

## **SUMMARY**

**Keywords:** cropping system, fertilization, plants development and evolution, productivity, CP (crude protein), RFQ (relative feed quality), species competitiveness

Among the current problems of great importance for our country, given the need for green mass and hay for livestock, is to raise the productive potential of meadows and improve the quality of forage obtained.

The synthesis of experimental results in recent decades shows, that the superiority of temporary grasslands over permanent grasslands, depends on the natural and economic conditions, in which these grasslands are established, the species used and the proportion of their participation in the preparation of mixtures, as well as the grassland management and the mode of exploitation during their existence.

In this context, **the present research aims studying the behavior of smooth brome grass (*Bromus inermis* Leyss.) and sainfoin (*Onobrychis viciifolia* Scop.) species, in pure culture and simple mixtures under the conditions of the Jijia-Bahlui Basin.**

The objectives and activities of the study are represented by the analysis of the behavior of smooth brome grass (*Bromus inermis*) and sainfoin (*Onobrychis viciifolia*) species, cultivated alone or in mixed culture, in terms of grassland installation and evolution, of the obtained production and interspecific relationships.

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

In **the first part**, which comprises 36 pages (20,1% 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 importance of temporary meadows for forage base and opportunities to improve biomass production and

forage quality.

**Chapter I** presents the importance and spread of temporary grasslands, the main species of grasses and perennial legumes used in the establishment of temporary grasslands and the description of *Bromus inermis* and *Onobrychis viciifolia* species.

**Chapter II** contains research conducted in Romania and abroad, **on mixtures of perennial grasses and legumes**. The most important research are presented selectively, results which aimed to improve the cultivation technology of perennial grass and legume mixtures, to evaluate the productivity and quality of the forage obtained, as well as the relationships between the species used in the mixtures,.

The natural setting of the experimental area is presented **in Chapter III**. The researches were carried out within the Didactic Station of the University of Agricultural Sciences and Veterinary Medicine Iași, Ezăreni farm (47°05'-47°10' northern latitude and 27°28'-27°33' east longitude). Structurally, the territory of Ezăreni farm is located entirely on an old plain unit, called the "Moldovian Plain", this being an extension of the "Russian Plain" on the territory of our country. In the area where the study was conducted, there is a boreal climate, with cold and frosty winters. Multiannual precipitation average in the Ezăreni farm area is 517.8 mm, and the average multiannual temperature is 9.7 ° C.

The soil was represented by a cambic chernozem, with a pH between 6.68 - 7.01 in the top layer soil, medium supplied with humus on the range 0-30 cm (2.40%). 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) (1.78%) and medium supplied with mobile P (26.00 ppm).

The natural vegetation is represented by grassy species and some forest-steppe shrubs, characteristic of the arid and isolated forest-steppe climate.

**In part II**, which contains 70% from the volume of the thesis (110 pages), are **presented the results of research on the behavior of smooth brome (*Bromus inermis*) and sainfoin (*Onobrychis viciifolia*) species in pure culture and simple mixtures in Jijia-Bahlui Depression 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 Ezăreni farm, within the Didactic Station of the University of Agricultural Sciences and Veterinary Medicine Iasi, in the spring of 2014, an experiment in which 2 factors were studied, namely: A- the system culture, with 5 ( $a_1$  - *Bromus inermis* 100%;  $a_2$  - *Bromus inermis* 75% + *Onobrychis viciifolia* 25%;  $a_3$  - *Bromus inermis* 50% + *Onobrychis viciifolia* 50%;  $a_4$  - *Bromus inermis* 25% + *Onobrychis viciifolia* 75%;  $a_5$  - *Onobrychis viciifolia* 100%;) and B-fertilization, with four graduations ( $b_1$ -nefertilizat,  $b_2$ -N<sub>50</sub>P<sub>50</sub>,  $b_3$ -N<sub>100</sub>P<sub>100</sub> și  $b_4$ -N<sub>150</sub>P<sub>150</sub>).

The experiment was based on the method of subdivided plots, type 5x4, with the dimensions of a plot of 3x6 m (18 mqs), and the harvested area of 10 mqs (2x5 m), the total area of the experient being 1140 mqs (30x38 m).

The biological material used was *Bromus inermis*, Doina variety, approved in 1995 and *Onobrychis viciifolia*, Anamaria variety, approved in 2010, varieties created at the Research - Development Station for Meadows - Vaslui.

The activities of the study were concretized by establishing the influence of the studied factors on the height of the plants; analysis of plant height dynamics; establishing the influence of the studied factors on the plant density; determining the share of species on botanical families; determination of dry matter production (DM); determination of forage content in PB (crude protein), in NDF (neutral detergent fiber), in ADF (acid detergent fiber); calculation of the relative quality of the feed (RFQ); determination of the RYT index (Relative Yield Total); determination of the CR index (Competition Rate).

All observations, measurements and analyzes performed were in accordance with the rules of experimental technique and standards in force. The data obtained were statistically interpreted by analyzing the variance and calculating the limit differences.

In general, the agricultural period 2013-2015 can be characterized as close to the multiannual average in terms of average monthly temperatures. Both during each agricultural year and during the vegetation periods, the average temperature was higher than the multiannual average by 1.4-1.5°C for the entire agricultural year and by 0.3-1.6°C during the vegetation periods.

The total amount of precipitation was higher than the multiannual average, but unevenly distributed, there were periods of drought in the fall of 2013 and 2014, and also a very dry period between May and September 2015.

