

Medicinal plants in a seborrheic scalp care

Rośliny lecznicze w pielęgnacji łojotokowej skóry głowy

ABSTRACT

Seborrhea is a serious dermatological problem that concerns disturbances in the activity of the skin's sebaceous glands. It is based on the microbiota changes with fungal disorders. Genetic factors, hormonal diseases, improper diet, deficiencies of certain vitamins, and external factors, such as inadequate care treatments, play important role in seborrhea.

The aim of the study was to analyze plant materials exhibiting high anti-seborrheic potential and to review current studies of selected plant extracts with anti-seborrheic activity and their possible therapeutic effects.

In addition to personalized therapy that allows the normalization of the work of the sebaceous glands, cosmetic treatments and topical application of appropriate medicinal plant-based products are also important. Acquiring and planning a well-chosen composition of highly effective plant extracts allow creation a natural cosmetic that safely reduce seborrhea without any additional side effects.

Keywords: sebum, seborrhea, medicinal plants, scalp

STRESZCZENIE

Łojotok stanowi poważny problem dermatologiczny. Dotyczy zaburzeń w czynności gruczołów łojowych skóry. Jego podłoże stanowią zmiany w mikrobiocie o podłożu grzybiczym. Istotną rolę w jego powstawaniu odgrywają czynniki genetyczne, choroby o podłożu hormonalnym, niewłaściwa dieta, niedobór niektórych witamin oraz czynniki zewnętrzne, takie jak nieodpowiednie zabiegi pielęgnacyjne.

Celem pracy była analiza surowców roślinnych, wykazujących wysoki potencjał przeciwłojotokowy oraz przegląd aktualnych badań z zastosowaniem wybranych ekstraktów roślinnych o aktywności przeciwłojotokowej oraz możliwych ich efektów terapeutycznych.

Poza spersonalizowaną terapią pozwalającą na normalizację pracy gruczołów łojowych, istotne są zabiegi kosmetyczne oraz aplikacja miejscowa odpowiednich produktów opartych na roślinach o działaniu leczniczym. Pozyskanie i zaplanowanie dobrze dobranej kompozycji ekstraktów roślinnych o wysokiej skuteczności działania, pozwala na stworzenie naturalnego kosmetyku, który w sposób bezpieczny, bez dodatkowych działań będzie zmniejszał łojotok.

Słowa kluczowe: sebum, łojotok, rośliny lecznicze, skóra głowy

INTRODUCTION

Seborrhea (*Seborrhoeic dermatitis*) is characterized by a pathological, excessive activity of sebum secreting glands. Areas with the greatest congestion of these glands are particularly vulnerable to this condition. The most common features of seborrhoeic skin are dilated glands located in the skin, filled with keratin-sebaceous mass and greasiness. In the case of a problem-free, healthy or balanced scalp, the secretion of sebum is age-dependent. The sebaceous glands of newborns

secrete a lot of sebum, but later, with age, its production decreases and suddenly increases in adolescence, which is related to the maturation process. Many factors, including constant stress, disturbed balance of hormones, as well as some neurological disorders, have a great influence on the increase of sebum secretion [1].

Sebum contains ingredients such as esters of waxes, free fatty acids, squalene, as well as triglycerides. When the quan-

titative and qualitative composition changes, excessive sebum secretion occurs, which may result in unfavorable changes like inflammation [2]. The definition of seborrhea is excessive sebum production. As mentioned earlier, this is accompanied by a disturbance in the work of the sebum secreting gland, however, seborrhea is not associated with any skin pathologies [3].

TYPES OF SCALP SEBORRHEA

Trichology has identified three types of scalp seborrhea.

- **Oily seborrhea** - is characterized by excessive work of sebaceous glands and oily roots, and the skin itself is thick, oily, or combination.
- **Greasy seborrhea** - otherwise known as dry seborrhea. As in the case of oily seborrhea, an oily root is noticeable, the glands that secrete sebum excessively work, while the scalp itself is dry and sensitive.
- **Liquid seborrhea** - characterized by the so-called hyperhidrosis, i.e. excessive work of the sweat glands. In addition, there is also a greasy bulb, excessive sebum secretion, and the skin itself is dry and sensitive [4].

