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The use of the medicinal plant raw material and bee products in the treatment of dermatological diseases

Aim. To analyze the application of natural components in dermatological practice, as well as to study the potential benefits of using extracts from the medicinal plant raw material (MPRM) (*Curcuma longa*, *Aloe vera*, *Calendula officinalis*) and bee products (propolis, bee venom, honey) in the treatment of skin diseases.

Materials and methods. To achieve this aim, methods of logical-content issue formation, content-analysis of publications in scientific and practical-oriented medical and pharmaceutical publications, comparative analysis and graphic tools of visual presentation of the data obtained were used. This study presents the results of scientific and practical work of leading scientists and the own experimental research materials of the authors of the article. Determination and observational studies cover clinical tests that diagnose acne on the skin.

Results. Traditional treatments, including topical retinoids, benzoyl peroxide, and systemic antibiotics, while effective, are not without side effects and limitations, requiring the study of alternative therapies. The combination of bee products and medicinal plant extracts proposed is a potentially synergistic approach to improving acne treatment outcomes. These materials show a clear effect of using natural components in dermatological practice.

Conclusions. The analysis of scientific literature has shown that the plant raw material and bee products have significant therapeutic potential due to a wide range of biologically active substances. The use of honey, propolis and bee venom in the treatment of dermatological diseases, as well as plant extracts that enhance the effect of bee products is of particular interest. The studies conducted have confirmed the effectiveness of the medicinal compositions developed on the basis of the MPRM and bee products for the treatment of dermatological pathologies.

Keywords: *acne; phytotherapy; bee products; skin diseases; cysts; inflammatory processes*

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Застосування лікарської рослинної сировини та продуктів бджільництва у лікуванні дерматологічних захворювань

Мета роботи – проаналізувати застосування природних компонентів у дерматологічній практиці, а також вивчити потенційні переваги використання витяжок із лікарської рослинної сировини (*Curcuma longa*, *Aloe vera*, *Calendula officinalis*) та продуктів бджільництва (*Propolisi*, *Apis venenum*, *Mel depuratum*) у лікуванні шкірних захворювань.

Матеріали та методи. Для досягнення зазначеної мети було використано методи логіко-змістовного формування проблеми, контент-аналіз публікацій у наукових та практично-орієнтованих медичних і фармацевтичних виданнях, порівняльний аналіз і графічні засоби наочної презентації отриманих даних. У цьому дослідженні наведено результати науково-практичних робіт провідних учених та матеріали власних експериментальних досліджень авторів статті.

Результати та їх обговорення. Традиційні методи лікування, зокрема місцеві ретиноїди, бензоїлпероксид та системні антибіотики, ефективні, але не позбавлені побічних ефектів та обмежень, що зумовлює вивчення альтернативних терапевтичних методів. Запропоноване поєднання продуктів бджільництва і витяжок лікарської рослинної сировини є потенційно синергічним підходом до поліпшення результатів лікування шкірних захворювань, зокрема акне. Наведені матеріали наочно демонструють ефект використання природних компонентів у дерматологічній практиці.

Висновки. Аналіз наукової літератури свідчить, що рослинна сировина й продукти бджільництва володіють значним терапевтичним потенціалом завдяки багатству біологічно активних сполук. Особливий інтерес становить застосування меду, прополісу та бджолиної отрути в лікуванні дерматологічних захворювань, а також використання екстрактів рослин, що підсилюють дію продуктів бджільництва. Проведені дослідження підтвердили ефективність розроблених лікарських композицій на основі рослинної сировини та продуктів бджільництва для лікування дерматологічних патологій.

Ключові слова: *акне; фітотерапія; продукти бджільництва; захворювання шкіри; кісти; запальні процеси*

Introduction. Acne (*Acne Vulgaris*) is a common cutaneous inflammatory disease of the sebaceous glands that occurs chronically and affects people all over the world. The prevalence of acne among the global population is 9.4 %, ranking eighth among skin diseases worldwide [1-3]. About 87 % of teenagers suffer from this common skin problem, and the disease can persist into adulthood. The pathogenesis of lesions can be characterized as inflammatory or non-inflammatory. The non-inflammatory ones include:

- Whiteheads: closed comedones that form due to a complete blockage of the hair follicle.

