

SUMMARY

of the doctoral thesis entitled:

CONTRIBUTIONS TO THE STUDY OF MILK PRODUCTION AND REPRODUCTIVE PARAMETERS AT HOLSTEIN BREED COWS IN ROMANIA

PhD-student: ENEA Dănuț Nicolae

Scientific coordinator: Prof. PhD VIDU Livia

KEYWORDS: Holstein, milk, production, reproduction, genomics, exterior traits.

The dairy cow breeding sector is a representative one in Romanian animal husbandry. Therefore, this thesis addresses a topic of economic importance, which enjoys high interest and analyzes the current level of Holstein breed in our country.

The present thesis is structured in two parts: the first one presents a bibliographic study of the chosen topic, and the second, our own research.

PART I of the thesis begins with “THE CURRENT STATE OF KNOWLEDGE REGARDING THE PRODUCTIVE PERFORMANCE OF THE HOLSTEIN BREED”, this being the first chapter of the thesis. It presents data on the creation of the breed and its performance worldwide. It is presented how this breed arrived on other continents, what directions of improvement followed and what are the prospects in various states. This chapter also provides information on the number of breeding members of the Holstein breed registered in different breed registers (over 8,000 in the UK, over 22,000 in the Netherlands, over 13,000 in Italy, over 9,000 in Hungary), as well as information on the average productions achieved (9,933 kg in Germany, 10,775 kg in the Netherlands, 12,558 kg in the US, 10,242 kg in Italy) in 2021. The Holstein breed burst onto the Romanian territory, the breed societies accredited to draw up and maintain the breed register and the performance of the breed at national level (both production and breeding) are also presented.

The second chapter is called “STUDY ON THE ASSESSMENT OF BODY CONFORMATION IN HOLSTEIN CATTLE” and it is divided in two subsections. The first is called *The Holstein Breed Body Conformation Worldwide* and shows how Holstein breed animals have undergone changes in outdoor characters in different states worldwide. Numerous breeding works aimed at improving their body development have been carried out in the US and Canada over the years, and breeders believe this will also increase production capacity. However, the results were not as expected, proving that the lifespans of animals with a smaller size appear to be longer (so they have a longer productive life) and they have lower maintenance costs. Similar conclusions were drawn from another study, with the mention that cows with a higher final score following the cow exterior assessment had these advantages (the emphasis being placed on the conformation of the udder, limbs, chest and abdomen). *The Body Conformation of the Holstein Breed at a European Level* is the second subsection. It provides data on how a uniformization of the breed has and continues to take place at European level (of course, each state can determine its own direction of improvement of conformation). There are a number of characters that are appreciated in all European countries, such as: stature, croup angle, chest width, etc., when it comes to exterior appreciation in Holstein cows. We note in 2015 correlations of 0.93 at the rump angle, 0.90 at the stature, 0.93 at the depth of the chest, 0.94 at the length of the teats in terms of how the external features are analyzed by Interbull.

“THE PURPOSE and OBJECTIVES OF the RESEARCH” is the first chapter of the second part of our thesis. It presents the objectives of our study: to analyze the external features of the Holstein cows in Romania, to

observe their productive and reproductive level, the qualitative parameters of the milk produced by the Holstein cows and the results of the genomic tests carried out in our country. In order to achieve the proposed results, the data of 15 Holstein cow farms were analyzed, farms located in three different geographical points: east, south and west.

The Chapter IV title is “RESEARCHS ON THE CORRELATION BETWEEN EXTERIOR TRAITS AND MILK PRODUCTION IN HOLSTEIN COWS IN ROMANIA”. It presents the advantages of assessing external features, how to make them, but also how to use the the acquired data to improve milk production. In Romania, a number of 22 features are appreciated, grouped into 5 different groups, each group having a certain percentage of the final grade. In this study, a number of 3682 primiparous were estimated, most of the characteristics falling within the optimum of the breed (stature, rump angle, teat length, udder tilt) some being below the lower limit (udder texture, rear udder height, rear udder width).

“RESEARCHS ON THE QUANTITATIVE CHARACTERISTICS OF MILK PRODUCTION IN HOLSTEIN BREED COWS, DEPENDING ON DIFFERENT INFLUENCING FACTORS” is the title of the fifth chapter. In this chapter we are presenting the factors influencing milk production and their action on Holstein breed cows. The amount of milk produced per standard lactation, respectively per total lactation, as well as the duration of lactation were observed. In the southern area of the country we record the highest average of regional milk production in 2020 – 2021, 10,203 kg per standard lactation, the same trend being found in the eastern area, with an average of 10,435 kg. In the western area, we see an annual increase, the average maximum production recorded being thus 10,177 kg in the last year of study. Following the analysis of the significance of the differences between the environments, it was found that there are significant differences between the regions, both in terms of standard milk production per total lactation and the duration of lactation. Regarding fat and protein production, homogeneous samples were identified in the Western area and significant differences in the Southern and Eastern areas.

The next chapter is entitled “COMPARATIVE RESEARCH ON MILK QUALITY IN HOLSTEIN BREED COWS, DEPENDING ON DIFFERENT INFLUENCING FACTORS”. It presents the main qualitative parameters of milk (percentage of fat, protein, lactose, number of somatic cells, urea level in milk) and how they are correlated with each other. The results indicate that there are significant differences between the sample averages in both fat and protein percentage. Regarding the number of somatic cells in milk, it was found that there are farms with normal values at this parameter, but also farms with worrying values. Negative correlations were established between the percentage of lactose in milk and the number of somatic cells (-0.47 in the south, -0.34 in the west and -0.47 in the east). Between the percentage of milk fat and the level of milk urea, the correlations determined are antagonistic (-0.40 in the south, 0.35 in the east and -0.04 in the west), and between the percentage of protein and the level of milk urea, moderate positive correlations have been determined.

The next chapter (VII) is entitled “COMPARATIVE RESEARCH REGARDING REPRODUCTION PARAMETERS IN HOLSTEIN COWS, DEPENDING ON DIFFERENT INFLUENCING FACTORS”. This chapter presents the dynamics of the main reproduction parameters that were analyzed in the studied farms. We reflect on the dynamics of age at first calving, calving – interval, number of inseminations per gestation, duration of gestation and service – period. We identified a high variability in the age of the first calving, but a decrease in the value of this parameter in all areas during the study period. A homogeneity of western samples was found for the interval between calving, significant differences being observed in the eastern and southern areas. The number of inseminations per gestation shows satisfactory values in the case of the studied farms, approximately 2 inseminations being required for one gestation. Negative correlations were established between milk urea level and CI (-0.79, -0.17 and -0.55), between MUL (milk urea level) and No. IA. (-0.97 and -0.63), MUL and SP (-0.58 and -0.51), MUL and GL (-0.44 and -0.97), respectively.

CHAPTER VIII is called “RESULTS RECEIVED FROM GENOMIC TESTING OF THE HOLSTEIN BREED IN ROMANIA”. This chapter presents the history of genomic testing of the cattle, the advantages they offer and the results obtained in Romanian farms regarding these tests. The animals tested in our country recorded good results, the values of the most important indices being found in the international average. Potential directions

for improvement (especially health and reproduction) were also identified on this occasion. Correlations were also determined between the values obtained from genomic testing and the productions made by animals in order to verify the predictability of these tests, the results being positives.

Our thesis concludes with a series of conclusions and recommendations. They are intended to present, in a comprehensive way, the main results obtained following the preparation of this paper and to provide support to Holstein dairy cow breeders.