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BIOLOGICALLY ACTIVE SUBSTANCES OF THE MEDICINAL PLANT ECHINACEA PURPUREA (L.) MOENCH

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Currently, the number of medicinal plants subject to scientific research is increasing. Well-known medicinal plants are intensively studied to obtain the most accurate data on the chemical composition, pharmacological effects and safety of use in therapy.

Echinacea purpurea (L.) Moench (EP), commonly known as Echinacea purpurea, is a perennial herbaceous flowering plant belonging to the family of compound flowers. The genus Echinacea originates from North America in the United States, and its species are widely distributed around the world. Echinacea has nine different varieties, but only three of them are used as universal medicinal plants: Echinacea purpurea (L.) Moench, Echinacea pallida (Nutt.) and Echinacea angustifolia (DC). Several important groups of biologically active compounds with pharmacological activity have been isolated from Echinacea species. Many beneficial effects of these compounds have been demonstrated.

Keywords: Echinacea purpurea (L.) Moench, biologically active compounds, immunomodulatory, cannabinomimetics, anti-inflammatory, antiviral, antimicrobial, antioxidant effects.

Introduction

Nature has always been an excellent source of medicinal substances and has given us a wide variety of medicinal plants that produce valuable phytochemicals. The use of medicinal plants dates back to ancient times and is therefore considered the beginning of modern medicine. In addition, plant-derived chemicals continue to be valuable molecular sources for pharmaceutical preparations. In the past, private observation

and experience determined their use of plants, but today their active ingredients, mechanisms of action based on evidence of medical principles of use have been discovered.

Phytopreparations are widely used in the treatment and prevention of various diseases and are well known to the general public. Currently, herbal medicines account for about 30% of the pharmaceutical market of essential medicines, and the remaining 11% are non-essential medicines.

The main purpose of this assessment is to combine data from the specialized literature on biologically active compounds, chemical composition, pharmacological and biological properties of Echinacea purpurea (L.) Moench to guide future research. It's about emphasizing opportunities and prospects. Get a safe and pharmacologically effective product.

Echinacea purpurea (L.) Moench is a perennial plant 100-150 cm tall, strong—growing and herbaceous. The roots and rhizome are highly developed. The roots are cylindrical, brownish-gray on the outside and white on the inside. The aboveground stem is branched, with coarse hairs and reddish-brown spots, which gives it the appearance of a bush. Linear-lanceolate leaves with three arched ribs and rough hairs are whole-edged, 3-6 cm wide. Echinacea purpurea produces a rosette of leaves during the first year of cultivation and blooms only in the second year.

Species of the genus Echinacea occupy an important place among medicinal plants, grow in North America and belong to the family of compound flowers. Echinacea has nine different species, but only three of them are used as medicinal plants for a wide range of therapeutic purposes Echinacea angustifolia (DC). Many species of the family of compound flowers are used for therapeutic purposes in comparison with other plant families. A large number of species of the family of compound flowers are used for therapeutic purposes in comparison with other plant families due to the presence of chemicals with a wide range of therapeutic properties, as well as the fact that the family of plants of the family of compound flowers is one of the most well-known.

Bioactive compounds of Echinacea purpurea (L.) Moench. Several important groups of biologically active compounds with pharmacological activity have been isolated from Echinacea species. The most important components of Echinacea purpurea (L.) Moench are alkylamides, polysaccharides, glycoproteins, flavonoids and phenolic compounds, which include caffeic acid derivatives such as caffeic acid, chicory acid, caftaric acid, chlorogenic acid and echinacoside, the amount of which varies depending on the section of the plant. In addition to these components, the researchers also determined that phylloxanthobilins, β-fellandren, acetaldehyde, dimethyl sulfide, camphene, hexanal, α-pinene and limonene are present in all plant tissues, regardless of species. Fatty acids, aldehydes and terpenoids are components whose presence depends on the parts of plants used.

The chemical components responsible for the immunomodulatory activity of Echinacea purpurea (L.) Moench roots are glycoproteins, alkylamides and polysaccharides. Glycoproteins are proteins and carbohydrate chains that play a role in various physiological processes, including immunology. Alkylamides are chemicals found in the genus Echinacea (Asteraceae) that have been shown to have high bioavailability as well as immunomodulatory properties. Structurally, they have a common feature of an amine bond and usually contain an aliphatic chain of polyunsaturated fatty acids connected to a short-chain amine. Polysaccharides are complex carbohydrate polymers consisting of more than two monosaccharides. The complex color family contains important polysaccharides, pectins, arabinogalactans and inulin. Bioactive polysaccharides can justify part of the traditional use of these species.

