SUMMARY

of the doctoral thesis entitled:

COMPARATIVE RESEARCH ON THE BIOLOGICAL VALUE OF MILK FROM DIFFERENT SPECIES OF DOMESTIC ANIMALS AND THE INFLUENCING FACTORS

PhD-student: **DĂNILĂ Corina Maria**

Scientific coordinator: **Professor, PhD VIDU Livia**

KEYWORDS: milk, species, chemical composition, biological value

The main purpose of the paper is to determine the comparative chemical composition of milk from domestic animal species of economic interest (raised on cow, goat, sheep and buffalo farms) in Romania. To achieve this goal, scientific results published by other authors were analyzed and own research was done by traveling to farms and analyzing milk samples from cow, goat, sheep and buffalo farms.

Secondary objectives:

- carrying out a comparative bibliographic study on milk production from a quantitative point of view, according to different influencing factors; dynamics of livestock of domestic animals, cows, goats, sheep and buffaloes worldwide and nationally;
- dynamics of milk production and dairy products at national and global level;
- carrying out a bibliographic study on the physical, chemical and organoleptic characteristics of the milk from the animal species studied;
- carrying out a marketing study regarding the valorization of milk from different species of economic interest.

The thesis was structured in two sections, in accordance with the drafting rules in force. The first part consists of a bibliographic study and consists of two chapters, and the second part, seven research, comprising six chapters.

Section I - The bibliographic study presented in the first part is structured in two chapters.

Chapter I presents the dynamics of cattle, goat, sheep and buffalo herds, both at global world level, and national.

In subsection 1.1 it refers to raising farm animals worldwide, of milk production and dairy products, because these animals provide raw materials (milk, meat) for various food products.

Worldwide in 2021, the highest growth rate of the total number of cattle recorded (over 1,529.2 million heads). Also in 2021, the highest growth rate of the goat population was recorded (1,111,279 million heads), in sheep there were over 1,284.8 million heads and over 251,688 million buffalo heads.

In Europe, the main cattle-breeding country is France - 17,330 thousand heads in 2021. Spain is the country with the most sheep herds -15,081 thousand heads, Italy is the country with the most buffalo herds - 409,410 thousand heads, and Greece is the country with the largest herds of goats – 2,844 thousand heads.

In subsection 1.2 the dynamics of cattle, goat, sheep and buffalo herds, milk production and dairy products at the national level is presented.

In order to highlight the situation in Romania, data from the National Institute of Statistics (INS) for the periods 2017-2021 were processed. In recent years, there has generally been an upward evolution of the total effectives. Cattle numbers increased, reaching more than 1,826,845 heads in 2021, also more than 1,492,544 goats, 9,981,859 sheep and 17,950 buffaloes were registered.

A comparative analysis regarding the distribution of livestock by counties, in 2021, shows that the most heads of cattle were registered in the county of Suceava with 121,433 heads and Botoşani with 85,214 heads, located in the North-East region of Romania. The counties with the largest herds of goats were Telorman county - 95,469 heads and Tulcea county – 77,972 heads. The county with the largest flocks of sheep was Timiş with 624,923 heads and Sibiu county with 548,010 heads. The counties with the largest cattle herds are in Cluj county – 2,547 heads and Maramureş – 1,890 heads

Regarding the dynamics of milk production, milkof cows produced recorded in the North-West region of the country, over 657,293,052 liters of milk. The most significant goat milk production was produced in the South-East region of the country (55,649,069 liters of milk), the highest sheep milk production was 8,64,263 liters of milk in the Bucharest-Ilfov region and the production the largest amount of buffalo milk was recorded in the North-West region of the country – 10,825,122 liters of milk.

Regarding the assortment of dairy products in Romania, more cow's milk preparations are obtained in the North-Eastern region of Romania, compared to the regions in the rest of the country. Cheeses are the category of products widely consumed by the population of South-East and South-West Romania, especially from goat's milk. In the development region of the North-West of the country, the most assortments of dairy products obtained from sheep's milk can be found. Dairy products from buffalo milk are found in rather small numbers on the market. They are produced in the North-West region of the country.

Chapter II present the physical chemical and organoleptic properties of milk from the main species of economic interest.In this chapter, the chemical properties of milk are reproduced, which differ according to several influencing factors, namely: proteins rich in essential amino acids, mineral substances, vitamins, enzymes and carbohydrates.

Section II - of the thesis refers to own research. It is structured in seven chapters.

Chapter III. This chapter presents the aim and objectives of the work, the researched material and the work methodology. The proposed goal was to highlight the growing conditions with direct influence on the nutritional and biological value of milk from cows, sheep, goats and buffalo farms. To carry out the experiment, 4 batches of animals were

constituted, represented by cows from the Holstein breed, goats from the Saanen breed, sheep from the Țurcană breed, and buffaloes from the Romanian Buffalo breed. The research was carried out over three years (2020-2023), in four farms: the breeding farm for Holstein dairy cows, with a herd of 1000 cattle, in Prahova county; holding for raising sheep of the Țurcană breed, with a herd of 500 heads, in Călărași county; the Saanen dairy goat breeding farm, with a herd of 454, in Prahova county; the milk buffalo breeding farm within S.C.D.C.B. Șercaia, with a herd of 450 heads, in Brașov county. Travels were made to the farms taken in the study, it involved the collection of several data on the technology of animal husbandry from the experimental lots, data were collected from the zootechnical records and milk samples were collected from the four seasons.

Chapter IV. In this chapter, the morpho-productive characteristics of the breeds studied, technological aspects of maintenance and feeding are described.

