

## BIOLOGICAL CHARACTERISTICS OF THE SPECIES OF *ECHINACEA PURPUREA* L. CULTIVATED AT THE AGROBIOLOGICAL STATION STATE UNIVERSITY OF MOLDOVA

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### Abstract

In this paper are the results of studying of the morphological structure of *Echinacea purpurea* L species cultivated for two years in indigenous bioecological conditions. In this period of time was analyzed biomass accumulation of different plant parts in different stages of vegetation. The results showed that the dynamics of biomass accumulation in all three parts of the plant has increased capacity as well as the number of flowering shoots, both in the first year of cultivation and in year two. This proves about an increased adaptability to indigenous bioecological conditions

**Key words:** morphological, biomass, bioecological, germination, adaptability

The morphological structure of the *Echinacea purpurea* L. species cultivated for two years in autochthonous bioecological conditions was studied. Later, analyzing the biomass accumulation of different parts of the plant in different phenological phases of vegetarianism. The obtained results showed that the dynamics of biomass accumulation in all three parts of the plant has an increased capacity in mass as well as the number of shoots, inflorescences, both in the first year of cultivation and in the second year. This fact proves to us about a high adaptability to the autochthonous bioecological conditions.

Today it is well known that contemporary medicine is increasingly focusing on phytotherapeutic treatment, and the spontaneous flora cannot provide the ever-increasing plant raw material required, therefore it is necessary to gradually switch to the cultivation of a significant number of plant species (Teleuta A. *et al*, 2008; Paun E. *et al*, 1998). *Echinacea purpurea* L. is one of the plants with a very wide applicability in our country and abroad, in various fields of pharmaceuticals and cosmetology.

The vegetable raw material obtained from crops under native bioecological conditions of medicinal plants presents biological uniformity and a high content of active principles, a greater amount of vegetable product following the improvement process of these species (Muntean L.S., 1990).

Also, in the case of medicinal plant crops, it is possible to plan the time of harvesting and processing the plant product, preventing the depletion of resources from the spontaneous flora and obtaining raw material from species that do not grow in our country (avoiding the import of raw material), but which find favorable ecological conditions in certain areas of the country (introducers).

**Purpose:** the morphological study of *Echinacea purpurea* L. plants grown under bioecological conditions of the agrobiological station of the State University of Moldova.

**Objectives:** highlighting the morphological structures of *Echinacea purpurea* L. plants grown in bioecological conditions in the first year of vegetation; highlighting the morphological structure of *Echinacea purpurea* L. plants grown in bioecological conditions in the second year of vegetation.

### MATERIAL AND METHOD

The species *Echinacea purpurea* L. served as a research object in the first two years of vegetation 2020-2023. The experimental plots were established in the bioecological conditions of the Agrobiological Station of the State University of Moldova. The seed material collected from the collection of the Scientific Center for the Cultivation of Medicinal Plants within the State University of Medicine and Pharmacy, "N. Testemițanu". The

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experimental plots were established in two stages: direct sowing in the open field in autumn and planting with seedlings in spring. The growth and development of *Echinacea purpurea* L. plants were carried out according to the classical methods specific to perennial plants with a bushy appearance in three phenological phases as provided by the ontogenetic development period: the virginal stage, the juvenile and immature stage, the generative period.

The research foresees the following observations: morphological structure, accumulation of biomass of root and aerial parts under conditions of pure ecological culture without fertilizers. The root was collected at the end of the growing season, dried, conditioned and then stored. The inflorescences were also collected during the period of massive flowering, dried, then stored.

## RESULTS AND DISCUSSIONS

As a result of the observations, we can mention that the seeds sown in autumn showed a major germination capacity of 80% until the frosts came, developing embryonic leaves and one or two true ones.

The morphological structure, in the first year of vegetation, of *Echinacea purpurea* L. plants, in the spring of the following year (in the first half of April), slightly elliptical or almost round leaves appear on the soil surface, 0.4-0.7 cm in diameter, short-petioled and with a slightly obvious central vein. Over 9-15 days, the first true leaf develops, which in 6-7 days has the maximum dimensions: limb length 2.0-3 cm, width 1.3-1.5 cm and petiole length 3.0-4.0 cm.

Both sides of the cotyledons, the limb and the petiole are covered with short and rough hairs, and the underground part is represented by the main root, deep into the soil at 3.0-6.0 cm, with a few lateral roots and 2-4 adventitious roots starting from in the middle of the hypocotyl (figure 1).

After another 10-12 days, the second leaf develops, with slightly larger dimensions: limb length - 1.0-5.0 cm, width 3-3.5 cm and petiole length 3.0-5 cm. The dimensions of the cotyledons remain unchanged, their base elongates up to 1.0 cm and the main root deepens into the soil to 10-15 cm. In the first half of May, in the specimens grown in favorable conditions, with the fall of the cotyledons, the 3rd leaf also develops, with dimensions even larger than the previous ones

By the end of the vegetation period, most specimens undergo essential morphological changes. The formation of new leaves takes place at intervals of 15-20 days, but at the same time, the drying of the first leaves is also observed. So, during the summer months, each plant has a

relatively stable number (7-10) of leaves arranged in rosettes. During this time, the diameter of the hypocotyl also increases, from which several adventitious roots of different lengths start.

