SUMMARY

Keywords: permanent grassland, harvesting phenophase, productivity, phytodiversity, PB (crude protein), cell walls (ADF and NDF), RFQ (relative forage quality)

Occupying an area of 4.8 million ha, meaning 33% of the country's agricultural area, grasslandss have been and continue to be a significant source for forage production, which also results from the specialized data. This great national wealth is required to be well managed, as the fodder from grasslandss is the cheapest source of forage.

Volume fodder is also produced on arable land, but these lands are increasingly required for the production of large quantities of cereals and technical plants, so that the intensification of production on grasslandss remains the most important way to produce them.

Scientific research in the field of pratology has a special role in ensuring the increase of forage production on grasslands. For this, studies of inventory and mapping of areas with grasslands are required in the permanent grasslands sector, simultaneously with the elaboration of technologies for their improvement and rational use.

It is desirable that in the future, the production of grasslands and forage, in general, to be more and more expressed in animal products, as milk, meat, wool, etc. This requires intensified research on the rational use of grasslands. Forage quality is defined in different ways, but is often poorly understood. This is a simple concept, but it involves a lot of complexity. Although important, forage quality often receives much less attention than it deserves.

The production of quality forage for a given situation requires knowing the factors that affect the quality of forage, then the exercise of management accordingly.

Many factors influence the rate of change in forage composition during the growing season, being correlated especially with the advanced stages of plant development and maturity.

Establishing changes in the chemical composition of fodder species in the main phenophases of the growing season can provide information on forage quality that can be used to increase animal performance and producers' profits. Better evaluation of the nutritional value of forage requires knowledge of its dynamics during the plant growth process. The stage of development is an essential factor that caused changes in the quality of forage, being influenced by the management of the grasslands.

The results of numerous researches, verified on large areas under production conditions, clearly prove that the level of forage production can currently be considerably high, applying the known technology. The use of fertilizers on grasslands, regardless of their nature, remains the safest measure to raise forage production and improve the quality of forage on grasslands. This had led to a large volume of research in this area, in the past as well as in the present.

The purpose of this thesis entitled *"Research on the value of use of the main species in some permanent grasslands"* was to highlight the influence of harvesting phenophase and fertilization with mineral or organic fertilizers on forage quality with important implications in obtaining superior quality forage, depending on the type of fertilizer and the size of the applied doses. The experiences initiated by us on the grasslands of *Festuca valesiaca* Schleich. ex Gaudin *and Dichanthium ischaemum* (L.) Roberty during 2018-2020 focused on productivity, biodiversity, but especially the quality of forage provided by these two types of grasslands in different development phases under different mineral and organic fertilization, but also the qualitative contribution brought by the main species from the vegetal cover of the two types of grasslands to the value of the forage.

The present thesis is intended to be primarily an attempt to combine the multitude of information provided by a vast literature consulted, on the topic addressed, with our own investigations conducted in organized experiments and in the laboratory.

It is the reason why I proposed to structure this study in two distinct parts: the general part or the documentary study and the special part or personal contributions.

The general part **(Chapters 1-3)** in total a number of 43 pages which represents 17.7% of the volume of the thesis and includes a selection from the literature that I had the opportunity to consult: general considerations on permanent grasslands, a brief history of research on the typology of permanent grasslands, their nutritional value on vegetation phenophases, influence of fertilization on productivity, nutritional value, biodiversity, and the characterization of the natural conditions in which we conducted the experiment.

Chapter 1 of the thesis refers to the multifunctional role of permanent grasslands, their classification and distribution worldwide and in Romania, as well as the characterization of the main grassland ecosystems in the Moldavian forest-steppe area.

Chapter 2 presents the history of research in our country and abroad in the field of permanent grasslands, regarding the phytodiversity of permanent grasslands on *Festuca valesiaca* Schleich. ex Gaudin and *Dichanthium ischaemum* (L.) Roberty, the nutritional value on developmental phenophases of the dominant species *Festuca valesiaca* and *Dichanthium ischaemum*, as well as studies on the improvement of these permanent grasslands by applying mineral and organic fertilizers in order to increase production potential, increase quality forage, as well as to establish the changes that take place at the level of the vegetal cover.

Part I of the thesis ends with chapter 3 which characterizes the natural conditions of the area where we conducted the experiments, namely Moldavian forest-steppe area, which specifies the geographical location, hydrographic network, climatic conditions, relief, soils and vegetation. The two experiences were placed in two different locations, experience I - was organized on a permanent grassland of *Festuca valesiaca* Schleich. ex Gaudin within the Ezăreni farm in Miroslava, Iaşi county, between the parallels 47°05'-47°10'N and 27°28'-27°33' E, and the second experience was organized on a permanent grassland of *Dichanthium ischaemum* (L.) Roberty, in Andrieşeni, Iaşi county, framed between the parallels 47°30'45,2"N and 27°15'42,0" E.

The second part of personal contributions (Chapters 4, 5, 6, 7 and final conclusions) has the largest share of the thesis, which totals 199 pages, with 35 tables and 28 original figures that summarize the results of research on the value use of the main species in some permanent grasslands in the Moldavian forest-steppe.

