SUMMARY

Keywords: *genotype, nutrition space, fertilization, seed production, 1000 grains mass, hectolitre mass, germination*

Seed production of perennial meadow legumes should be one of the concerns of agriculture, as a result of the increasing quantities of seed needed to improve permanent grassland, restore new land and significantly increase the area of temporary grassland.

Sainfoin (*Onobrychis viciifolia* Scop.) is one of the most valuable perennial fodder legumes. It is grown for hay, green mass or pickled fodder, in pure culture or mixed with perennial grasses and is valued for its productivity and feed quality.

In this context, **the present research aimes studying the** influence of technological factors on the production and quality of *Onobrychis viciifolia* Scop. seeds in the conditions of the Central Moldavian Plateau**.**

The objectives and activities of the study are represented by the analysis of the influence of some technological factors on some morphoproductive parameters of the plants, on the seed production and on some physical and biological indices of the seeds of sainfoin, in seed culture.

The thesis is structured in **two parts** and includes **six chapters**.

In **the first part**, which comprises 40 pages (26,14% of the thesis), representing chapters I, II and III, shows a study of the literature, in order to understand the current state of research referring to the the importance of seed production in the field and a brief description of the pedoclimatic conditions in the study area.

Chapter I presents **the seed production at *Onobrychis viciifolia* Scop.** showing the economic importance of sainfoin, the main varieties of sainfoin created in Romania, the methodology and technique of seed production ofsainfoin, the requirements for the ecological factors specific to the culture of sainfoin for seed and the cultivation technology.

Chapter II contains research conducted in Romania and abroad **on the importance of technological factors for seed production in *Onobrychis viciifolia* Scop..** The results of the most important research aimed at improving the sainfoin technology of cultivating sfor seed by studying in detail the cultivated biological material, the nutrition space for sainfoin plants and the supply of mineral elements are presented selectively.

The natural setting of the experimental area is presented **in Chapter III**. The researches were carried out within the Grasslands Research and Development Station, Vaslui, Romania (46°40'36" northern latitude and 27°44'16" east longitude). Structurally, the territory of the Station is located on the Central Moldavian Plateau. In the area where the study was conducted, there is a temperate continental climate, with excessiveness nuances. Multiannual precipitation average in the area is 533.2 mm, and the average multiannual temperature is 9.9 °C.

The soil was represented by a cambic phaeziom, with a pH of 6.4 in the top layer soil, good supplied with humus on the range 0-30 cm (3.44%). From the point of view of the content in mineral elements, the soil in the experimental field was, on the interval 0-30 cm, medium supplied with total nitrogen (Nt) (0.17 g%) and good supplied with mobile P (37.7 ppm).

The natural vegetation is characteristic of the forest-steppe climate, being formed by perennial grassy species and some forest-steppe shrubs.

In part II, which contains 73.86% from the volume of the thesis (113 pages), are **presented the results of research regarding the influence of some technological factors on seed production and seeds quality at sainfoin (*Onobrychis viciifolia* Scop.) in Central Moldavian Plateau conditions.**

Chapter IV presents the goals, objectives and activities of the study, the research methods used, the applied cultivation technology and a description of the climatic conditions during the experimentation period.

In order to achieve the goals and objectives, it was organized at the Grasslands Research and Development Station, Vaslui, in the spring of 2019, an experiment in which 3 factors were studied, namely: A- cultivated variety, with two graduations (a_1 - Anamaria, a_2 - Vlamar), B - the distance between rows with three graduations (b_1 - 25 cm, b_2 - 37.5 cm and b_3 - 50 cm) and C - fertilization with five graduations (c_1 - unfertilized, c_2 - $N_{50}P_{50}$, c_3 - $N_{50}P_{50}K_{50}$, c_4 - $N_{100}P_{100}K_{100}$ and c_5 - cattle manure 20 $Mg \cdot ha^{-1}$).

The experiment was based on the method of subdivided plots, type 2x3x5, with the dimensions of a plot of 2x10 m (20 m^2), and the total area of the experient

being 2400 m^2 (48x50 m).

The biological material used was represented by the sainfoin varieties, bifera type, Anamaria, a variety created at the Grasslands Research and Development Station, Vaslui in 2006 and Vlamar created at the University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca in 2011.

