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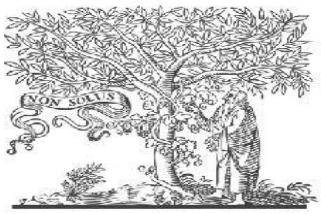

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Title **EFFICIENCY, PROSPECTS AND ECONOMIC EVALUATION OF THE CULTIVATION OF ECHINACEA PURPUREA**

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EFFICIENCY, PROSPECTS AND ECONOMIC EVALUATION OF THE CULTIVATION OF ECHINACEA PURPUREA

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Abstract: The article provides information on the medicinal plant Echinacea purpurea (L.) Moench). Information about the introduction of plants was given. The literature data on the effectiveness, economic assessment and prospects of cultivation of Echinacea purpurea are given. And also there was a comparison of the conditions and places of growing these plants and the data obtained by some researchers.

Keywords. Echinacea purpurea, medicinal plants, introduction, biologically active substances, raw materials, cultivation, vitamins, mineral salts, essential oils, phytoncides, efficiency, economic assessment.

Introduction

One of the main tasks of the agro-industrial complex is to increase the quantity and improve the quality of crop production. Medicinal plants are an irreplaceable source of various vitamins, mineral salts, essential oils and phytoncides that are essential for the health and harmonious development of humans and farm animals. Depending on the soil and climatic conditions, a biological basis for the introduction and agrotechnical methods for the cultivation of those species of useful plants that can give the greatest practical effect should be developed.

An urgent and promising direction is the study of the composition of the metabolome of medicinal cultures, which will reveal new aspects of their biological activity and therapeutic action. Thus, studies carried out in our country and in a number of foreign countries have shown that preparations from echinacea have not only immunostimulating effects, but also antibacterial and antiviral effects (Sakovich et al. 2000; Hudson, Vimalanatham, 2011). The therapeutic effect of belladonna preparations was noted in the treatment of bronchial asthma (Mikhailov, 2003). Sanguirithrin has shown good results in cancer therapy; its antiviral effect against HIV-1 has been established. The study of the metabolome composition of Echinacea purpurea, Ammi large, macklea cordata, and belladonna will make it possible to determine the main metabolomic components, to study the influence of soil and climatic conditions of cultivation and methods of cultivation on their content.

An important aspect in the development of agricultural technologies for the cultivation of medicinal crops is the assessment of the quality of raw materials for the content of biologically active substances and the determination of changes in metabolic components (secondary metabolites) depending on soil and climatic conditions [8].

The value of Echinacea purpurea as a plant of combined use, became the basis for research, with the study of the adaptive capabilities of this species and further prospects for its use.

Echinacea purpurea is a valuable medicinal, ornamental, fodder, melliferous plant of the North American flora, used to create phytopreparations and food additives with immunomodulating and adaptagenic action: it is the source of a number of biologically active substances, all plant organs contain essential oils, polysaccharides, organic acids, vitamins A and B, tannins, flavonoids. The use of Echinacea purpurea improves immunity and protects a person from diseases.

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The need to solve regional problems of the lack of plant raw materials raises interest in the introduction of promising plants from other geographic zones. In the process of realizing the biological potential of such plants, cultivation features are identified, which are associated with changes in growing conditions, cultivation methods. These factors of influence on plants are closely interrelated: growing conditions help to reveal the adaptive capabilities of plants, and cultivation methods - to bring them in line with the biological needs of the crop. Optimized growing and cultivation conditions result in optimized agricultural technologies. Plant introduction is an area of application of various biological sciences, it comes into contact with many of them (ecology, geography, agronomy, forestry), borrowing their theoretical positions and methods. Among the botanical disciplines designed to solve the problems of introduction, one of the leading places belongs to plant physiology, because, by studying the dependence of the vital processes of plant adaptation to external factors. As indicated by Brykalov and others, introduction and breeding work was carried out in the Stavropol Research Institute of Agriculture. (four)

Long-term experiments of Sharaevskaya and others on the cultivation of echinacea in the Bryansk region have shown its high introduction capacity, winter hardiness and drought resistance. The results they obtained indicate the advisability of creating a local raw material base for Echinacea purpurea by treating them with biological products and growth stimulants. Watering seedlings with humistim in a ratio of 1:10 promoted an increase in the number of leaves and, ultimately, an increase in the aboveground plant mass. In the Bryansk region, a breeding site for Echinacea purpurea has been established, and for a number of years, industrial experiments have been carried out at the UOKH (KOKINO), BGSKhA using various dates and planting schemes. Zamanova is considering the possibility of introducing Echinacea purpurea into the soil and climatic conditions of the southern forest-steppe of the Republic of Bashkartostan. The author revealed that the plant goes through the full life cycle of development and from the second year of vegetation enters the generative period [2].