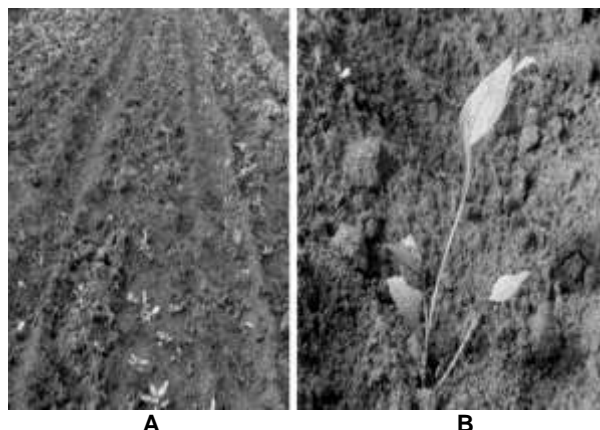


Figure 1. Propagation by seeds (A); Propagation by seedling (B)

Due to the contraction of all the roots, the hypocotyl and the base of the cotyledons gradually deepen into the soil. Towards the end of September, the underground part of the plants is the hypocotyl 1.0-1.5 cm long and 0.8-1.0 cm in diameter, extended in the main root, deepened into the soil up to 15.0 cm. Along its entire length, lateral roots of the 1st and 2nd orders are formed, the sizes of which decrease from the base to the top. The number of adventitious roots, which branch profusely from the middle, also increases. At the base of the cotyledons and the first leaves there are 3-5 well-developed buds (table 1).

Table 1  
The biometric structure of *Echinacea purpurea* L. plants in the first year of vegetation with the rosette and flowering shoots approx. 40% from plants.

Leaves			Plant mass g/pl		
Number	Limb length (cm)	Limb width (cm)	Herb	Radex	Average mass per plant gr./pl.
79,6±8,4	28,8±1,2	5,7±0,7	350,2±43,3	64±3,5	414,2±46,2

Morphological structure in the second year of vegetation of *Echinacea purpurea* L. plants.

In the spring of the second year (the first half of April) the buds that have overwintered start to develop simultaneously. From the central bud develops a rosette consisting of 5-7 leaves larger than those in the side rosettes (figure 2).



Figure 2. Refinement phase

At the beginning of May, the development of an orthotropic shoot was observed from the central rosette, which, towards the end of the month, forms a calathidium-type inflorescence at the top. 7-12 lateral shoots develop from the lower part of the upper stem leaves (sometimes also the middle ones), which end with smaller inflorescences (figure 3)



Figure 3. Flowering in mass

In the middle of June, the flowers in the central calathids begin to open. In calathids, the flowers open from the periphery towards the center, and in plants - in the basipetal direction. The fruit ripening phase begins in August and lasts until the end of September.

As the generative shoot grows, the leaves at its base dry, and after fruiting, the stem leaves also dry. In the lateral rosettes, the formation of new leaves is prolonged at the end of summer, and the aged leaves dry up, so that in each rosette there are only 6-8 leaves that ensure the assimilation process. At the end of the vegetation period, the aerial part of the plants is presented by 20-30 leaves of different sizes, and in place of the central rosette remains a depression that retains the soil and various organic remains.

The underground part of the plants becomes more complicated than it was the previous year. The main root atrophies, and the hypocotyl and the roots starting from it increase their diameter without going deeper into the soil. From the base of each rosette of leaves, 4-6 adventitious roots develop, which branch at different depths. So, the root system in the pivot becomes fasciculated. At the base of the basal leaves of each rosette, regeneration buds are continuously formed, which next year repeat the path of the previous ones. As a result, the underground part becomes a rather complicated morphological formation, with sympodia of different ages, at the base of which regeneration buds and numerous adventitious roots are found (table 2).

Table 2

**The biometric structure of *Echinacea purpurea* L. plants in the second year of vegetation with the rosette and flowering shoots approx. 40% from plants.**

Specification	Specification	Total average
Leaves	Number	168.3 ± 28.5
	Table gr.	193 ± 17.6
	Limb length (cm)	20 ± 1.1
	Limb width (cm)	14 ± 0.4
Number of shoots per plant		27 ± 0.6
The number of inflorescences per plant	Numărul	250.3 ± 1.4
	Masa în gr.	120 ± 5.5
The height of the plant		156 ± 10.3
Mass gr/plant	Herb	600 ± 14.4
	Radex	98 ± 31
	Total/plant	698 ± 17.5

## CONCLUSIONS

*Echinacea purpurea* L. crops grown under native ecobiological conditions for two years have a 70/100 germination percentage of seeds sown in autumn, in the open field in spring and a morphological structure: the number of leaves

168.3 ± 28.5; number of shoots per plant 14; inflorescences in number of 20; plant height 120 cm; the average mass of a plant is 678 g, which indicates increased adaptability

*Echinacea purpurea* L. can be considered a priority crop for domestic medicinal plant growers, obtaining quality raw material for the pharmaceutical industry avoiding its import.

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