

ABSTRACTS

Keywords: medicinal and aromatic plants, purple echinacea, fertilization, active principles.

Echinacea purpurea (L) Moench. is in the present one of the most important species of aromatic and medicinal plants. The need to introduce this plant in culture derives from the fact that on the internal market the preparations from this plant are very used and the internal market is poor in vegetal raw material for processing. In the same time, the establishing of technological parameters of cultivation leads to increased surfaces with this species especially in the reference area of Secuieni Station of Agricultural Research and Development.

For the development of work and for the interpretation of the obtained results, the bibliography was consulted on the issues addressed asking for the latest news in the field.

The master's degree thesis includes eight chapters with 188 pages, 66 tables and 83 figures. The thesis has two distinct parts, the first part is a synthesis of bibliographic data as regard the master's degree thesis, natural frame, climatic conditions from the experimental years, the material and methods of research and also included here is the bibliography. This part includes 56 pages. In the second part are presented the results of the own research as regard the subject of the master's degree thesis. This part has a total of 107 pages, 53 tables and 66 figures.

Chapter I contains information as regard the global and national importance of medicinal and aromatic plants and news on the field of their use. Also in this chapter are presented the chemical composition of active principles and their therapeutic action on the human body.

Chapter II refers to the current state of research as regard the culture technology and the content of active principles at species *Echinacea purpurea* (L) Moench. both global and national. To prepare this chapter were synthesized the research performed in our country but especially in the world as regard some aspects concerning the biology of some technological links but also of biomass quality at *Echinacea purpurea* (L) Moench. as well as research of very recent date as regard the medicinal benefits of products from this plant.

Chapter III refers to the natural frame and ecological conditions of experimentation in relation to the requirements of medicinal plants especially *Echinacea purpurea* (L) Moench. The research about the culture and establishment of cultivation technology at *Echinacea purpurea* (L) Moench. were performed at S.C.D.A. Secuieni during the period 1999 – 2003, but in 2003 have done a series of experiments to determine the influence of climatic conditions and some certain parameters on the production of herba and their quality. The Secuieni Station of

Agricultural Research and Development is part of the research network of Academy of Agricultural Sciences and Forestry and is situated in south – east of the Neamt county, located on the geographical coordinates of 26°5' east longitude, 46°5' north latitude. From agro-systemic point of view, the territory belongs to Moldavian Central Plateau. Typical for the area morphology is the relief conditioned by the monoclinic structure: inter-rivers and valleys mainly oriented NV – SE and structural plateaus. The large valleys with 7 – 8 terraces whose relative heights exceeding sometimes 170 – 200 m, the frequency and development of landslides, of the other slope process are also characteristic morphological features. The area climate is *temperate continental*.

The climatic conditions from the experimental years were favorable to growth and development of species *Echinacea purpurea* (L) Moench. during the period 2000 – 2006 the most dry months were: May (- 18,6 mm towards multi-annual average) and June (- 17,7 mm towards multi-annual average) and the most rainy months were: July (126,8 mm exceeding with 40,5 mm the multi-annual average) and August (100,1 mm exceeding with 33,9 mm the multi-annual average).

Chapter IV refers to the objectives, material and methods of research. The research objectives were the study, research and establishment of biological features at *Echinacea purpurea* (L) Moench., influencing of seeds germination and reduction of germination period with the aim of decrease of sowing – rises period, the effect of sowing time on the herba production and active principles from biomass, as well as the quantification of impact of distance between rows and plants/row and effectiveness of chemical and organic fertilizers on herba production and their quality. The seed used for experiments has been provided by SCDPMA Fundulea, being of foreign origin, having germination of 85% and purity of 97%. The origin has the period of vegetation between 78 and 102 days (from the second year of vegetation), is cultivated for air part (herba) and at culture abolition the roots (radix) can be capitalized.

The location of experiments was done in field, in randomized blocks, in four repetitions, the variant surface being by 8 m². The observations were made at plants located in vegetation and the biometrical measurements were made at plants harvesting when have taken the samples for their analysis. This were made to a number of 10 plants from the variant of which the average has been made and consisted in plant height at harvest, plant weight, stalks weight, leaves weight, inflorescence weight and number of inflorescence on plant. The samples for analysis were taken from 2 linear meters (flourished at the maximum) and were dried.