**Chapter V presents the results of research on the influence of the grassland management system and fertilization on plant growth and development in *Bromus inermis* and *Onobrychis viciifolia* species, cultivated alone or in simple mixtures, in year I and II of vegetation.**

In the period 2013-2015, in both years of vegetation (I and II), three mowers were obtained, of which the first two were harvested for production, and the third was cleaning mowing;

At each of the harvested crops, for the height of the plants, the largest differences, statistically ensured, were obtained for the variants that included the species *Onobrychis viciifolia* and which have been fertilized with N<sub>100</sub>P<sub>100</sub> or N<sub>150</sub>P<sub>150</sub>;

Regardless of the fertilization variant or the cropping system used, climatic conditions (especially the amount of rainfall) had a high influence on plant growth and development.

**In chapter VI, the results of the research on the influence of the cultivation system and fertilization on the evolution of the structure of the plants in grassland, to the mixtures between the species *Bromus inermis* are presented. and *Onobrychis viciifolia* in the first and second years of vegetation.**

Regardless of the agricultural year, the cropping system had a negative influence on the number of shoots/m<sup>2</sup>, in the sense that as the share of the species *Bromus inermis* was smaller, a considerable decrease in the number of shoots/mq was observed;

In the first year of vegetation, compared to the initial percentage of species established by the experimental protocol, in the case of the culture system used, the general trend was to increase the coverage of the *Bromus inermis* species and decreasing the weight of the *Onobrychis viciifolia* species, and in the case of the fertilization factor the structure of the plants in the grassland was insignificantly influenced.

In the second year of vegetation, in the case of the culture system used, the same general tendency of increasing the coverage of the species *Bromus inermis* was manifested and a decrease in the coverage of the *Onobrychis viciifolia* species, and at the fertilization factor there was an increase in the share of *Bromus inermis* in the grassland composition. Nitrogen fertilization with increasing doses changed the share of mixed species, in the sense of stimulation *Bromus inermis*, due to the

decrease in the share of *Onobrychis viciifolia*.

**Chapter VII presents the results of research on the influence of cropping and fertilization system on biomass production and quality in *Bromus inermis* and *Onobrychis viciifolia* species, cultivated alone or in a mixture, in the first and second years of vegetation.**

Forage productions resulted in the 2014-2015 period were influenced by the species of the cultivated mixture, the quantities of mineral fertilizers administered, as well as by the climatic conditions of the year.

Analyzing the total yield obtained in two years of vegetation, it was found that the values recorded for the variant with *Bromus inermis* 100%, unfertilized, were 2.46-3.92 Mg·ha<sup>-1</sup> DM, and most of the differences compared to the control, in the variants studied were statistically ensured. The highest yields, of 8.91-10.08 t/ha DM, were recorded for the *Bromus inermis* 50% + *Onobrychis viciifolia* 50% mixture fertilized with N<sub>150</sub>P<sub>150</sub>, which is a doubling of production, compared to the control variant.

In the two years of study, the variant *Bromus inermis* 50% + *Onobrychis viciifolia* 50%, offered the highest yields, of 7.01-8.97 Mg·ha<sup>-1</sup> DM, with a statistically assured difference from the control, very significant.

In the variant with *Bromus inermis* 100% (control variant) yields of 3.63-5.27 Mg·ha<sup>-1</sup> DM were registered, while in the variant with *Onobrychis viciifolia* 100% yields of 6.89-8.49 Mg·ha<sup>-1</sup> DM were registered. Thus, the role of legumes in biomass formation was highlighted.

Analyzing the effect of fertilization on the total production of DM, in years I and II of vegetation, a distinctly significant influence of the higher doses of fertilizers used was observed (N<sub>100</sub>P<sub>100</sub> and N<sub>150</sub>P<sub>150</sub>). The highest productions, of 7.22-8.72 Mg·ha<sup>-1</sup> DM, were registered for the variant fertilized with N<sub>150</sub>P<sub>150</sub>, and the lowest for the non-fertilized control variant, of 4.48-6.65 Mg·ha<sup>-1</sup> DM.

In the second year of vegetation, at the second harvest, the production was negatively influenced by the climatic conditions specific to the agricultural year 2014-2015, especially by the lack of precipitation in the second part of the vegetation period.

The influence of the interaction between the species or mixture used and fertilization on the relative forage quality (RFQ) highlighted the fact that the highest RFQ value of 165 was recorded in the control variant (*Bromus inermis*

100% unfertilized). The lowest RFQ value of 83 was obtained in the variant only with *Onobrychis viciifolia* 100% fertilized with N<sub>150</sub>P<sub>150</sub>.

In the control variant, with *Bromus inermis* 100%, the highest RFQ value was obtained, of 137 (quality class 1 - very good quality feed), and the lowest RFQ value, of 101 (quality class 2 - good quality feed), was registered in the variant only with *Onobrychis viciifolia* 100%.

On average, the application of nitrogen and phosphorus fertilizers did not change the quality class of the feed obtained, in terms of its content in PB, the values obtained classifying the feed in quality class 2 (good quality feed).

The last **chapter, VIII**, presents the results of research **on the influence of cropping and fertilization on competitiveness in *Bromus inermis* and *Onobrychis viciifolia* species in the second year of vegetation.**

The results obtained showed that the interaction between the crop system used and fertilization on the interspecific relationships at the two crops in the second year of vegetation, showed that the species, *Bromus inermis* and *Onobrychis viciifolia*, occupy different ecological niches in the present study and also showed a relationship of mutual cooperation throughout the vegetation period.

*Onobrychis viciifolia* and *Bromus inermis* species may coexist in the early stages of vegetation, but the species *Onobrychis viciifolia* has a strong degree of competitiveness, exceeding the share of *Bromus inermis* to obtain the status of dominant species.

The two species, *Onobrychis viciifolia* and *Bromus inermis* may form simple mixtures, but the *Onobrychis viciifolia* species has a high degree of competitiveness, in conditions of non-fertilization, compared to the *Bromus inermis* species. That is why the mixtures and the fertilization method must be well substantiated.

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.