In the conditions of Ukraine, breeding work is underway with echinacea purpurea and varieties Princess, Charovnitsa, and others are bred. The yield of the aboveground mass of these varieties reaches 64.0-76.0 c / ha. In the agro-ecological conditions of the Central forest-steppe zone of Ukraine, the ecological, physiological and biochemical characteristics of echinacea were studied. The optimal cultivation and productivity conditions were selected depending on climatic conditions; it was found that to obtain a high yield of Echinacea purpurea, the average temperature during the growing season should be 15.8^0C, the amount of precipitation - 489.3 mm. In the introduced plants, the content of chlorophyll was 0.506-1.381 m / g, and carotenoids 0.378 mg / g. Since 1993, the Echinacea purpurea gene pool has been created in the Siberian Botanical Garden of Tomsk University in order to select promising medicinal and decorative forms based on morphological and biochemical characteristics. The mobilization of seeds for research was carried out from the botanical gardens of Germany, France, Poland, Russia, since 2000 sowing is carried out with seeds of Tomsk reproduction. Field experiments were carried out at the expositions of the experimental farm SBS TSU, located in the subzone of the southern taiga. Plants were grown from achenes in a greenhouse and then planted in open ground. Individuals bloomed in the second year. In the generative state, the species is stable in culture. T.N.Belyaeva et al. Compared the dynamics of the main morphological indicators of various samples and varieties of Echinacea purpurea over four years of life. They found that with age there was an increase in the number of generative shoots in an individual, the number of basal and stem leaves, and the height of shoots increased. At the same time, some features of the generative organs remained fairly stable [3].

Also, Belyaeva et al. Found that environmental conditions have a significant effect on the synthesis and accumulation of

biologically active substances (BAS) in plants. Samples of Echinacea purpurea, introduced into SIBS, are distinguished by a high level of accumulation of biologically active substances, noted in leaves and inflorescences, minimal - in stems. The content of the total hydroxycinnamic acids in various organs of echinacea and its varieties in different phases of the growing season varies: in leaves and inflorescences - from 0.8 to 5.1%, in stems - from 0.5 to 2.2% of the mass of air-dry raw materials ... The greatest accumulation of the amount of hydroxylic acids was noted in the form of the third year of vegetation. The dependence of the level of accumulation of biologically active substances on the conditions of the growing season was confirmed. Samples and varieties of Echinacea purpurea introduced into SIBS are characterized by winter hardiness, high and pests, and a significant content of biologically active substances [2].

According to Bodrug's data, perennial individuals start growing in mid-March-early April. During May, a powerful rosette of leaves is developed, and in early June leafy stems grow, the number of which depends mainly on the age of the plants: 2-year-old plants develop 1 stem, 3-year-old -2-4-4-K orders end with an inflorescence. The first to bloom were the inflorescences of the main shoot, then the rest. The flowering of baskets is very extended and depends on the location on the shoots. Baskets located on shoots of 3-4th orders bloomed at the end of September and did not produce viable achenes. Ripening of achenes on the main shoot and shoots of the 1st and 2nd orders was observed from mid-August to mid-September. The greatest number of seeds with high sowing qualities developed on these shoots. In mid-October, at the end of the fruiting phase, the aboveground organs died off. Underground organs tolerated the winter period normally, without freezing out [3].

As studies by E.S. Vasfilov and RI Butdinov, one of the ways to accelerate the development of plants in the first growing season and, accordingly, to reduce their mortality over the winter can be cultivation by not direct sowing in open ground, but by preliminary cultivation of seedlings in a greenhouse followed by planting in open ground. In countries and regions with a warmer climate, for example, in Ukraine, the first method of cultivation is widespread. Observations carried out by Bodrug over the years have shown that Echinacea purpurea plants are among the resistant to pests and diseases. Individuals affected by powdery mildew and viral mosaic, as well as root rot were noted [3]. To combat these diseases, the phytosanitary state of plantations was optimized. Cleaning of the above-ground organs of Echinacea purpurea is proposed to be carried out from the second year of plant life in the phase of their mass flowering. The studies carried out on the introduction and primary culture of Echinacea purpurea in Moldova indicated the full possibility of its transition to an industrial basis. Based on the analysis of scientific literature, it has been established that Echinacea purpurea is a valuable plant of multifaceted use; it can be successfully used both in medicine and in the agro-industrial complex [3].