- Blackheads: open comedones, resulting from the accumulation of surface pigments in the pores, and forming dark dots on the skin.
- Giant comedones: they are exceptionally large blackheads (a type of cyst), or inflammatory formations (papules, pustules, nodules, and cysts) that lead to scarring and pigmentation on the skin [1-3]; requiring long-term and persistent treatment.
- Pustules: with a white head or pus filled with a white or yellow liquid (pus that comes out when pierced), with a brownish dot in the middle of the white head. Pustules appear on the face, chest, neck, shoulders, and back [2, 4, 5].

Nodules, in turn, are classified into inflammatory (granulomas, vasculitis, or panniculitis), infectious, vascular, or metabolic malformations. They can manifest as benign or malignant tumors that arise from skin cells or migrant cells. Cystic inflammatory painful acne, which is filled with pus and forms deep under the skin, occurs when oil and dead skin cells clog the skin pores [3, 6].

Acne is commonly observed in adolescents and young adults, but it can affect individuals of various ages. Clinical presentation can vary from very mild facial comedonal lesions to more severe forms characterized by disfiguring inflammatory manifestations, which can lead to hyperpigmentation, scarring, adverse psychological effects, and other clinical sequelae [7].

The pathogenesis of acne resulting from dysbiosis refers to an imbalance in microbial species and a decrease in microbial diversity in certain microbiomes of the body, i.e., the accumulation of microorganisms that exist in a specific part of the human body. The human gut microbiota plays an important role in maintaining the intestinal-skin homeostasis and the entire body. Violation of this balance is characterized by the excessive growth of some species of bacteria, pathogens, fungi and the general loss of community diversity. This dysbiosis can lead to chronic diseases, poor wound healing, increased inflammation, and an increased risk of various infections in the body and on the skin. Dysbiosis leads to metabolic deregulation, which affects the skin barrier.

Staphylococcus (*Staphylococcus aureus*) lives on the human skin, mucosa and causes the most common infections [2, 5, 8]. Although *S. aureus* usually acts as a commensal human microbiota, and it can also become an opportunistic pathogen as a common cause of skin infections, including abscesses, respiratory infections (such as sinusitis), food poisoning, [1, 6, 9]. Streptococci can also cause local purulent complications, such as peritoneal abscess, otitis media, sinusitis, and bacteremia [1, 5, 10]. Chronic low-grade streptococcus can move from the liver to the lymphatic system and even reach the skin, leading to cystic acne. As a result, there is a growing interest in alternative and complementary therapies, including herbal medicine, bee products, and probiotics. This article studies the complexity and potential benefits of these natural remedies in managing acne.

A significant amount of research by domestic [11-14] and foreign [15-17] scientists is devoted to the use of extracts based on the medicinal plant raw material (MPRM) for the treatment of dermatological diseases. The experience of traditional medicine and the results of modern scientific research in the field of pharmacognosy, chemistry, technology, etc., allowed the introduction of a significant number of medicines containing the MPRM to the pharmaceutical market.

The use of bee products in the practice of treating dermatological diseases is limited by “traditional” medicines and dietary supplements. A significant contribution to the development of new products based on beekeeping products (honey, propolis, pollen, etc.) was made by Professor Tikhonov O. I. and his students [18, 19].

The aim of the work was to study the potential benefits of using phytotherapy – extracts from the MPRM (*Curcuma longa*, *Aloe vera*, *Calendula officinalis*) and bee products (propolis, bee venom, honey) in the treatment of skin diseases.

Materials and methods. To achieve this aim, methods of logical-content issue formation, content-analysis of publications in scientific and practical-oriented medical and pharmaceutical publications, comparative analysis and graphic tools of visual presentation of the data obtained were used.

This study presents the results of scientific and practical work of leading scientists and the own experimental research materials of the authors of the article. Determination and observational studies cover clinical tests that diagnose acne on the skin.

The authors of the article took photos by digital multimodal imaging using photographic equipment to assess the types of lesions, the degree of acne changes. Photos (Fig. 8-12) were taken within 60 days (Day 1 (onset of the disease, severe acne), Day 15 (acne of moderate severity grade 3), Day 30 (acne of moderate severity grade 2), Day 45 (mild severity grade 1), Day 60 (zero grade of disease)).

