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Current state and prospects of using medicinal plants growing in the Zailiysky and Zhetysu Alatau, Kazakhstan

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ABSTRACT

This article examines the use of medicinal plants and their distribution areas. In general, the basis of medicinal growth in the Zailiysky and Zhetysu Alatau is medicinal herbs, which have therapeutic or prophylactic effects for various diseases. The development of effective and safe domestic drugs and pharmaceutical substances, as well as the study of phytochemicals, antioxidants, antimicrobials, and other properties, is a pressing issue today. Therefore, the current status and prospects for the use of medicinal plants growing in the Zailiysky and Zhetysu Alatau indicate the need for a comprehensive review.

Keyword: Medicinal plants, Pharmaceutical substances, Phytochemicals, Antioxidants, Antimicrobials.
Article type: Review Article.

INTRODUCTION

The role of the plant kingdom in human life is enormous. Today, interest in the use of medicinal plants in practical healthcare is growing worldwide. This is due to the fact that drugs derived from plants contain a complex of biologically active substances and exhibit a broad spectrum of pharmacological action. According to the World Health Organization, plant-derived drugs form the foundation of the pharmaceutical industry worldwide. Medicinal plants have been used in medicine since ancient times due to their healing properties. The pharmacologically active compounds derived from the biosynthesis of plants, i.e., biologically active substances of medicinal plants, are responsible for the healing properties of medicinal plants including alkaloids, glucose, vitamins, saponins, phenolic compounds (lignans, coumarins, flavonoids, skin-tanning substances, etc.). The main group of pharmacologically active substances of medicinal plants is essential oils, which contain resins and other compounds (Ginwala *et al.* 2019; Mukta *et al.* 2021; Julián-Flores *et al.* 2025). The Republic of Kazakhstan is located in the temperate zone of the Eurasian continent. Our country is very rich in medicinal plants, including Zailiysky and Zhetysu Alatau regions, which have a large number of medicinal plant species. According to literature reviews, 230 medicinal plants of the natural flora of our republic are officially widely used in medicine (Ametov *et al.* 2014; Tleuberlina *et al.* 2023; Aidarbayeva *et al.* 2024; Taldybay *et al.* 2024). Interest in medicinal plants dates back to ancient times. Among the biological resources in our country, one third of the plants used in medicine grow on the territory of our country. The resource of medicinal plants in our country is very important, they are plants widely used in modern medicine. According to the latest data, there are 5,600-6,000 species of higher plants in Kazakhstan. Of these, over 1,500 are useful plants, and over 500 are medicinal, but only over 50

