union herbal monograph on *Glycine max* (L.) Merr., *oleum raffinatum*., EMA/338914/2016 Committee on Herbal Medicinal Products (HMPC).
- EMA (2017d). European Union herbal monograph on *Echinacea purpurea* (L.) moench, *radix*., EMA/424583/2016 Committee on Herbal Medicinal Products (HMPC).
- EMA (2018a). Assessment report on *Calendula officinalis* L., *flos*, EMA/603409/2017 Committee on Herbal Medicinal Products (HMPC).
- EMA (2018b). European Union herbal monograph on *Oenothera biennis* L. or *Oenothera lamarckiana* L., *oleum*., EMA/753041/2017 Committee on Herbal Medicinal Products (HMPC).
- EMA (2020a). European union herbal monograph on *Achillea millefolium* L., *herba*, EMA/376416/2019 Committee on Herbal Medicinal Products (HMPC).
- EMA (2020b). European Union herbal monograph on *Mentha x piperita* L., *aetheroleum*, EMA/522410/2013 Committee on Herbal Medicinal Products (HMPC).
- EMA (2021). European Union herbal monograph on *Trigonella foenum-graecum* L., *semen*, EMA/179591/2018 Committee on Herbal Medicinal Products (HMPC).
- EMA (2022). European Medicines Agency (official website). [accessed 21/01/22].
URL: <https://www.ema.europa.eu/en>
- ESCOP (2003). ESCOP Monographs, 2nd edition, supplement., *Menthae piperitae aetheroleum*, peppermint oil, European Scientific Cooperative On Phytotherapy.
- ESCOP (2009a). ESCOP Monographs, 2nd edition, supplement., *Capsici fructus*, *Capsicum*, European Scientific Cooperative On Phytotherapy.
- ESCOP (2009b). ESCOP Monographs, 2nd edition, supplement., *Echinaceae purpureae herba*, purple coneflower herb, European Scientific Cooperative On Phytotherapy.
- ESCOP (2009c). ESCOP Monographs, 2nd edition, supplement., *Vitis viniferae folium*, red vine leaf, European Scientific Cooperative On Phytotherapy.
- ESCOP (2009d). ESCOP Monographs, 2nd edition, supplement., *Centellae asiaticae herba*, *Centella*, European Scientific Cooperative On Phytotherapy.
- ESCOP (2009e). ESCOP Monographs, 2nd edition, supplement., *Melaleucaae aetheroleum*, tea tree oil, European Scientific Cooperative On Phytotherapy.
- ESCOP (2021). *ESCOP Monographs The Scientific Foundation for Herbal Medicinal Products*, Online series, Exeter: ESCOP.
- González-Minero, F. and Bravo-Díaz, L. (2018). The use of plants in skin-care products, cosmetics and fragrances: past and present, *Cosmetics* 5(3): 50.
- Hussin, H. (2001). Adverse effects of herbs and drug-herbal interactions., *Malaysian Journal of Pharmacy* 1(2): 39–44.
- ISO 16128-1:2016 (2016). Guidelines on technical definitions and criteria for natural and organic cosmetic ingredients and products – part 1: Definitions for ingredients, International Organization for Standardization, Geneva, Switzerland.
- ISO 16128-2:2017 (2017). Guidelines on technical definitions and criteria for natural and organic cosmetic ingredients – part 2: Criteria for ingredients and products, International Organization for Standardization, Geneva, Switzerland.
- Korting, H., Schäfer-Korting, M., Hart, H., Laux, P. and Schmid, M. (1993). Anti-inflammatory activity of *Hamamelis distillate* applied topically to the skin: Influence of vehicle and dose, *European Journal of Clinical Pharmacology* 44(4): 315–318.
- Kovačević, N. (2004). *Fundamentals of Pharmacognosy*, Faculty of Pharmacy, Belgrade. [in Serbian].
- Madhusudhan, B. (2009). Potential benefits of flaxseed in health and disease - A perspective, *Agriculturae Conspectus Scientificus* 74(2): 67–72.
- Migliani, A. and Manchanda, R. (2014). Observational study of *Arctium lappa* in the treatment of Acne vulgaris, *Homeopathy* 103(3): 203–207.
- Mihailović, M. (2011). Herbal medicines - requirements for quality control and good manufacturing practice, *Lekovite sirovine* 31: 17–31.
- Monk, B. (1986). Severe cutaneous reactions to alternative remedies, *British Medical Journal* 293(6548): 665–666.
- NATRUE (2021). Label criteria: Requirements to be met by natural and organic cosmetics (Version 3.9 – 01.01.2021), The International Natural and Organic Cosmetics Association.
- Patri, F. and Silano, V. (2002). *Plants in Cosmetics: Plants and Plant Preparations Used as Ingredients for Cosmetic Products*, Council of Europe, Ann Arbor.
- Ph.Eur.10 (2019). *European Pharmacopoeia*, Vol. 10, Council of Europe, Strasbourg.
- RS Official Gazette (2010-2017). Law on medicines and medical devices, National Assembly of the Republic of Serbia, Official Gazette of the Republic of Serbia (30/2010, 107/2012, 105/17-state law and 113/2017-state law).
- RS Official Gazette (2010-2018). Rulebook on the health safety of dietetic products, National Assembly of the Republic of Serbia, Official Gazette of the Republic of Serbia (45/2010, 27/2011, 50/2012, 21/2015, 75/2015, 7/2017 and 103/2018).
- Schulz, V., Hänsel, R., Blumenthal, M. and Tyler, V. E. (2004). *Rational Phytotherapy*, 5th edn, Springer Berlin Heidelberg, Berlin, Heidelberg.
- Sohn, E.-H., Jang, S.-A., Joo, H., Park, S., Kang, S.-C., Lee, C.-H. and Kim, S.-Y. (2011). Anti-allergic and anti-inflammatory effects of butanol extract from *Arctium lappa* L., *Clinical and Molecular Allergy* 9(1): 4.
- Srivastava, K., Shankar, E. and Gupta, S. (2010). Chamomile: A herbal medicine of the past with a bright future (Review), *Molecular Medicine Reports* 3: 895–901.
- Tamburić, S. and Vuleta, G. (1997). New trends in the formulation of medicinal forms and cosmetic preparations with plant raw materials, *Arhiv za farmaciju* 5: 445–456.
- Tucakov, J. (1997). *Herbal therapy*, Rad, Belgrade.
- Vasiljević, D. and Bojović, L. (2018). Organic and natural cosmetic products : How safe are they?, *Arhiv za farmaciju* 68(5): 990–1007.