The acne assessment scales included the use of the Global Acne Grading System (GAGS) [2, 5, 20]. These studies include tracking the acne process over a certain period of time to see how their condition changes.

Results and discussion. Research conducted in the laboratory at the Department of Industrial Technology of Medicines and Cosmetics focused on skin diseases, such as acne. The severity of acne was assessed as severe (scale four). Before and after treatment with a complex of medicinal products (washing solutions, gels and creams containing extracts of the MPRM, such as turmeric (*Curcuma longa*), aloe vera (*Aloe vera*), calendula (*Calendula officinalis*) and bee products, such as propolis (*Propolisi*) and bee venom (*Apis venenum*), photographs of volunteers who later used the products containing extracts the MPRM and bee products for treatment were taken.

Acne lesions of various types on the face from the study are presented and described in Fig. 1-7.

In the treatment of closed comedones, over-the-counter or prescription creams, herbal and bee products, as well as probiotics can be used [2, 21, 22]. Milia (milium) (Fig. 2) are caused by a protein called keratin that accumulates under the skin [23, 24].

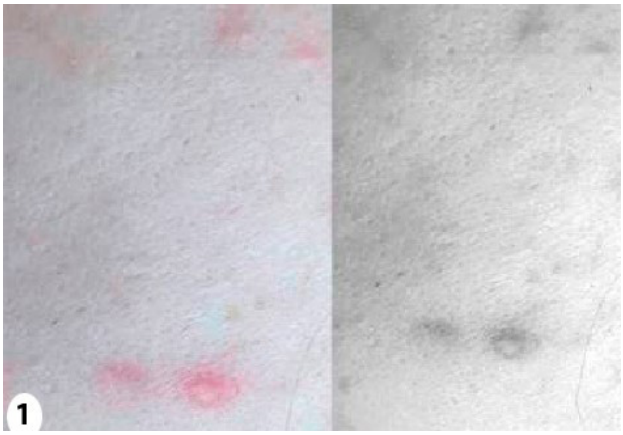

Fig. 1. Closed comedones (whiteheads)

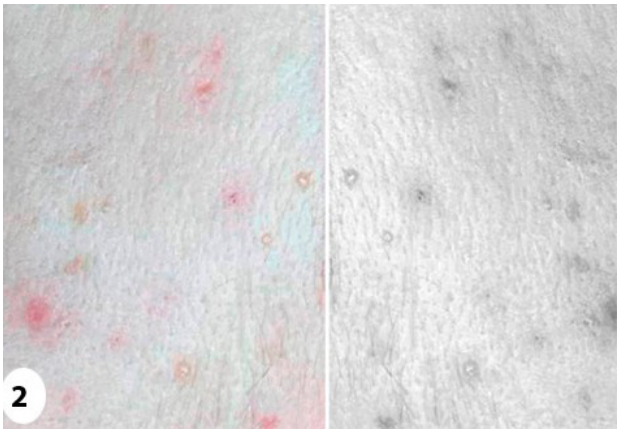

Fig. 2. Milia (milium)

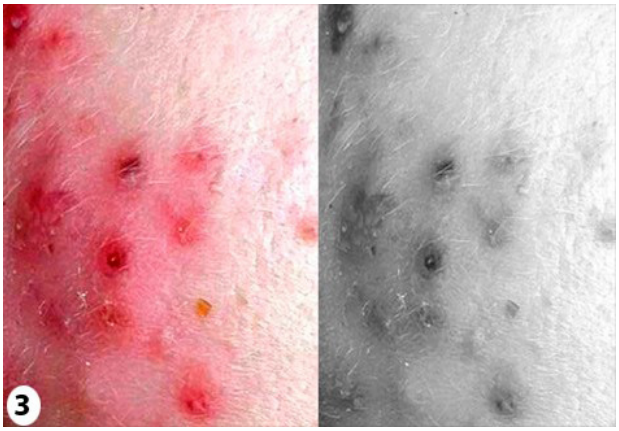

Fig. 3. Blackheads

Blackheads (Fig. 3) are comedones that are open on the surface of the skin due to the surface pigment (melanin) [5, 7, 25]. Blackheads are areas filled with excess oil and dead skin cells.

In turn, papules (Fig. 4) appear as slightly raised red bumps on the skin [3, 9, 21]. Papules are a type of inflamed spot, better known as a pimple or acne. Papules are comedones that have become inflamed.