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species are intensively used (Seilkhan *et al.* 2019; Özek *et al.* 2022). The flora of Almaty region, like other regions of Kazakhstan, is rich in endemic species of medicinal plants and food plants, which in turn affects the development of national economy. Many scientists have contributed to the study of Kazakhstan's natural plant resources, conducting the first major studies on medicinal and industrial plants (Akhmetov *et al.* 2015; Zhumaliyeva *et al.* 2020; Ivashchenko *et al.* 2021). A lack of information about their distribution and resources hinders the expansion, enrichment, and use of medicinal plant species. The main reserves of medicinal plants growing in the Zailiysky and Zhetysu Alatau regions of our country are concentrated in areas where a wide variety of woody, shrubby, and herbaceous species are found (Aidarkhanova *et al.* 2019; Balkybek *et al.* 2025). This is due to the scarcity of natural resources of valuable plants. Therefore, plant cell cultures are of interest as a source of biologically active substances. Ili and Zhetysu Alatau are the collection base for many types of plant raw materials in Kazakhstan, hence the study on the endemic species of medicinal plants growing here and their medicinal properties is an urgent issue today. Today, medicinal plants found in the flora of Kazakhstan are widely used in scientific medicine, and medicinal plants are used to prepare herbal medicines, that is, medicinal plants that are well-known among the population are in demand. (Abdreshov *et al.* 2021; Demchenko *et al.* 2023; Zhumagul *et al.* 2024). In official medicine, the pharmacopoeial species of medicinal plants are of primary importance (Feng *et al.* 2020; El-Saadony *et al.* 2025), and 29 species are included in the State Pharmacopoeial List of the Republic of Kazakhstan. The phytochemical composition of Kazakhstani plants contains a large number of biologically active substances, including: organic phenolic acids, flavonoids, alkaloids, vitamins, coumarins, saponins, etc. It should be noted that the chemical and therapeutic properties of a number of plants in our country require full study. The phytochemical composition of all 800 endemic plants in our country has not yet been fully studied. Only a small number of species are used as medicinal plants. Therefore, increasing the variety of medicinal products derived from plants, and the safe and effective use of phytopreparations are the main tasks of the domestic pharmaceutical industry (Zhangabylov *et al.* 2005; Zhurinov *et al.* 2023; Keleke *et al.* 2025). Ensuring the quality of medicinal plants for consumers is one of the most important aspects of a healthy lifestyle and safety for modern humanity. Over 80% of the world's population uses herbal medicines. Interest in herbal medicines is growing every year. A total of 40% of today's medicines are made from plants. Of the 500,000 vascular plants in the world, 80,000 species are considered medicinal plants (Sinitsyn 1982; Kukenova 1996; Nurlybayeva *et al.* 2024; Nurlybayeva *et al.* 2024). It is necessary to identify the biologically active substances of natural medicinal plants, study the physicochemical composition of plants, and determine their quantitative and qualitative composition with modern devices. In the development of new medicinal products, it is necessary to consider the technology of pharmaceutical substances derived from plants (Aidosova *et al.* 2021; Azhikhanova *et al.* 2024, Karaubayeva *et al.* 2024, Kuntubek *et al.* 2025). Medicinal products derived from plants have pharmacological, and therapeutic (anti-inflammatory, analgesic, restorative, hemostatic) and regulatory (sweat-eliminating, diuretic, and sedative) effects. They have diuretic, antiseptic, and aphrodisiac properties. It also normalizes blood pressure, regulates the work of the cardiovascular system, and restores the body's metabolic processes. The most important property of herbal medicines is that they have no side effects and no allergic reactions. They contain vitamins, many trace elements, and are rich in essential oils and biogenic substances (Zhusupova *et al.* 2013; Dimitrova *et al.* 2019; Gorchakov *et al.* 2022; Kozhaniyazova *et al.* 2023; Kadyrbay *et al.* 2025). Phytopreparations have a mild therapeutic effect and do not have additional side effects. In addition, they do not have a toxic effect, and their affordable price is very reasonable. Medicinal plants have higher healing properties than synthetic drugs and help prevent many diseases. According to current scientific literature, the number of medicinal plant species in scientific and traditional medicine is 2,500, but these figures are not accurate and definitive. In our country, more than 145 different plant species have been used to produce medicines, and more than 260 drugs have been produced (Šmejkal *et al.* 2016; Tasneem *et al.* 2019). The main reason for the significant increase in interest in medicinal plants and the increasing need for them is the comprehensive and mild effect of medicines derived from plants in the treatment of many complex diseases (heart, blood vessels, tumors, etc.), as well as the manifestation of many positive therapeutic effects of herbal medicines (Domitrović *et al.* 2016; Bai *et al.* 2021). The desired therapeutic effect of a drug, its bioavailability, is ensured not only by its pharmacological action, but also by the dosage form chosen for its manufacture and use. The dosage form requires the determination of the composition of the drug, which is consistent with the methods of its administration and use and ensures the achievement of the desired therapeutic effect. Medicinal products derived from medicinal plant raw materials are usually called "herbal medicinal products". Foreign pharmacopoeias and regulatory