The activities of the study were concretized by establishing the influence of the studied factors on: plant height, number of shoots per m^2 (generative shoots), number of inflorescences per m^2, seed production, mass of 1000 grains (MMB), hectolitre mass (MH), total seed germination (G), number of normal germs, number of hard seeds, number of abnormal germs, germination energy and shape and size of fruits and seeds.

In general, the agricultural period 2018-2021 can be characterized as favorable for the installation and exploitation of sainfoin culture for seed production.

The agricultural year 2018-2019 was favorable for the sainfoin crop, even if the precipitations did not have a uniform distribution, there being short periods of water stress, in October 2018, March and July 2019.

The agricultural year 2019-2020 was dry, with periods of water stress, in October 2019, April and August 2020 and, in general, less favorable for the culture of sainfoin, especially due to the small amounts of rainfall and their distribution.

The agricultural year 2020-2021 was a year close to a normal one, favorable to the culture of sainfoin, the distribution of temperatures and precipitations, both during the year and during the vegetation period following a trend close to that of the values of the multiannual average.

Chapter V presents the **results of research on the influence of some technological factors on morphoproductive parameters and seed production in sainfoin (*Onobrychis viciifolia* Scop.).**

In the first year of vegetation, the sainfoin plants of the Anamaria variety had a higher height than those of the Vlamar variety. Anamaria variety had a greater number of shoots and inflorescences were obtained per unit area.

In both varieties by applying mineral or organic fertilizers and by sowing at smaller distances between rows were obtained plants with a higher height, with a higher number of shoots per m^2 and inflorescences per m^2.

Sainfoin plants from the Vlamar variety produced a higher amount of seeds than those from the Anamaria variety, and by applying mineral or organic fertilizers and sowing at smaller distances between rows, higher seed yields were

also obtained.

The factor with the greatest influence on seed production was the distance between rows, and seed production was correlated with the number of shoots per m^2 and the number of inflorescences per m^2.

Regardless of the studied factor, the amount of sainfoin seeds obtained in the first year of vegetation varied between 65.0-324.1 kg·ha^{-1}, the factor with the greatest influence on seed production being the distance between rows.

In the second and third years of vegetation, the Anamaria variety performed better in cultivation, the sainfoin plants of this variety generating higher shoots, on average by 16.5-17.5%, a higher number of shoots per m^2, in average with 18.6-20.0% and inflorescences per m^2, on average with 12.1-26.3%.

By sowing at short distances between rows and by applying mineral or organic fertilizers, shoots with a higher height were generated.

By applying mineral or organic fertilizers the number of shoots per m^2 had a tendency to increase, and in the case of fertilization with manure was generated the largest number of shoots per unit area, and by sowing at distances between smaller rows led to a lower number of shoots per m^2, the higher nutrition space did not compensate for the problem posed by climatic conditions, especially the lack of rainfall.

By applying mineral or organic fertilizers the number of inflorescences per m^2 had a general tendency to increase, and the highest values for this indicator were obtained when the sowing had a distance of 50 cm between rows.

In the second year of vegetation, 2019-2020, at harvest I, the seed production had values between 633 kg·ha^{-1} for the $a_2b_3c_5$ variant (Vlamar variety, sown at 50 cm between rows, fertilized with manure 20 t·ha^{-1}) and 1107 kg·ha^{-1} for variant $a_1b_1c_4$ (Anamaria variety, sown at 25 cm between rows, fertilized with $N_{100}P_{100}K_{100}$).

In the third year of vegetation, 2020-2021, at harvest I, the seed production had values between 744 kg·ha^{-1} for the $a_2b_2c_1$ variant (Vlamar variety, sown at 37.5 cm between rows, unfertilized) and 1277 kg·ha^{-1} for variant $a_1b_1c_4$ (variety Anamaria, sown at 25 cm between rows, fertilized with $N_{100}P_{100}K_{100}$), the same variant as in the second year.

From a statistical point of view, assured positive differences compared to the control variant were obtained for the Anamaria variety, sown at 25 cm between rows, fertilized with $N_{50}P_{50}K_{50}$ and $N_{100}P_{100}K_{100}$ and for the Vlamar variety sown at 50 cm between rows, fertilized with $N_{100}P_{100}K_{100}$, and the greater negative

differences compared to the control variant, with statistical assurance, were determined for the Vlamar variety, cultivated at 37.5-50 cm between rows, regardless of the fertilization variant and for the Anamaria variety regardless of the distance between rows, under non-fertilization conditions.