CONDITIONS AND FACTORS CONDUCTING SEBORRHEA

To a large extent, the factor causing seborrhea is the disturbance of the scalp microbiota, including the overgrowth of *Malassezia furfur* pathogenic microorganisms, i.e. yeasts.

Other factors that cause seborrhea:

- genetic factors - research shows many individual differences which convey a lot of information about the number and location of not only androgen receptors but also sebum-secreting structures;
- individual tendency to periteneal keratosis and the work of sebocytes;
- neurological disorders and diseases - increased sebum secretion occurs in many diseases with a neurological basis, including Parkinson's disease and encephalitis. In addition, chronic stress, both physical and emotional, is also of great importance;
- hormonal diseases - including an excess of androgens (hyperandrogenism) and progesterone in the female body. The reason is the presence of receptors next to the hair follicle that converts testosterone into dihydrotestosterone (DHT). DHT, on the other hand, is a well-known substance responsible for stimulating the production of sebum. In case of hormones, it is also worth considering the period of puberty, in which, due to hormonal disorders, increased sebum secretion can be noticed;
- a poorly balanced diet - food that contains large amounts of fats, in particular trans fats and carbohydrates, especially simple sugars, have an adverse effect on health and causes a change in the composition of sebum and increases

its secretion. The excessive production of sebum is also influenced by: coffee, tea, highly processed food, and insufficient fluid replenishment;

- external factors - including inadequate hair care, such as hot blower drying or washing hair in hot water, excessive use of seborrheic shampoos - used more often than recommended, can lead to a vicious cycle and increased sebum production. Touching and scratching the scalp also stimulates the sebaceous glands to work and transfers fat to the length of the hair;
- hypovitaminosis - vitamin deficiencies play a significant role in the development of seborrhea. Vitamins A, E, C, B2, B6, and B3 play a role in the processes of epidermis keratinization and the secretion of sebum. With their deficiency, increased seborrhea is noted.

There are many causes of seborrhea, and discovering them is the basis for starting a targeted treatment. In some cases, it is enough to change the diet and care, in other cases, it may even be necessary to conduct pharmacotherapy [4-7].

SYMPTOMS OF SEBORRHEA

The hairy scalp, the eyebrow area, the T-zone of the face (nose, forehead, and chin), nasolabial folds, the place between the scapulae and the sternum are the so-called seborrhea areas, where increased seborrhea is noted [8]. The skin of a patient with greasy seborrhea in a trichoscopic image is often tense. Clogged and sometimes empty hair follicles are clearly visible. In addition, irritated, damaged, waxy-white skin is also observed, and the follicles themselves are weakened, which makes the hair grow thin and weak. On the other hand, in the case of liquid seborrhea, mixed sebum with sweat on the scalp surface is clearly noticeable, and the skin itself appears wet and oily in the trichoscopic image. Another symptom of fluid seborrhea is an unpleasant smell on the scalp. There may also be redness and irritation on the skin as well as itching and general discomfort felt by the patient. Increased seborrhea is unfortunately the basis for much more serious diseases on the scalp surface, including oily dandruff, which is the onset of seborrheic dermatitis. In addition, long untreated seborrhea may cause increased hair loss, and thus intense hair thinning [9, 10].

MEDICINAL PLANTS USED IN THE THERAPY OF SEBORRHEA

Medicinal plants are becoming popular ingredients in products used in the treatment of seborrhea. Long-known species such as burdock, sage, nettle, or juniper are common ingredients in shampoos, conditioners, and rinses indicated for seborrhea. Their chemical composition consists of tannins, flavonoids, or essential oils, which determine their pharmacological activity, such as astringent, anti-inflammatory, or disinfecting properties.

Greater burdock

Greater burdock (*Arctium lappa L.*) is a plant with a wide range of applications, appreciated for many years. The greatest number of compounds with a nurturing and healing effect is found in the burdock root. It contains polyenes, essential oils, lignans, and many substances of antioxidant properties. Thanks to the aforementioned compounds, burdock root has antiseptic, antibacterial, antioxidant, and seoregulatory properties, and thus is an effective plant against skin inflammation, dandruff, psoriasis, and seborrhea. In addition, it has a fungicidal and cleansing effect on the scalp, positively affecting the hygiene of the follicles. What is more, burdock root extract reduces the number of bacteria on the scalp, improves its hydration, and regulates the secretion of sebum. It also removes dead epidermis cells around the hair follicle, thus taking care of periallionic hygiene. In addition, the monograph of the European Medicines Agency of *Arctii radix (Bardanae radix)* confirms that greater burdock is used in the treatment of seborrheic skin conditions. It is also worth remembering that *A. lappa L.* has also found its application in the treatment of severe itching, excessive exfoliation, and dry scalp, so it can be used with any type of seborrhea [4, 11, 12, 20, 21, 23].