Acne is a type of pimple, these bulging blemishes are pores clogged with pus, sebum (fat), and cell debris. Acne develops when the walls of the affected pore begin to break down and become a red papule (Fig. 5). White blood cells collect on the papule to fight infection. These cells form pus that is visible inside the blemishes [2, 10, 26].

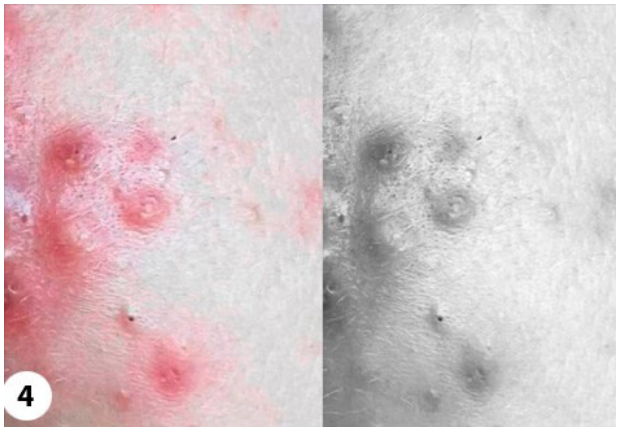

Fig. 4. Papules

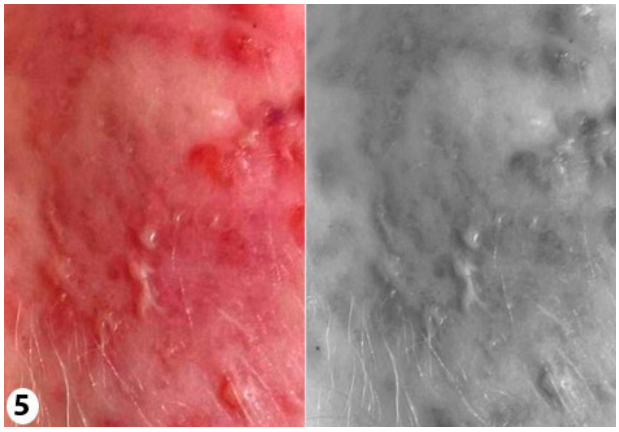

Fig. 5. Acne

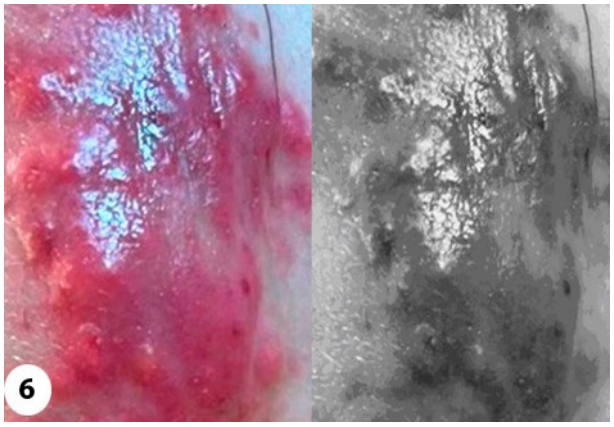

Fig. 6. Nodular acne

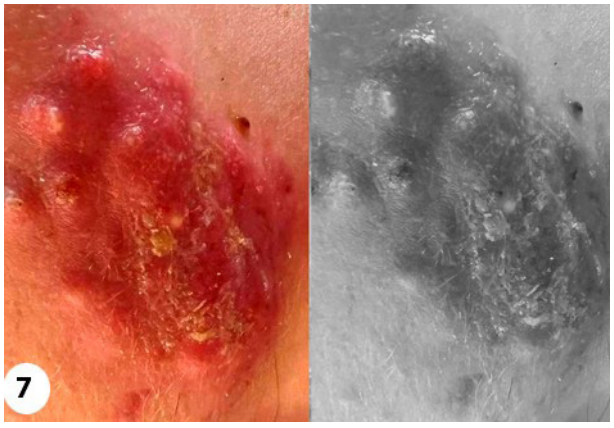

Fig. 7. Cystic acne

Nodular acne is a severe type of acne that develops deep under the skin, causing painful red bumps. This pathology leads to the formation of hard bumps or nodules deep under the skin. Nodules start below the surface and appear on the skin as red bumps, usually without a whitehead or blackhead in the center (Fig. 6).