Echinacea purpurea (L.) Moench supplements are usually sold as encapsulated tablets containing aboveground parts or dried roots, or tablets containing extruded plant material or alcohol extracts.

The aboveground part of the plant contains less volatile oils than the roots, and pyrolytic alkaloids such as tatsilagins and isotacilagins.

It is believed that the most important derivative of caffeic acid of Echinacea purpurea (L.) Moench species is chicory acid, the most important phenolic component of roots and petioles. Chicoric acid is the most common phenolic component in the roots and petioles of Echinacea purpurea (L.) Moench. These antioxidant and antibacterial compounds help improve the functioning of the body's immune system. However, the concentration of caffeic acid derivatives depends on the type of Echinacea, the type of organ, growing conditions and environmental factors.

Several studies using HPLC methods have shown the preservation of caffeic acid derivatives of dried Echinacea purpurea (L.) Moench. It is reported that chicory acid accounts for 63% and 67%, respectively, of the relative peak area in the air sections. Caffeic acid cannot be detected in all dried flowers by HPLC. On the contrary, the content of caffeic acid was 8-18% of the measured relative peak areas. Chicory acid (71.45%) is the most predominant derivative of caffeic acid in flowers, followed by caffeic acid (23.25%).

Echinacoside has been found to have many important pharmacological benefits for human health, especially neuroprotective and cardiovascular effects. Echinacosite is a derivative of caffeic acid found in flowers at a concentration of 1.45%. In addition to these substances, Echinacea species contain flavonoids, polyacetylenes and alkaloids.

Phylloxanthobyrin is a key component isolated from Echinacea purpurea (L.) Moench leaf extract. These natural tetrapyrrole compounds are formed during the decomposition of chlorophyll. Phylloxanthobyrins were identified in the leaves of deciduous trees about ten years ago and are now considered a class of compounds with great potential for unexplored biological activity. However, to date, there have been no

reports of the detection of phylloxanthobine in some medicinal plants used in medicine.

Echinacea purpurea (L.) Moench raw materials have also been prepared for use as a topical remedy for the treatment of skin inflammation and wounds. In addition, Echinacea products are licensed in Europe for the treatment of upper respiratory tract infections and wound healing.

In the course of modern pharmacological studies, many biological activities have been discovered, including immunomodulatory, anti-inflammatory, antioxidant, antiviral and antifungal.

Chronic arthritis, cancer, antimicrobial action, persistent fatigue syndrome, HIV infection, a number of skin diseases, wounds and chronic pelvic infections have been mentioned as a potential therapeutic use of Echinacea purpurea (L.) Moench.

Preparations containing Echinacea purpurea (L.) Moench are among the best-selling herbal preparations in Europe and the USA. According to current research, taking Echinacea purpurea (L.) Moench may reduce the severity and duration of acute respiratory tract infections; however, no studies have been identified using Echinacea purpurea (L.) Moench for the prevention or treatment of SARS-CoV viral infection.

The immunomodulatory effects of Echinacea species are of paramount importance in research, especially related to upper respiratory tract infections. Recent discoveries have also shown that some standardized Echinacea preparations have strong antiviral, antifungal, antimicrobial, anti-inflammatory, antioxidant and psychoactive effects. According to available data, drugs derived from Echinacea are well tolerated by the human body. Therefore, further research is needed to ensure the quality and safety of various preparations of Echinacea purpurea (L.) Moench. Echinacea may cause minor side effects; it should be considered if the patient receiving the drugs is allergic to Ambrosia artemisifolia L. or other species of the family of compound flowers. Echinacea, like many other plants of compound flowers, includes phototoxic polyacetylene compounds that can be inactivated with minimal treatment.

It is important to note that during conservation, enzymatic processes can lead to degradation of bioactive substances as a result of long-term storage from collection to sale, which will lead to a change in composition.

Conclusions: Scientifically proven biological and pharmacological effects, according to the literature data, it can be seen that most of the demonstrated effects are common to several compounds, for example, immunomodulatory, antioxidant or antimicrobial action. After studying the literature, researchers have identified a large number of scientifically proven therapeutic properties of Echinacea purpurea

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