Sage

Sage (*Salvia officinalis L.*) is a plant that has been cultivated in Poland for several centuries. Its name is not accidental. "Salvia" means "to heal" and "officinalis" is medicinal, so it has been valued for its medicinal properties for many years. In traditional medicine, it has been recognized as a remedy for diseases such as malaria, inflammation, and bacterial infections. From a medical point of view, sage extracts contain substances with antioxidant, virucidal, and antimicrobial properties, and have anti-inflammatory and antifungal features. From the trichological point of view, the most important property in the treatment of seborrhea is the inhibition of sebum secretion due to the content of polyphenols. Sage essential oil contains many valuable compounds that are not only anti-inflammatory, but also soothing and astringent, which are effective in preventing the growth of pathogens on the surface of the scalp. In the study of the effectiveness of the shampoo against dandruff and seborrheic diseases, containing, among others, 3% sage extract, it was proved to be effective against the above-mentioned dermatoses. The sage extract itself has anti-inflammatory, antibacterial, and antiviral properties [4, 13, 22].

Nettle

Nettle (*Urtica dioica L.*) is a popular plant in the care of the scalp and hair. It contains many nutrients, including vitamins B2, B6 and C, histamine, as well as chlorophyll and carotenoids, which reduce itching in seborrhea due to their anti-inflammatory properties. The leaves also contain tannins

with disinfecting features, moisturizing phytosterols, and flavonoids with antioxidant properties. The nettle stimulates circulation in the skin, strengthens hair and nails, but also has antibacterial and anti-inflammatory properties and reduces excessive sebum production. It is often used in cosmetics for oily scalp, e.g. shampoos, especially in the case of seborrhea and hair loss. Moreover, research confirms that nettle extract has an antibacterial effect on *Staphylococcus aureus* strains and acts as a strong antioxidant preventing damage to scalp cells. Moreover, *U. dioica* extract has a broad spectrum of activity against many strains of bacteria [4, 14, 15, 24, 25].

Juniper

Juniper (*Juniperus communis L.*), a tree or shrub, contains over 0.01% of essential oil, which components consist of 60-90% monoterpenes, well-known to exhibit disinfecting properties. Juniper essential oil itself has an antibacterial effect and prevents the development of mycosis [16]. The extracted juniper oil is a valuable raw material in the treatment of seborrhea. Thanks to its lipophilic properties, it can help maintain the balance of microflora on the surface of the scalp. Juniper oil improves the secretion of sebum on the scalp and is indicated in the treatment of seborrhea, dandruff, and seborrheic alopecia, i.e. the consequences of untreated scalp seborrhea. Moreover, the comparison of the effect on the secretion of sebum of essential oils from juniper and geranium to niacinamide, showed that the sebo-regulating effect of a 0.25% solution of juniper essential oil tonic is almost at the same level as a 1% niacinamide tonic [17- 19].

Recent reports on the analysis of many plant species used in medicine in various geographic areas show that many less known plants, such as the thuja, the arugula or the mulberry, can effectively reduce the sebum secretion and alleviate the symptoms of seborrhea [26, 27].

PHARMACOLOGICAL AND CLINICAL STUDIES OF PLANTS POTENTIALLY EXHIBITING ANTISEBORRHEIC PROPERTIES

One of the most recent in vitro studies by Said et al. (2020), a randomized, double-blind, placebo-controlled trial attempted to determine the efficacy and safety of nine Mediterranean medicinal plants with anti-acne activity. The antimicrobial, anti-seborrheic and anti-inflammatory effects of the plant extracts were assessed in tests on human keratinocytes (HaCaT) and the human monocytic (THP-1) cell line. Ten medicinal plants were used in the study: caper (*Capparis spinosa L.*), black nightshade (*Solanum nigrum L.*), ferula (*Ferula hermonis Boiss.*), arugula (*Eruca sativa*), a species of St. John's wort such as *Hypericum triquetrifolium*, elecampane (*Inula helenium L.*), hairy flax (*Linum pubescens*), nettle (*Urtica dioica L.*), soapwort root (*Saponaria officinalis*) and black cumin seeds (*Nigella sativa L.*), which are widely used in Greek-Arabic tradition. Plants have been tested for their anti-acne activity by