Cystic acne (Fig. 7) is another type of severe acne. It develops when cysts form deep underneath the skin. Cysts caused by excess fat, dead skin, and bacteria are a particularly persistent form of rash that persists for weeks or even months. Like nodules, cysts resemble deep red lumps. But unlike nodules, cysts are filled with pus or other fluids and appear soft and painful to the touch.

The choice of acne treatment is usually based on the severity of the disease and includes various local and systemic agents aimed at reducing the sebum production, comedone formation, inflammation and bacterial number, as well as normalizing keratinization. The results of many studies and observations conducted by the authors [4, 8, 26] prove that the effectiveness of additional therapy using an individual approach in reducing acne has been confirmed. Combined treatment confirms the effectiveness of therapy since the contrast value decreases in each area of the face, and the homogeneity value increases, which means that the number of acne lesions decreases. At the same time, therapy focused only on the use of synthetic substances can lead to a significant increase in the occurrence of side effects, as in the case of using retinoids [27].

At the same time, turmeric, aloe vera, calendula and bee products (propolis, bee venom and honey) [4, 8, 26] play an essential role in the treatment of acne. Possessing anti-inflammatory, antioxidant and antimicrobial properties that will affect the multifactorial causes of acne, this plant raw material can be used for the prevention and treatment of skin diseases.

The effectiveness of natural ingredients is confirmed by tests and photos to assess the improvement of skin condition and the degree of reduction of acne lesion. The results of studies that included the use of a medicinal product based on the MPRM and bee products as the main therapy are presented in the form of photos in Fig. 8-12. The photos show the evolution of changes in the human skin when using products (solutions, gels and creams) [28] based on propolis, bee venom, honey with extracts of turmeric, aloe vera, and calendula.

To maximize the potential benefits of natural therapy in managing acne, a comprehensive approach should be applied, including [22, 23, 26]:

- personalized treatment plans – understanding individual skin types and the severity of acne can help you choose the appropriate formulations from herbs, bee products, and fermented products;
- combination therapy – using the synergistic effects of several natural products or integrating them with traditional treatments can increase the overall effectiveness of rapid recovery;
- patient education – encouraging patients to use natural remedies and dietary supplements requires training on proper use, potential benefits, and monitoring of side effects.

The complexity of the action of plant APIs and bee products in the treatment of acne can be explained by their diverse phytochemical profile. The anti-inflammatory components of medicinal plant extracts can inhibit the activity of pro-inflammatory cytokines, while antibacterial agents can reduce the microbial population of infections. Moreover, plant extracts and native plant-based