Chapter 4 presents in detail the purpose and objectives of the thesis, research material and methods, how to organize experiments with applied experimental variants, working technique, methods used in performing chemical analyzes for the obtained forage, statistical analysis of production and quality results based on analysis of variance and correlation method as well as the interpretation of vegetation data using the PC-ORD program. Also, in this chapter there is a brief presentation of the climatic conditions in the two different locations of the Moldavian forest-steppe area, where both experiences were organized, during 2018-2020.

The investigations made by us which are the subject of our study aimed to highlight the influence of the harvesting phenophase under different doses of mineral and organic fertilizers, during 2018-2020, on the use value of the main species in some permanent grasslands in Moldavian forest-steppe.

In order to achieve the pursued aim and objectives, in the spring of 2018, two bifactorial experiences were organized in the Moldavian forest-stepe, on *Festuca valesiaca* Schleich. ex Gaudin and *Dichanthium ischaemum* (L.) Roberty grasslands, situated in different locations according to the randomized block method, in three repetitions, the experimental factors being the following: factor A - harvesting phenophase, with 3 graduations: a_1 - harvested at plants height of 15-18 cm; a_2 - harvested at the ear formation (control); a_3 - harvested at full flowering and factor B - fertilization with 7 graduations: b_1 - unfertilized (control variant); b_2 - $N_{50}P_{50}$; b_3 - $N_{75}P_{75}$; b_4 - $N_{100}P_{100}$; b_5 - 10 t/ha of sheep manure applied annually, b_6 - 20 t/ha of sheep manure applied annually and b_7 - 30 t/ha of sheep manure applied at 2 years.

The main objectives and activities proposed for the research consisted in determining the floristic composition and the main phytocenological indicators on the grasslands of *Festuca valesiaca* Schleich. ex Gaudin and *Dichanthium ischaemum* (L.) Roberty :floristic structure and composition, as well as the analysis of the Shannon - Wiener diversity index (H'); determination of the quantitative value of the forage on development phenophases (amount of DM per unit area); the value of the elements that express the nutritional value of the forage and of the main species analyzed on different developmental phenophases - forage content in crude protein (PB), cell walls (ADF and NDF), calculation of the relative forage quality of the forage (RFQ) and statistic analysis of the obtained results.

All the results obtained regarding the elements of productivity, quality and biodiversity were analyzed respecting the standardized working methodology using the analysis of variance and the correlation method, as well as the PC-ORD program according to the considered parameter.

In general, the studied areas in the analyzed period, 2018-2020 can be characterized by a climate and vegetation typical to the Moldavian forest-steppe, with monthly and annual deviations from the multiannual average, with an uneven distribution of rainfall, which determines the same variations in the production of plant biomass.

Chapter 5 refers to the results obtained regarding the influence of the harvesting phenophase and fertilization on the phytodiversity of the permanent grasslands of *Festuca valesiaca* Schleich. ex Gaudin and *Dichanthium ischaemum* (L.) Roberty.

The harvesting phenophase, but especially the applied fertilization determined important changes regarding the structure and the floristic composition of the vegetal cover of the two types of grasslands, by favoring the valuable species from the fodder point of view.

The changes that appeared in the floristic composition of the vegetal cover of the *Festuca valesiaca* and *Dichanthium ischaemum* grasslands, as well as the variation of the number of species and of the Shannon - Wiener (H') diversity index, were largely influenced by the amount of mineral fertilizer (NP), the amount of sheep manure, but also the number of years in the experimental period.

Chapter 6 presents the synthesis of research results on the influence of harvesting phenophase and fertilization on the productivity of *Festuca valesiaca* Schleich. ex Gaudin and *Dichanthium ischaemum* (L.) Roberty permanent grasslands.

The harvesting phenophase and the applied fertilizers significantly influenced the average production in the study period 2018-2020, the level of productions obtained on the two types of grasslands being different depending on the type of fertilizers, in direct correlation with the climatic conditions of that year.

In all three years of experimentation, the dry matter productions obtained from the *Festuca valesiaca* grassland registered significant increases in relation to the harvesting phenophase and to the applied fertilization, the average productions in the study period 2018-2020 were between 2.36 t/ha DM in the unfertilized

variant and 5.29 t/ha DM in the variant fertilized with $N_{100}P_{100}$, where a production increase of 95.4% was registered compared to the control.

From the results obtained on the *Dichanthium ischaemum* grassland, it was found that their productivity can be greatly increased if the necessary improvement measures are applied. Thus, on this type of grassland, depending on the harvesting phenophase and the applied fertilization, production increases between 19.1% and 276.8% were registered.

Chapter 7 has the largest share of the thesis, with reference to the results of research on the influence of harvesting phenophase and fertilization on the quality of *Festuca valesiaca* Schleich. ex Gaudin and *Dichanthium ischaemum* (L.) Roberty permanent grasslands.

The results obtained in the two types of studied grasslands show that the stage of development is an essential factor that determines changes in the quality of forage, but also of the component species with a certain share in the vegetation cover, the chemical composition being influenced by the harvesting phenophase, the type of fertilizer and the applied doses.

According to the study, the qualitative value of the forage proved to be the highest during the vegetative growth, when the harvesting was carried out at the height of the plants of the dominant species of 15-18 cm, the plants having a high protein content and a low cell wall content.

The doctoral thesis ends with conclusions, recommendations and the list of consulted bibliographic titles.