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Research Progress on the Whitening of Angelica Dahurica

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ABSTRACT

This paper mainly reviews the application status and research progress of Angelica dahurica in the field of whitening in recent years, analyzes its active ingredients, mechanism of action, and existing problems, and provides a theoretical basis for the subsequent development of natural whitening products. Through literature review and summary. The extensive use of Angelica dahurica in both ancient and modern times confirms that its whitening and skin care effects are certain. However, there are still issues such as unclear mechanisms related to its whitening active ingredients and photosensitive coumarin components, and the photosensitivity of coumarin components limits their application in cosmetics. The idea of using natural active ingredients for skin care is becoming increasingly popular, and the development, validation, and application of natural whitening active ingredients will be the future direction of cosmetics. This article provides relevant references for the further development and application of Angelica dahurica in the field of whitening.

KEYWORDS

Angelica dahurica; Whitening; Tyrosinase

1. INTRODUCTION

Angelica dahurica(Fisch.ex Hoffm.) Benth.et hook.f. exfranch.et Sav, a perennial tall herb The dried rhizoa has the effects of dispelling wind and cold, opening orifices and relieving pain, reducing swelling and discharging pus, resolving exterior and dispelling cold, drying dampness and stopping vaginal discharge. Since ancient times, the Chinese people have regarded fair skin as beautiful. It is recorded in "Rihua Zi Cao Ben" that "Angelica dahurica can relieve pain, promote muscle growth and remove blemishes and scars", and it is also recorded in "Shen Nong Ben Cao Jing" that it has the effect of "moisturizing the skin". Zhou Lihui et al. found that Angelica dahurica is the most frequently used in ancient Chinese medical books, which shows its great potential for whitening [1]. However, its related products are particularly rare in today's whitening cosmetics market, which may be related to the coumarin-like photosensitive ingredients in it. Based on the above, this article summarizes the research progress of angelica dahurica for whitening, providing relevant references for further development and application of Angelica dahurica in the field of whitening.

2. CHEMICAL COMPOSITION OF ANGELICA DAHURICA

Relevant literature indicates that the active chemical components of Angelica dahurica are very complex, with coumarins and volatile oils being the main active chemical components [2]. Coumarins are the earliest pharmacological components studied in Angelica dahurica. They are abundant and have strong biological activity. The coumarins that can be isolated from them are the main active

components. The coumarins in Angelica dahurica mainly include benzopyranone coumarins and furanocoumarins. Deng Gaigai et al. pointed out in their study of the liposoluble chemical components of Angelica dahurica that the liposoluble chemical components of angelica dahurica are mainly linear pyranocoumarins (opyranocoumarins, isopyranocoumarins, etc.) [5]. The volatile oil components in Angelica dahurica are mostly monoterpenes and sesquiterpenes, and their related structures have been studied most thoroughly. In addition, Angelica dahurica also contains chemical components such as polysaccharides, flavonoids, alkaloids, sterols, etc. However, there is a lack of relevant research and demonstration on these chemical components. For example, polysaccharides in Angelica dahurica are also one of its main active ingredients, but the main research has focused on its pharmacological effects, and there is relatively less research on the chemical components, so further exploration is needed [2]. To sum up, the chemical components of Angelica dahurica are mainly coumarins and volatile oils.

3. APPLICATIONS OF ANGELICA DAHURICA IN WHITENING

The color of normal skin is the result of a combination of various biological pigments, including melanin, red oxygenated hemoglobin, blue deoxygenated hemoglobin and carotene. The color of the skin is the result of a combination of multiple factors, with melanin being the main determinant of skin color, which is related to the amount, distribution level, thickness of the skin and the scattering of light on the skin surface [6]. Whitening has always been a highly discussed topic among beauty enthusiasts, but nowadays there are numerous whitening products with varying effects, and as traditional Chinese medicine beauty has become a research hotspot in medical beauty, people have gradually turned their attention to natural active ingredients, and Angelica dahurica, a whitening traditional Chinese medicine favored by physicians throughout history, has received even more attention.

A search of relevant ancient books shows that Angelica dahurica is the most frequently used in whitening prescriptions. It is recorded in Compendium of Materia Medica that Angelica dahurica can "make the skin grow, brighten the complexion, and be used as a face cream." Yu Jing et al. reviewed 104 works of traditional Chinese medicine, including "Universal Prescriptions", "Compendium of Materia Medica", "Emergency Prescriptions for the Backup of the Arm", "Emergency Prescriptions for the Thousand Gold of the Backup of the Arm", "Shennong's Classic of Materia Medica", "Secret Prescriptions of the Outer Platform", etc. Among them, 119 prescriptions recorded the use of angelica dahurica for whitening [7]. For instance, in Volume 8 of "Emergency Prescriptions for the Reserve of the Chin", it is recorded that grinding equal parts of Ligusticum chuanxiong, Angelica dahurica and Ligusticum ligusticum into fine powder and applying it to the body can make the skin smooth and fair [8]. It can be seen that Angelica dahurica has been commonly used in the history of traditional Chinese medicine for whitening, and there is evidence to support it.

In recent years, the number of products related to the use of angelica dahurica for whitening has also increased year by year. Wang Xiaohui et al. developed the "Three Whites" moisturizing and whitening gel by extracting the whitening active ingredients from Angelica dahurica, Atractylodes macrocephala and Poria cocos based on the common gel preparation process, making the gel fine and uniform in texture, transparent, with appropriate viscosity and good spreadability, and achieving good whitening effect [9]. Yan Yong et al. developed a new type of traditional Chinese medicine whitening and moisturizing mask by adding effective extracts of Angelica dahurica and Poria cocos on the basis of the traditional mask process. The whitening effect was remarkable and the moisturizing performance was excellent [10]. Xiao Mengyuan et al. used angelica dahurica whitening liquid extracted from angelica dahurica and added it to sunscreen to prepare angelica dahurica sunscreen. The resulting cream was stable in nature, good in color, and had certain antioxidant and whitening effects [11].