Within the experimental farm I - breeding farm for Holstein dairy cows, the morphological characteristics of the breed are: at birth, the weight of calves is between 38-40 kg, at maturity, the weight is between 675-680 kg, bulls can reach a weight of 1,180 kilograms. This breed is exploited mainly for milk production. Traditional and conventional dairy products are obtained from their milk - cheeses, butter, cream, sour dairy products including different types of yogurt, whipped milk, acidophilic milk and kefir. In the experimental farm I (breeding of dairy cows) – the maintenance technology is linked stall with paddock for movement. Technological works are fully mechanized. Cow feeding is an important aspect in operation, both to ensure vital functions and to reach the genetic potential in milk production. Alfalfa hay, corn silage, semi-hay, mixtures of concentrates, of which bran and meal are included in the ration.

In experimental farm II (breeding sheep from the Țurcană breed) - Țurcană Albă is a local breed, the most common. Adult females reach 55 kilograms, and rams almost 80 kilograms. Milk lambs at the age of ten days, reach 15-16 kg, at 45 days gaining weight up to 270 g daily. Lambs weaned at 3 months and intensively fattened reach 46 kg at 7 months of age. The weight of lambs at calving is 3 - 4 kg, at 90 days they weigh 20 - 25 kg, at 150 days approximately 30 kg. Maintenance technology is in the stable, in the saivan in the winter, and in the summer on the pasture during the day and in the shelters at night with access to the paddock. The feeding differs from one season to another: hay and concentrated fodder are administered in the winter and green grass through grazing in the summer.

In experimental farm III (breeding goats of the Saanen breed). The Saanen breed originates from Switzerland, being among the most productive milk breeds. Males reach heights between 80 - 95 cm, and females 75 - 85 cm. Prolificity is very good, approximately 180 - 200 kids can be born per 100 goats annually. This breed can be crossed with the Carpathian breed to obtain improved results in milk production. Traditional and conventional products are obtained from goat's milk - fresh cheese, curd, cheese. The maintenance of the goats is done in a closed shelter, compartmentalized in the stable, with individual farrowing boxes. Feeding differs from one season to another, in winter concentrates are given in granulated form and in summer green mass through grazing, concentrate feed supplement, and alfalfa hay.

In experimental farm IV (breeding of Romanian buffalo female buffaloes). The Romanian Buffalo breed is the only buffalo breed approved in our country. The body weight

reaches 490-650 kg and the waist around 138 cm. The height at the croup is 138.95 cm, the depth of the chest is 72.52 cm and the length of the trunk is 140.05 cm. This breed feeds on: green mass, hay, corn silage, concentrated fodder (wheat, corn, barley). Maintenance technology is stable in closed shelter, in linked system. It presents outbuildings: maternity, dairy, artificial insemination point.

Chapter V. Refers to the primary chemical composition of milk from cows, goats, sheep and buffaloes.

The analyzes were carried out at the Laboratory for the quality of fodder and products of animal origin within the National Research Development Institute for Animal Biology and Nutrition in Baloteşti. The data were statistically processed, compared and interpreted in accordance with the research methodology. Analyzing the primary chemical composition for milk samples from the four animal species, it was found that it varied by species, season, nutrition and diet. It was found that in the colder seasons the protein and fat content is slightly higher compared to the spring and summer seasons. It is stated that the highest dry matter content is found in goat and sheep milk compared to the other two species. Sheep's milk has a higher protein content compared to goat's milk. In the percentage, relative to each season, a species difference was determined in the spring season, between the averages determined for buffalo and cow milk samples. For ash content the highest average ash content was determined in cow's milk samples, compared to goat's milk - for which the lowest percentage of ash was determined.

Chapter VI. It refers to comparative research on the fatty acid content of milk from species of economic interest. Among the most important acids determined were caproic acid C6:0, caprylic acid C8:0, capric acid C10:0, searic acid C18:0. To the values determined depending on the season, it was observed that the highest content of caproic acid C6:0 was in summer for cow and goat milk, and for that from buffaloes in autumn. For sheep's milk, the values are very close in the summer, autumn and winter seasons and slightly lower in the spring. The lowest content of caprylic acid C8:0 was determined in cow's milk, compared to goat's milk, where the highest average was determined. The lowest content of capric acid C10:0 was determined in buffalo milk, less than in cow and goat milk. Regarding stearic acid C18:0, the highest average was determined for buffalo milk. It was observed that for buffalo milk there are very small variations in saturated fatty acids (SFA), with a slight decrease in summer seasons and winter.

Regarding the content in monounsaturated fatty acids (MUFA) for the analyzed species it was observed that a superior performance was determined for buffalo milk, compared to sheep milk, for which the lowest performance was determined. Sheep's milk has the richest content in polyunsaturated fatty acids (PUFA).

Chapter VII. It refers to comparative research on the mineral content of cow, buffalo, sheep, goat milk. The largest species difference in calcium content was 0.5% between buffalo and sheep milk. The lowest content of iron in milk was in the winter season, in all species analyzed. The highest iron content was determined for goat milk samples. Regarding the content in vitamins were determined: incow's milk showed the greatest seasonal variations in the amount of alpha-tocopherol. The highest amount of delta-tocopherol was in sheep's milk, regardless of the season.

Chapter VIII. It refers tothe marketing study regarding the valorization of milk from different species of economic interest. In this chaptera questionnaire based on the collection of information on consumer preferences for milk and milk products was developed. The information was obtained through a quantitative survey through a questionnaire containing 19 questions. We highlighted the following: almost half of the people surveyed consume milk daily, and 30.8% of them consume it at least twice a week; most, 51.3%, buy milk from the store, and 14.2% directly from producers; regarding the range of dairy products, cheese is in the top of preferences, for 33.2% of the respondents, followed by yogurt 21.2%; 67.1% of study participants prefer to consume milk and dairy products obtained from cow's milk.