analyzing their ability to inhibit the growth of *Cutibacterium acnes* bacteria, their effect on the release of pro-inflammatory cytokines and excessive sebum production. Most of the extracts showed no significant cytotoxic effect on HaCaT cells (up to 250 µg/ml). Plants such as *Inula helenium* and *Saponaria officinalis* inhibited sebum production at a concentration of 90 µg/ml and 30 µg/ml, respectively. The inhibitory effect of soapwort extract on the growth of *Cutibacterium acnes* was 1.2 times higher than that of chloramphenicol as the reference substance. Extracts of elk horn and soapwort significantly inhibited lipopolysaccharide (LPS) induced interleukin 6 (IL-6) and tumor necrosis factor (TNF-α) production in THP-1 cells, achieving cellular control levels at a concentration of 250 µg/ml. Both oman and the soapwort extract as well as the *Solanum nigrum* extract inhibited the production of nitric oxide (NO) in a dose – dependent manner. Based on these results, an anti-acne herbal cream was also prepared from various portions of oman and soapwort extracts, and their effectiveness was assessed in a double-blind, randomized, and controlled efficacy study in 41 patients aged 18-24 years with acne. Patients were asked to use a cream (n = 27) or placebo (n = 14) two to three times a day for six weeks. This study showed the high anti-acne and anti-seborrheic potential of plants such as elk horn, medical soap, and black nightshade, which may be used as ingredients of preparations to alleviate the symptoms associated with sebum secretion disorders. The results of the study sheds light on their future use as potential components of care products for seborrheic hair and skin [26]. Zeng et al. (2017) examined the extract from the leaves of the thuja (*Biota orientalis* L.). In China, the thuja is used in traditional medicine thanks to its antibacterial properties. It supports the restoration of hair due to its effect on the secretion of sebum and inhibiting hair loss. *Biota orientalis* at a concentration of 25 or 50 µg/ml, ethanol extract from lichen plants and water extract from lichen plants containing eastern thymus and other plant compounds were used for the study, which showed an inhibitory effect on the secretion of sebum in sebaceous cells derived from the ear of the Syrian hamster. Their effect on the growth of human epidermal keratinocytes as well as on gene expression related to hair growth stimulation on human epidermal keratinocytes and hair papilla cells was investigated. The extract reduced the level of sebum in cultured sebaceous cells and increased the amount of mRNA of hair growth factors in the keratinocytes of the epidermis and hair papilla cells. The ethanol extract of the plant showed a stimulating effect on hair growth and a hair restoration effect, and also reduced the amount of sebum. The conclusion of this study may be that hair conditioners containing the ethanol extract of *Biota orientalis* leaves may be useful for stimulating hair growth and reducing excess sebum in the scalp in men and women [27].

NATURAL COMPOSITIONS OF POTENTIAL COSMETICS

The aim of the research by Aror et al. (2019) was to formulate and evaluate a herbal shampoo containing natural ingredients with an emphasis on product safety and efficacy. It was aimed to eliminate the harmful synthetic ingredient from the shampoo recipe and replacing it with safe natural ingredients. The shampoo was prepared from plant extracts such as Aloe vera (L.) Burm. F.), Chinese rose ketmi (*Hibiscus rosa-sinensis* L.), tannin leaf (*Phyllanthus emblica* L.), Acacia concinna (Willd.) DC., Indian honey (*Azadirachta indica* L.), *Sapindus mukorossi* Gaertn., Liquorice (*Glycyrrhiza glabra* L.) and *Eclipta prostrata* (L.). The designed cosmetic effectively removed sebum, reduced dandruff, cleansed the skin and hair, promoted hair growth, strengthened the bulbs, and darkened their color. Moreover, it also acted as a conditioning agent and did not negatively affect or damage the hair structure. The above combination of natural ingredients can be used as a potential alternative to cleansing and caring for hair in a natural and effective way compared to synthetic agents [28].