The cultivator used, or rather its adaptation to the pedoclimatic conditions specific to the crop area and the agricultural year, plays a very important role for the productivity of the seed lots. In general, sainfoin plants of the Anamaria variety produced a higher amount of seeds than those of the Vlamar variety, on average, by 143-173 $kg \cdot ha^{-1}$.

By applying mineral or organic fertilizers and sowing at shorter distances between rows, higher seed yields were obtained.

In **chapter VI**, the results of **the influence of some technological factors on on physical and biological indices of seeds in sainfoin (*Onobrychis viciifolia* Scop.).**

In the first year of vegetation, 2018-2019, regardless of the factor studied, the seeds of sainfoin had mass of 1000 grains of 15.4-17.5 g and the total germination of 73.0-82.1%, the factor with the greatest influence on the analyzed parameters being the distance between the rows.

In the second and third years of vegetation, 2019-2020, respectively 2020-2021, in general, the biological value of the seeds obtained from the Vlamar variety was better, and the sowing at a distance of 37.5 cm between rows and fertilization with mineral fertilizers led to the obtaining of sainfoin seeds with superior biological indices.

In the specific climatic conditions to the agricultural year 2019-2020, the seeds of sainfoin obtained from the Vlamar variety, regardless of the distance between rows at sowing or the fertilization variant, had a higher total germination value, a higher percentage of normal germs, a lower number of hard seeds, lower percentage of abnormal germs, lower number of dead seeds, higher germination value and higher hectolitre mass value than Anamaria. In the Anamaria variety, seeds with a higher mass of 1000 grains value were obtained than in the Vlamar variety.

Regardless of the variety of cultivated sainfoin or the fertilization variant, the distance between rows at sowing had a different influence on the analyzed parameters. By sowing at a distance of 25 cm between rows, seeds with a lower percentage of abnormal germs were obtained, by sowing at a distance of 37.5 cm between rows, seeds with a higher total germination value, a percentage of germs

were obtained. higher normal seeds, a smaller number of hard seeds, a lower number of dead seeds and a higher value of germination energy, and by sowing at a distance of 50 cm between rows, seeds with higher mass of 1000 grains and hectolitre mass values were obtained.

Following the study carried out at the Grasslands Research and Development Station, Vaslui, the agricultural year, due to the specific climatic conditions, but also the factors studied influenced the morphological parameters of the seed material obtained, and by sowing at longer distances between rows and by fertilization with mineral fertilizers or manure were obtained with larger pods.

Fruits, indehiscent monospermous pods or seed material obtained in the 3 years of study from the two varieties of sainfoin, namely Anamaria and Vlamar, by comparison, at a glance look almost identical, having the same shape, size and color, but, in the Anamaria variety there are rigid mucrons and on the sides, in most of the fruits, while in the Vlamar variety the lateral parts of the seeds are devoid of asperities, being present only the alveoli.

In the second and third years of vegetation, the percentage of seed relative to the whole pod was higher in the Vlamar variety.

Regardless of the agricultural year or the factor studied, the pods were 3.91 mm wide, 5.69 mm long, 2.43 mm thick, the seeds were 2.43 mm wide, 3.52 mm long, the thickness of 1.82 mm, and the percentage of seed relative to the whole pod was 69.7%.

The study showed that the factor with the greatest influence on the parameters analysed was the distance between rows.

Both varieties can be used in the study area, namely Anamaria, which generated higher shoots and Vlamar, which generated a higher number of shoots per m^2.

In order to obtain higher seed productions, of a superior quality, for sainfoin in special crops for seed production, regardless of the cultivated variety, it is recommended to cultivate at a distance of 37.5 cm between rows.

in the studied area it is not possible to obtain large quantities of sainfoin seeds, with higher biological indices, without fertilization, recommending the use of complex fertilizers based on NPK in an amount of 100 $kg \cdot ha^{-1}$ active substance.

At the end of the thesis are presented the conclusions and recommendations derived from the study, as well as a selection of the bibliography consulted during the realization of this paper.