Chapter V contains the results of research on shortening of seeds germination and the influence of fertilization on the biomass production and their quality at *Echinacea purpurea* (L) Moench.

In laboratory conditions, the optimum temperature of germination is 22°C, the time process being by 11 days and the percentage of germinated seeds being by 90%. The shortening of germination period can be made by seeds moistening for 48 hours and put in refrigerator for 12 hours, the process of germination being 97%.

At the experience concerning the optimum level of fertilization, the period of vegetation on average of three years of experimentation at *Echinacea purpurea* (L) Moench. was by 155 days, the phases of vegetation meaning in average: starting in vegetation – formation of leaves rosettes 48 days (31%), formation of leaves rosettes – emission of floral stalk – 16 days (10%), emission of floral stalk – efflorescence – 17 days (11%), efflorescence – flowering – 26 days (17%) and flowering – seeds baking – 48 days (31%). The average height and weight of plants of *Echinacea purpurea* (L) Moench., were influenced by fertilizer doses and year of vegetation, this being more vigorous in the fourth year, at variant fertilized with N₈₀P₈₀.

From the average weight of a plant in phase of maximum flowering about 45% represent the stalk, 28% represent the leaves and about 27% from the air part represent the flowers. Between the nitrogen fertilizers used and the production of dry herba, on all agricultural backgrounds, have obtained positive correlations, evidenced by the coefficients values which varied from + 0,968 to 0,990.

During the period 2000 – 2003, the highest production of dry herba (76,26q/ha) has obtained at the variant fertilized with 80 kg s.a./ha nitrogen and 80 kg s.a./ha phosphorous, the growth to unfertilized witness being by 21,8 q/ha (40%). During the period 2004 – 2006, the highest average production of dry herba (79,43 q/ha) was obtained at the variant fertilized with 80 kg P₂O₅, the difference toward the unfertilized witness (66,70 q/ha) being by 12,73 q/ha (20%).

The growth of production obtained between years 2004 – 2006 through fertilization with nitrogen were by 2% at variant fertilized with N₄₀, 3% at variant fertilized with N₆₀ and 5% at variant fertilized with N₈₀. Under the influence of interaction of nitrogen and phosphorous fertilizers, in average of the three years of culture, the highest average production of dry herba (82,00 q/ha) was obtained at the variant fertilized with N₈₀P₈₀.

In **chapter VI** are presented the research results concerning the influence of sowing epoch and of the nutrition space at quantitative accumulation of biomass. As a result of phenological observations and biometrical determinations performed at the plants from the experience concerning the nutrition space, the average of the three experimental years shows us the period of vegetation at *Echinacea purpurea* (L) Moench., in the experience concerning the establishment of optimum space of nutrition was by 163 days, the phases of vegetation meaning in average: starting in vegetation – formation of leaves rosettes 52 days (32%), formation of

leaves rosettes – emission of floral stalk – 15 days (10%), emission of floral stalk – efflorescence – 17 days (10%), efflorescence – flowering – 30 days (18%) and flowering – seeds baking – 49 days (30%).

The average height of *Echinacea purpurea* (L).Moench. plants, varied depending on the distance between rows and between plants on row, in average on the three years of culture (2001 – 2003) the highest average height (101,20 cm) had the plants from the variant sowed at the distance of 50cm between rows and 15 cm between plants on row. The average number of leaves on plant was between 10,6 (at plants from variant sowed at the distance of 37,5 cm between rows and 20 cm between plants on row) and 15,4 leaves/plant (at plants from variant sowed at the distance of 50 cm between rows and 15 cm between plants on row).

The optimum sowing epoch has proved to be in the conditions from S.C.D.A. Secuieni, the first epoch – sowed on the brink of winter, at this variant in average on years of experimentation and on years of vegetation (the epochs average) at *Echinacea purpurea* (L).Moench. obtaining the production of 55,6 q/ha, the differences of production of the other epochs was provided statistical, namely of 5,2q/ha (9%) at second epoch (sowed at spring) and 42,4 q/ha (76%) at third epoch – summer sowing.

The productions of dry herba were significantly influenced both the distance between rows (average A) and the distance between plants on row (average B).