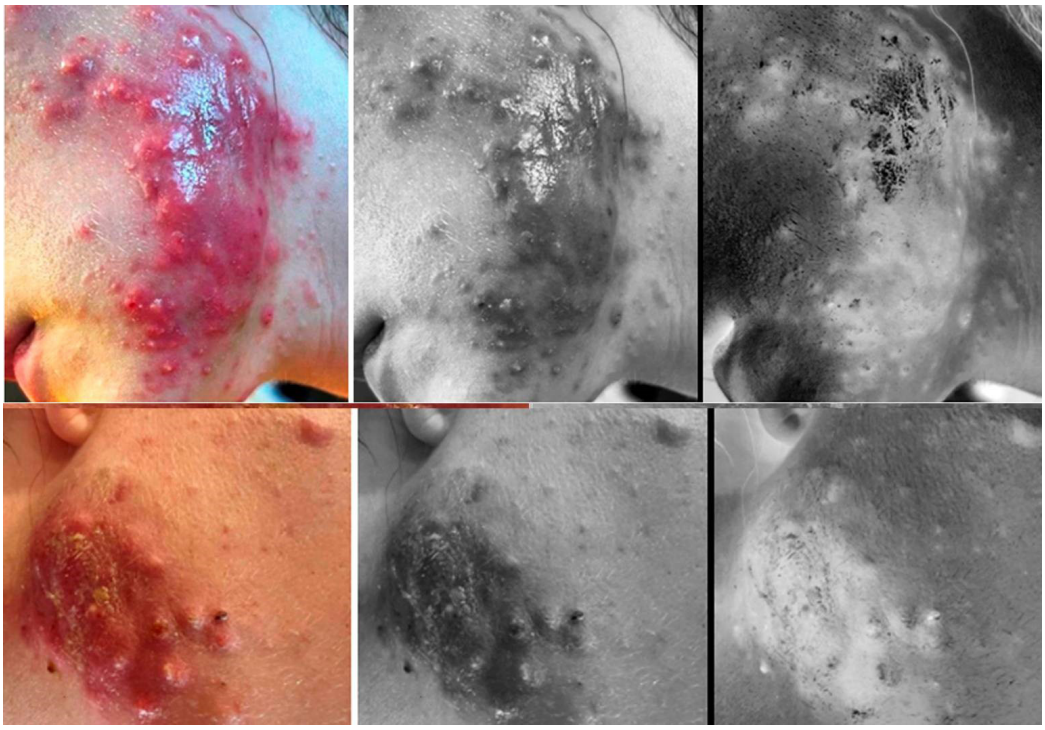

Fig. 8. Severe acne of grade 4: more severe form with cysts becoming confluent

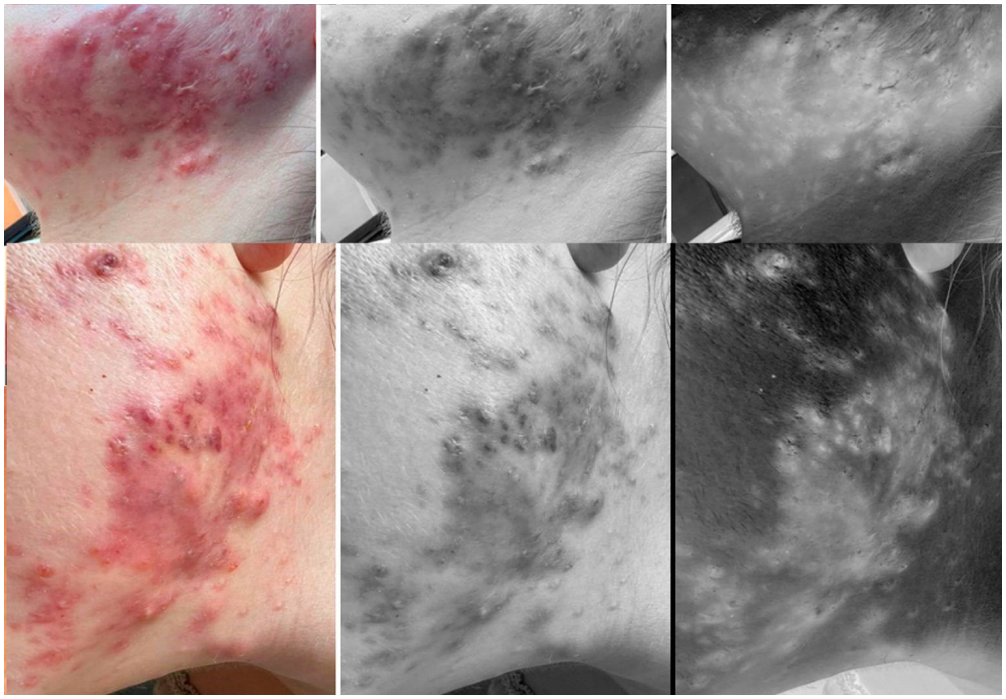

Fig. 9. Acne of moderate severity grade 3 or nodulocystic acne, with numerous papules and pustules, along with inflamed nodules