documents of different countries use different terms such as "medicinal plants", and "herbal medicinal products" with their own, non-identical definitions. Herbal medicines are obtained from whole, crushed or crushed (chopped, ground) plants or parts of algae, mushrooms, lichens, usually dried, sometimes fresh, and in some cases frozen, used as raw materials for the production of medicinal plants (Slusarczyk *et al.* 2021; Mironeasa *et al.* 2024). Some exudates (secretions) from plants that have not been specifically processed may be considered medicinal products. The use of "intermediate products from plant raw materials" as starting materials for the production of medicinal products of plant origin is regulated - products obtained by processing plant raw materials, for example, by extraction, distillation, centrifugation, fractionation, purification, concentration or fermentation. Such products include powders, tinctures, extracts, essential oils of medicinal products that have been crushed or separated during the processing process (Singh 2015; Jain *et al.* 2020e; Razzak *et al.* 2020). Plants are a source of many important substances. It is known that the number of medicinal raw materials prepared from plants continues to increase. This is evidenced by the fact that the demand for medicinal plants is increasing every year, in particular, over the past decade, demand in our country has doubled, and the amount of harvested plants exceeded 50-55 thousand tons, which satisfies only 70.2-73.9% of the demand for medicinal raw materials. Also, spices based on medicinal herbs are a rich source of phenolic acids, flavonoids, which are powerful antioxidants. Therefore, even a small addition of spices to food significantly increases the antioxidant status of the body and contributes to the normal functioning of vital organ systems, preventing the occurrence of various diseases. The importance of some official plant species is also increasing because many natural compounds (cardiac glycosides, steroids, flavonoids, saponins, etc.) contained in them are not readily available or their synthesis is very expensive. However, it is sometimes difficult to find metabolites of such necessary substances. Many scientists believe that herbal medicines are very useful for the treatment of chronic diseases and it is advisable to use them in the form of purified or semi-purified preparations. Medicinal plants are of interest to specialists in the field of medicine and pharmacy. After all, tinctures, extracts and decoctions of such plants have a milder effect than synthetic antibiotic and hormonal drugs, and they have fewer allergic and side effects. In general, medicinal products play an important role in medicine, pharmacy, cosmetology, food production, and are effectively used in production (Chan *et al.* 2017; Zheng *et al.* 2017; Abdulkhaleq *et al.* 2018; Zili *et al.* 2019; Rani *et al.* 2024). Medicinal plants are unique in their healing properties and have found application in traditional or folk medicine for the treatment of many diseases, and their therapeutic effects still require extensive research. Traditional medicine often uses vegetable oils, and products obtained from their fruits have various anti-inflammatory properties: they inhibit the secretion of gastric juice, affect protein and lipid metabolism in the liver; reduce the amount of total lipids and cholesterol in the blood and prevent the development of atherosclerosis (Kobylina *et al.* 2024; Ydyrys *et al.* 2025). Recently, preparations from medicinal plants have been used as a prophylactic agent in radiation therapy to reduce degenerative changes in the body. Since the protective compounds included in medicinal plants include vitamins, organic acids, mineral salts, enzymes, it is worth noting that plant active substances play an important role in increasing the body's protective and compensatory response. Antioxidant, antimicrobial, etc. activities have been identified in extracts of the peel of plant fruits, extracts of the peel and products obtained from their shoots. For example, arbutin (which is found in large quantities in pears) plays an important role in the prevention of kidney diseases, urinary tract diseases, and the development of lung inflammation. Amygdalin (found in the berries of cherries, chestnuts, etc.) normalizes the function of the nervous system and the heart, as well as the respiratory center. Betaine (found in buckwheat seeds, and honeysuckle seeds) has an anti-ulcer effect. Berberine (found in barberry seeds) has anti-cancer, anti-inflammatory, and anti-kidney stone properties. Viburnum prevents stomach ulcers, internal bleeding, etc. Choline (found in sea buckthorn, rose hips, hazelnuts, etc.) prevents fatty liver, kidney damage, and also restores high blood pressure and other disorders in the body. Coumarins and oxycoumarins (found in raspberries, blackberries, gooseberries, currants, safflowers, etc.) prevent the formation of blood clots, internal bleeding, and also have a very strong anti-inflammatory effect. Serotonin (found in redberries, blackberries, gooseberries, etc.) has an antitumor effect. Salicylic acid (found in raspberries, cherries, etc.) has an antipyretic and bactericidal effect. Schizoidin (found in the seeds of Chinese lemon) has a central nervous system activating and tonic properties, as well as relieving fatigue, increasing work activity, endurance, and restoring blood pressure in hypertensive patients. Saponins (found in hawthorn seeds, gooseberries, red currants, pears, and other plants) have antitumor and antiatherosclerotic properties. Triterpene acids prevent the development of vascular circulatory disorders, irregular heartbeat and heart disease, and other diseases. Today, due to the increasing rate of use of medicinal plant resources, the issue of their rational use is an urgent issue. The

current system of systematic and unregulated use of wild medicinal plant resources should be replaced by a strict scientific system that provides them with the necessary amount of raw materials and increases natural populations, as well as their rational use (Thatoi *et al.* 2009; Sami *et al.* 2021; Abdreshov *et al.* 2023). Currently, according to scientists, all the information necessary for the use of plants - a map of the distribution area, lists of stocks, the dynamics of manufactured products over the years, information on biological characteristics, and instructions for preparation - form the basis of cadastres of medicinal plants (Asnaashari *et al.* 2018; Radovanović *et al.* 2023; Zhu *et al.* 2023). One of the tasks facing scientists today is to prepare a certain plant species or group. However, this should only be done if there is no other way to preserve the reproduction of plants. Nowadays, not only ways to protect medicinal plants, but also their rational use have become an urgent issue. In areas where valuable medicinal plants grow in large numbers, it is necessary to carry out comprehensive resource and nature protection measures, and organize their registration and accounting (Kurdyukov *et al.* 2023; Altammar *et al.* 2025; Popkov *et al.* 2025). The rich flora of Kazakhstan is the basis for scientific research in the identification of new, modern, safe plant raw materials. Given the vast territory of our country, there are still many unexplored species of plants. They are capable of synthesizing substances of various chemical nature. According to modern views, medicinal products obtained from plants are a whole biogenetically formed complex of macro- and microelements, inorganic salts, containing secondary metabolites, proteins.

CONCLUSION

Based on the above, the relevance of the work is characterized by the importance of medicinal plants. A wide spectrum of biological activity of medicinal plants growing in the Ili and Zhetysu Alatau was determined. It was found that the flora of the Ili and Zhetysu Alatau region includes useful groups of plants: fodder, medicinal, food, honey, poisonous, insecticidal, ornamental, essential oil, tannin, dye, etc. The prospects for using them as a source of biologically active substances for the production of medicinal products based on plant raw materials were considered. The flora of Kazakhstan is rich in promising little-studied plants used in folk medicine, however, it was shown that additional in-depth research using modern scientific methods is necessary to introduce them into medical practice.

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