During the period 2000 – 2006 it was found that in the terms from S.C.D.A. Secuieni, the largest productions of dry herba were recorded at average distances of planting to which correspond high density at the surface unit. The largest average production of dry herba (64,42q/ha) was obtained at variant sowed at 50 cm between rows and 15 cm between plants on row (133333 pl/ha), the difference from the control sample – sowed at 37,5 cm and without thinning (39,08q/ha) being by 25,34 q/ha (64%).

During the period 2004 – 2006 the largest production of dry herba was obtained at distance of 50 cm between rows (70,62q/ha), the difference from control sample – sowed at 37,5 cm between rows being of 10,83 q/ha (17%). The growth of production obtained through plants thinning on row at 15 cm was 1,49 q/ha (2%). Under the influence of interaction of the researched factors, the largest average production on the three years (73,38 q/ha) was obtained at the variant sowed at the distance of 50 cm between rows and 15 cm between plants on row.

Chapter VII refers to the content of active principles of the plants of *Echinacea purpurea* (L) Moench. The qualitative analysis of vegetal raw material (herba) was made only to the experiences with chemical and organic fertilizers at plants from the fourth year of vegetation. The quantitative and qualitative chemical study was performed on various extracts obtained both from herba and vegetative organs of plants (root, stalk, leaves, flowers) in the phase of maximum

flowering of plant, realizing methanolic exhausted extracts MeOH 70% and extracts of tincture type and using the thin layer chromatography for three groups of active principles important from pharmacological point of view: polyphenolic acids, flavonoids and triterpenic components.

The chemical quantitative analysis pursued the quantification through spectrophotometry of flavonoids and polyphenolic acids. To pursue in the two groups of polyphenols the presence or absence of some relevant components, the study was completed with HPLC analysis of this. As a result of chemical research performed, it has been found that the only polyphenolic acid identified in the air part of *Echinacea purpurea* (L) Moench. is the coffee acid which is found in reduced amounts in stalks (8,010 mg/100 ml tincture), in flowers in higher concentration (38,050 mg/100 ml tincture), the leaves being the most rich in this component (79,700 mg/100 ml tincture). Depending on the dose of manure, the coffee acid was found in greater amounts at the variant fertilized with 30 t/ha.

The chemical fertilizers had a positive influence on the accumulation of coffee acid, how the dose of nitrogen and phosphorus increased, the concentration of coffee acid was higher (38,84 mg/100 ml tincture) at the variant fertilized with $N_{80}P_{80}$, the difference toward the untreated witness (control sample) being by 57%. Regarding the content of polyphenolic acid, analysing the values obtained at the samples analysed under the form of the exhausted MeOH70%, we found that at a fertilization of soil with $N_{40}P_0$ and $N_{60}P_{60}$, the content of total polyphenols increased up to 33% toward the unfertilized witness (control sample), while at a higher dose ($N_{80}P_{80}$), the concentration of this compounds decreased with 40% toward the witness (control sample).

The content in flavonoids (g rutozide) recorded higher values (0,6500 g rutozide) at the plants from the variant fertilized with $N_{60}P_{60}$.

The **chapter VIII** refers to the economic efficiency of the results obtained. At the experience with chemical fertilizers, the gross profit in the three years of vegetation in which has asserted the dry herba, on agricultural background $N_{80}P_{80}$, was by 44350 lei/ha in the second year, 42209 lei/ha in the third year and 42633 lei/ha in the fourth year of culture. The net profit on average upon the four years of culture was between 23174 lei/ha, on agricultural background N_0P_0 and 36174 lei/ha on agricultural background $N_{80}P_{80}$. The rate of net profit on average upon the three years in which was asserted the production, was between 63,7% on agricultural background N_0P_0 and 68,3% on agricultural background $N_{60}P_{60}$ and $N_{80}P_{80}$.

At the experience concerning the space of nutrition, the net profit on the four years of culture was by 95215 lei/ha and the rate of net profit was by 68 % in the second year, 67,7% in the third year and 66,4% in the fourth year of culture.

Based on the results obtained in the experimental period were made some proposals for cultivation of species *Echinacea purpurea* (L) Moench., designed to contribute at the increasing of biomass production.