SUMMARY

Although seborrhea is a very common skin disorder characterized by pathological excess production of sebum, it is often not treated properly. It is associated with a wrong diagnosis, sometimes with seborrhea itself, and sometimes with a failure to recognize a specific type of seborrhea. The care for a person who struggles with greasy (dry) seborrhea will be different from oily seborrhea, when the skin itself is very oily. Cases of fluid seborrhea are difficult to cure completely because hyperhidrosis, or excessive sweat secretion, is often genetically related and associated with comorbidities.

Proper diagnosis is the basis for an effective fight against seborrhea, and thus the removal of the skin. Plant raw materials are effective ingredients in the described disease. Greater burdock, sage, nettle, and juniper help to reduce sebum secretion, and also have antibacterial and antifungal properties. They are also proved to be useful in the maintenance of anti-seborrheic treatment. The latest reports indicate the high anti-acne and anti-seborrheic potential of plants such as elk horn, mycelia and black nightshade. Reaching for plants that have been used with great success for centuries in traditional Chinese medicine, and little known in Europe, such as *Biota orientalis* L., allows to expand research directions in the fight against seborrhea. The right composition of shampoos and other care products based on natural ingredients, on the one hand, brings the right cosmetic effect, and on the other hand, ensures a high safety profile of the product and reduces some of the undesirable effects of chemical substances.