4. THE WHITENING MECHANISM AND RESEARCH PROGRESS OF ANGELICA DAHURICA

In order to confirm and track the whitening active ingredients in Angelica dahurica, researchers have conducted many related experiments in recent years. I will summarize from the following three aspects.

4.1. Inhibition of Tyrosinase

Tyrosinase is the rate-limiting enzyme in melanin synthesis, and high activity of tyrosinase leads to melanin production. By inhibiting tyrosinase activity, whitening effects can be achieved [6]. In the study by Zhan Biao et al., it was clearly pointed out that isophenol reduces melanin production by inhibiting the mRNA expression of TYR, a key enzyme in melanin synthesis, promoting the enhanced mRNA expression of β-actin and facilitating the transport of melanosomes to keratinocytes, thereby indirectly reducing melanin accumulation in melanocytes [12]. In addition, Zhang Guowen et al. 's study clarified the inhibitory effect and mechanism of eupropyl on tyrosinase: eupropyl occupied the active center site of tyrosinase and interacted with amino acid residues such as His244, Val283, Val286, and His263, hindering substrate binding to the active center of the enzyme and thereby reducing the catalytic activity of tyrosinase [13]. Qin Congcong et al. 's article pointed out that Angelica dahurica volatile oil mainly exerts whitening effects by inhibiting tyrosinase, and the inhibitory mechanism is reversible, which can reduce the catalytic efficiency of tyrosinase and inhibit its activity, but the specific mechanism and single component were not clarified [14].

4.2. Antioxidation

In addition to inhibiting the synthesis of tyrosinase, whitening can also block melanin production by reducing the intermediates in the melanin production process or by binding to the intermediates. Antioxidants also reduce the free radicals produced by various exogenous factors such as ultraviolet radiation, smoke, etc., to prevent the yellowing of the skin caused by collagen fibrosis [6]. In her study of Angelica dahurica flavonoids, Li Shumei found that Angelica dahurica flavonoids are stable within the pH range of 3-4 and the temperature range of 25-40 ° C, and have good antioxidant capacity [15]. Wang Decai et al. found in their study of Hangzhou Angelica dahurica polysaccharides that Hangzhou Angelica dahurica polysaccharides can scavenge hydroxyl radicals (·OH) and superoxide anion radicals (O2 - ·), and the mechanism may be related to the structure of the polysaccharide chain and its hydroxyl group, and their antioxidant activity in vitro is weaker than that of vitamin C [16]. Qiu Xiaoyue et al. also studied the antioxidant activity of Qi Angelica dahurica polysaccharides, indicating that Angelica dahurica polysaccharides have significant pharmacological antioxidant effects [17]. The above-mentioned studies still failed to reveal the whitening mechanism of polysaccharides and flavonoids in Angelica dahurica, which can be used as a breakthrough for further research.

4.3. Related Target Studies

Based on research related to whitening targets, researchers have made some progress in the whitening of Angelica dahurica. In Li Kai's study, it was clearly pointed out that isophenol extracted from the roots of Angelica dahurica Xing 'an regulates CSTB and CSTD through miR-3619 to induce melanin degradation in keratinocytes [18]. Chen Huai-Chen et al. initially identified several molecular targets and pathways for Angelica dahurica to improve pigmentation through network pharmacology and molecular docking, indicating that β -sitosterol has the strongest binding activity with TGFB-1 and betophen has the strongest binding activity with CDK1. However, this study lacks research data to support it and still needs further research and development [19].

In summary, the whitening effect of Angelica dahurica should be beyond doubt, but its application in current cosmetic products is limited for two reasons: (1) the root cause: the mechanism related to its whitening active ingredients is not yet clear; (2) The direct cause: the presence of coumarin-like photosensitive components; The photosensitizing effect of furanocoumarins in Angelica dahurica is the direct cause of its less use in whitening.

The study by Li Hai Xin et al. used tyrosinase inhibition experiments and human whitening activity tests to determine the whitening activity at different extraction sites of Angelica dahurica, and used high performance liquid chromatography (HPLC) to determine the content of photosensitive coumarin substances (such as eophenin, isoeophenin) at different extraction sites [20]. The study aimed to investigate the whitening active ingredients in Angelica dahurica with lower coumarin content and stronger tyrosinase inhibition. The results showed that the tyrosinase inhibition effect of Angelica dahurica water extract was stronger than that of Angelica dahurica alcohol extract, and the human whitening activity was higher, while the coumarin content was lower. Therefore, Angelica dahurica should be used for whitening in its water-soluble part. However, the study still failed to solve the two existing problems, and further in-depth research is needed.

5. SUMMARY AND OUTLOOK

In recent years, there have been studies on the whitening effect of Angelica dahurica, but none have solved the problem of unclear mechanisms related to its whitening active ingredients and the presence of coumarin-like photosensitive components. In future research on Angelica dahurica, the following points can be considered: (1) Focus on the separation and confirmation of the active monomer components of Angelica dahurica, such as: identifying which single or multiple components in the volatile oil inhibit tyrosinase; Demonstration of the mechanism of action of chemical components such as β -sitosterol; (2) To address issues such as coumarin photosensitivity and increase the market availability of Angelica dahurica whitening active ingredients; (3) Traditional Chinese medicine compound, synergistic effect: Drawing on ancient prescriptions of traditional Chinese medicine, study the synergistic effect among various ingredients of traditional Chinese medicine, and optimize the formula of whitening products; (4) Further research on the whitening effect of Angelica dahurica with a dual-target approach of autophagy and inhibition of tyrosinase.

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