Chirkov, 1969; Budin 1975; Shashko 1985; believe that the main factor determining the features of agrotechnical measures, product quality, conditions for the formation of productivity of agricultural crops, territorial specialization of agricultural production are the agro-climatic conditions of the growing region, which consist of soil resources, unfavorable and dangerous weather phenomena. An important role in the cultivation of agricultural crops is played by the moisture supply and thermal regime of the growing season. The optimal average daily temperature for the normal development of most crops during the active growing season is a temperature above 10^0C. Agrometric conditions play an important role in the formation of high yields of agricultural crops. In conditions of sufficient moisture, the availability of nutrients by plants increases, optimal conditions for photosynthesis and biomass accumulation are created. The research was carried out in the forest-meadow zone of RNO-Alania. Climatic conditions in different years develop in different ways, which is

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explained by the influence of the ridges of the Greater Caucasus. The climate in the region of our research is moderately warm and rather humid. The relief of the territory is flat, the soil of the experimental site is sod-gley, slightly podzolized, with a humus content of 7.25% in the arable layer, the content of which depends on environmental and climatic conditions [3].

As established by Dzanagov (1999), the ratio of the sum of exchangeable cations to the sum of the same cations and the value of hydrolytic acidity (the degree of saturation with bases) ranges from 52% to 75%. The author points out that soddy-gley soils have a slightly acidic reaction, while the exchangeable acidity varies within the limits. High productivity of agricultural crops is significantly influenced by weather conditions, which consist of factors such as precipitation and ambient temperature [1].

The air temperature averaged over the period, equal to 20-220C, exceeded the norm by 1-1.5 degrees. The minimum air temperature for the summer period was 7-10^{0}C and was noted in early June. During the season, about 200-500 mm of precipitation fell everywhere - from 75% to 130% of the norm. They fell out in general, as usual, 35-45 days. However, precipitation was distributed nervously in time. The driest was in July and August. The duration of the period without rain on the main territory was 15-25 days. The most frequent precipitation was in June, 10-18 days. Autumn began with a steady transition of the average daily air temperature over 15^{0}C towards a decrease on September 24-27. It ended on December 11-13, on average 1.5-2 weeks later than the long-term average. The duration of the autumn season was close to the multiyear average and amounted to about 75 days. The average air temperature for the season was 8-9^{0}C, on December 11-13 and reached 23-26^{0}C. The minimum air temperature was noted in the first decade of November and amounted to -3 ... -6^{0}C [6].

The economic efficiency of the cultivation of Echinacea purpurea depends on many factors, both external and internal. From the political and economic priorities formed in the region, the organization of the marketing system, the qualifications of managers and specialists directly in the agricultural enterprise. The main positive role is played by weather conditions independent of humans. As a result, the profitability can vary significantly within one crop, depending on the climatic conditions and the conditions created. The higher the crop yield per hectare with the lowest cost of funds and labor for carrying out agrotechnical measures, the higher the economic efficiency [4].

Based on the results of the introduction studies in the Republic of North Ossetia-Alania, the economic efficiency of cultivation of Echinacea purpurea was calculated. The results are presented in the following table:

Indicators	Results
Average yield, q / ha	412,1
Selling price of 1 centner of product, rub	788,8
cost of production from 1 ha total, rub	325064
Labor costs per 1 ton of products, man-hour	273,6
Production costs per hectare, rub	245906
Cost of 1c product, rub	451,1
Net income, loss from 1 ha, rub	+79158
Profitability level	32,2

The most objective indicator characterizing production efficiency is profitability, which is an economic category that reflects profitability and profitability. The complexity of growing 1 ton of Echinacea purpurea was 273.6 people / hour. Per 1 kg, labor intensity is 0.27 person / hour. With a selling price of 788.8 rubles, per 1 centner and a cost of 1 centner, 451.1 rubles, the profitability level is 32.2%, which indicates the high economic efficiency of growing Echinacea purpurea in the Republic of North Ossetia-Alania [5].

The introduction of medicinal plants growing in other geographic areas and possessing economic and biological value,

positively affecting human immunity, is currently of great interest. The value of Echinacea purpurea as a plant of combined use became the basis for research in the Republic of North Ossetia-Alania. The results of many studies have shown that the achene of Echinacea purpurea is small, grayish-brown in color, tetrahedral, at the apex of a feather-toothed crown, 4.78-5.18 mm long, 1.18-2.0 mm wide and 1.4-2 thick. 1 mm. The mass of 1000 seeds was 3.28-3.85 g. Under the conditions of North Ossetia-Alania, the coefficient of plant seminification to new conditions is 77.9-88.5%, and the adaptation coefficient is 0.79-0.99, which shows favorable conditions for cultivation of Echinacea purpurea. It should also be noted that the green mass of Echinacea purpurea grown in the Republic of North Ossetia-Alania is distinguished by a significant content in its composition of basic nutrients, macro and microelements, as well as biologically active substances. At the same time, with an increase in the age of Echinacea purpurea plants, the amount of nutrients in the aboveground mass increases.

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