REFERENCES / LITERATURA

1. Hałat B. Skóra tłusta i jej pielęgnacja. *Medycyna Estetyczna i Anti-Aging*. 2010;3:5-7.
2. Melnik BC. Acne vulgaris: The metabolic syndrome of the pilosebaceous follicle. *Clin Dermatol*. 2018;36(1):29-40.
3. Martini M-C. *Kosmetologia i farmakologia skóry*. Warszawa: PZWL Wydawnictwo Lekarskie; 2006:79-80.
4. Siemiątkowska JM. *Zarys Trychologii Kosmetycznej*. Stargard: Instytut Kosmetologii Fryzjerskiej Trichomed; 2016:74-160.
5. Jabłońska S, Majewski S. *Choroby skóry i choroby przenoszone drogą płciową*. Warszawa: PZWL Wydawnictwo Lekarskie; 2013:438-439.
6. Małek E. *Rozpoznanie zaburzeń wzrostu, uszkodzeń i chorób włosów*. Radom: Instytut Technologii Eksploatacji – Państwowy Instytut Badawczy; 2007:16.
7. Sedlak-Kaczmarczyk I, Ciołkowski A. *Zioła w medycynie. Choroby skóry, włosów i paznokci tom 2*. Warszawa: PZWL Wydawnictwo Lekarskie; 2020:165-180.
8. Jabłońska S, Majewski S. *Choroby skóry i choroby przenoszone drogą płciową*. Warszawa: PZWL Wydawnictwo Lekarskie; 2013:438-439.
9. Sekita-Pilch M, Zielińska K. Diagnostyka chorób włosów i skóry głowy w praktyce trychologicznej – mikrokamera w roli głównej. *Kosmetologia Estetyczna*. 2015;4(3):269-271.
10. Łojotok. <https://www.hairmedica.pl/wiedza/choroby-skory-glowy/lojotok/#objawy>. Accessed: 18.03.2022.
11. Mi-Sun L, Ji-Sun J, Do-Young P. The Effects of *Arctium lappa* L. Root Extracts on the Scalp and Hair. *Journal of the Korean Society of Dermatology and Beauty*. 2015;13(1):43-48.
12. Kaur A, Gurjeet Singh T, Dhiman S et al. Novel Herbs Used In Cosmetics For Skin And Hair Care: A Review. Chitkara College of Pharmacy; Chitkara University; Punjab: India. *Plant Archives*. 2020;20(1):3784-3793.
13. Et-Touys A, Fellah H, Mniouil M, et al. Screening of Antioxidant, Antibacterial and Antileishmanial Activities of *Salvia officinalis* L. Extracts from Morocco. *British Microbiology Research Journal*. 2016;16(5):1-10.
14. Ahmadi Ashtiani H, Rastegar H, Aghaei M, et al. Clinical efficacy of natural formulated shampoo in subjects with dandruff and seborrheic dermatitis. *American Journal of Research Communication*. 2013;1(8):63-80.
15. Kieżyłka-Dadasiewicz A. *Rośliny w nowoczesnej kosmetologii*. Lublin: Wyższa Szkoła Społeczno-Przyrodnicza im. Wincentego Pola w Lublinie; 2016:1-160.
16. Wyszowska-Kolatko M, Koczurkiewicz P, Wójcik K, et al. Rośliny lecznicze w terapii chorób skóry. *Postępy Fitoterapii*. 2015;3:184-192.
17. Abelan US, de Oliveira AC, Cacoci ÉSP, et al. Potential use of essential oils in cosmetic and dermatological hair products: A review. *Journal of Cosmetic Dermatology*. 2022;21(4):1407-1418. <https://doi.org/10.1111/jocd.14286>
18. Can Baser KH, Buchbauer G. *Handbook of Essential Oils: Science, Technology, and Applications*. Boca Raton (FL, USA): CRC Press; 2015:429-432.
19. Kozłowska J, Kaczmarkiewicz A, Stachowiak N et al. Evaluation of Sebostatic Activity of *Juniperus communis* Fruit Oil and *Pelargonium graveolens* Oil Compared to Niacinamide. *Cosmetics*. 2017;4(3):1-8.
20. Kyung Sook K. Scalp Improvement Cosmetics' Natural Substance Development Trend - Focused on Plant Extracts and Marine Life. *Journal of the Korean Society of Aesthetics*. 2020;16(2):139-147.
21. Skowrońska W, Granica S, Dziedzic M, et al. *Arctium lappa* and *Arctium tomentosum*, Sources of *Arctii radix*: Comparison of Anti-Lipoxygenase and Antioxidant Activity as well as the Chemical Composition of Extracts from Aerial Parts and from Roots. *Plants*. 2021;10(78):1-19.
22. Ahmadi Ashtiani H, Rastegar H, Aghaei M, et al. Clinical efficacy of natural formulated shampoo in subjects with dandruff and seborrheic dermatitis. *American Journal of Research Communication*. 2013;1(8):63-80.
23. Amro BI, Abu Hajleh MN, Afifi F. Evidence-Based Potential of some Edible, Medicinal and Aromatic Plants as Safe Cosmetics and Cosmeceuticals. *Tropical Journal of Natural Product Research*. 2021;5(1):16-48. <https://doi.org/10.26538/tjnpr/v5i1.3>
24. Gendron F, Nilson S, Ziffle V, et al. Antimicrobial Effectiveness on Selected Bacterial Species and Alkaloid and Saponin Content of *Rosa nutkana* C. Presl (Nootka Rose) and *Urtica dioica* L. (Stinging Nettle) Extracts. *American Journal of Plant Sciences*. 2021;12(5):720-733. <https://doi.org/10.4236/ajps.2021.125049>
25. Bourgeois C, Leclerc ÉA, Corbin C, et al. Nettle (*Urtica dioica* L.) as a source of antioxidant and anti-aging phytochemicals for cosmetic applications. *Comptes Rendus Chimie*. 2016;19(9):1090-1100. <https://doi.org/10.1016/j.crci.2016.03.019>
26. Said O, Khamaysi I, Kmail A, et al. In Vitro and Randomized, Double-Blind, Placebo-Controlled Trial to Determine the Efficacy and Safety of Nine Antiacne Medicinal Plants. *Evid Based Complement Alternat Med*. 2020;32314131-14. <https://doi.org/10.1155/2020/3231413>
27. Zeng H, Gu L, Maeda K. Evaluation of the Effect of Plant Mixture Ethanol Extracts Containing *Biota orientalis* L. Extract on Suppression of Sebum in Cultured Sebocytes and on Stimulation of Growth of Keratinocytes Co-cultured with Hair Papilla Cells. *Cosmetics*. 2017;4(3):1-13. <https://doi.org/10.3390/cosmetics4030029>
28. Arora R, Singh RK, Meenakshi B. Formulation and Evaluation of Herbal Shampoo by Extract of Some Plants. *The Pharmaceutical and Chemical Journal*. 2019;6(4):74-80.

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