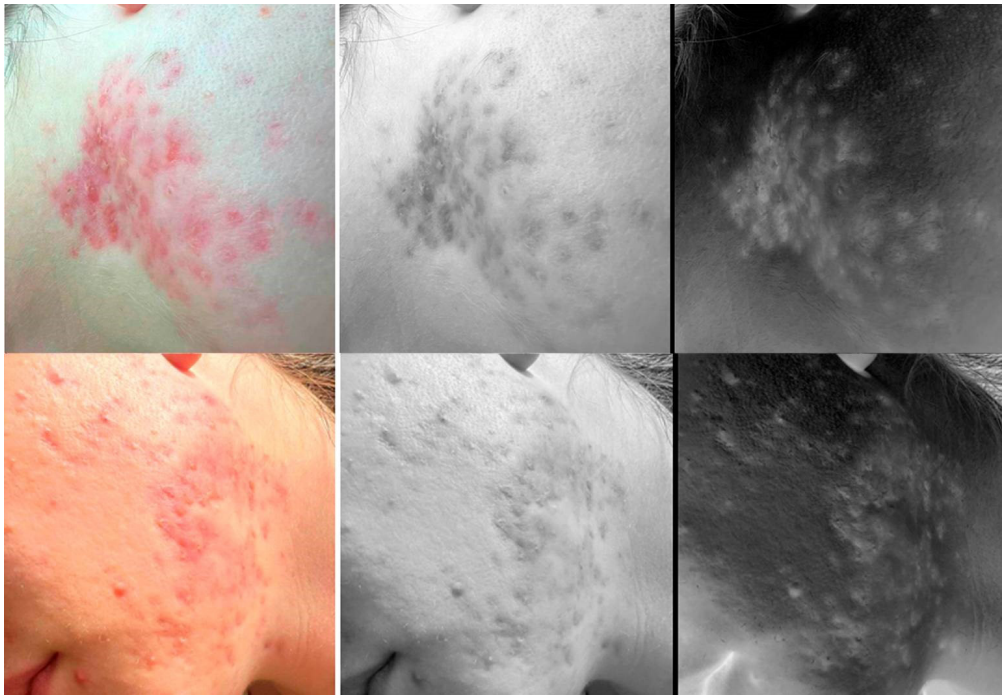

Fig. 10. Acne of moderate severity grade 2 with multiple papules and pustules

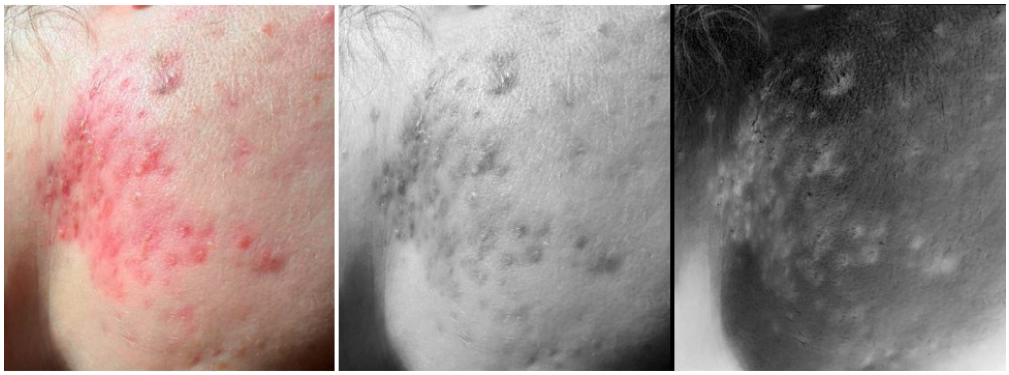

Fig. 11. Mild severity grade 1, mostly whiteheads and blackheads, with a few papules and pustules

Fig. 12. Zero grade, no impact of skin diseases on quality of life

products demonstrate antioxidant properties that combat oxidative stress, which contributes to the inflammatory processes in acne.

Naturally fermented foods attract a lot of attention from health experts as dietary supplements that promote the health of the gut microbiome – live microorganisms that are crucial for healthy digestion. Researchers are beginning to link the human microbiome to all kinds of health conditions, from metabolic disorders, skin diseases to obesity and neurodegenerative diseases.

Conclusions

1. The analysis of scientific literature has shown that the plant raw material and bee products have significant therapeutic potential due to a wide range of biologically active substances. Modern studies confirm their anti-inflammatory, antimicrobial, immunomodulatory and antioxidant properties, and it opens up prospects for creating new effective and safe medicines. The use of honey, propolis and bee venom in the treatment of dermatological diseases, as well as plant extracts that enhance the effect of bee products is of particular interest.

2. As a result of our studies, the effectiveness of using the composition based on the MPRM and bee products for the treatment of dermatological skin diseases has been confirmed. Experimental studies have confirmed the effectiveness of the products obtained, which indicates the prospects for their further introduction into pharmaceutical practice.

Conflict of interests: authors have no conflict of interests to declare.

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