

ABSTRACT

”Contributions to improving the management of brown breeding in the north - east area of the country”

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The importance of raising and exploiting cattles in the national agricultural economy can be highlighted by aspects such as:

- Growth in any region through appropriate technologies, due to the specificity of the digestive system (ruminants);
- The effective utilization of the vegetative mass obtained both on natural meadows and from the culture of field plants.
- Obtaining high productions of milk and meat, depending on the specifics of each breed and appropriate growing and exploitation conditions.

For these reasons, cattle occupy an important place in the total number of livestock raised and exploited globally, with a percentage of approximately 35% of global agricultural production.

The current situation in the breeding and exploitation of cattle as well as the continuous trends to increase productions have the following in mind:

- the production potential of the biological material;
- the ability to improve the biological material;
- the adoption of more efficient growth and exploitation technologies;
- specialization and concentration of productions;
- production valorization methods;
- increasing the economic efficiency of productions.

In this context, the research carried out in this work also falls into place, through which we aimed to contribute to the knowledge of the current stage of breeding and exploitation of the Schwyz breed the N-E area of Romania.

The aim of the research was to assess the morpho-productive potential, the growing conditions of the Schwyz cattle for milk production, in holdings of different capacities, from the N-E area of Romania, being studied topics such as the breeding cattles in the North East region, the study of technologies exploitation of Schwyz cattle in farms with different constructive types of shelters, the study of some morphological and productive characters.

The preparation of the doctoral thesis is based on the results of own research carried out between 2015 and 2018 and is structured in two parts, 8 chapters and contains 215 pages, 77 tables, 53 figures and 189 bibliographic titles.

Part I contains the bibliographic study regarding the situation of breeding on a global, european and national level, as well as the systems of raising and exploiting of the Schwyz cattle, part II includes our own research, structured in 6 chapters.

Considering that the Brown breed has a share of over 33% in the breed structure of cattle raised in private holdings in Romania, we considered it necessary and up-to-date to carry out some studies on the productive level, the current state of improvement of the populations, the technologies of exploitation practiced but also of existing constructive types in the North-East region of Romania.

The experimental researches were carried out between 2015 and 2018, the premise being the need to know the phenotypic characteristics of the taurine populations, the need to know the technologies of growth and exploitation and the socio-economic conditions where the animals are exploited.

In order to obtain an overview of the research of this doctoral thesis, the following research objectives were established:

- knowledge of the natural environment and the microclimate where the research was carried out;
- analysis of milk production performance obtained in the studied farms;
- study on the parameters related to reproductive activity;
- research on the quality parameters of milk;
- research on the morphological characteristics of the cattle herds from the studied farms;
- analysis of the state of health and the incidence of the main reproductive diseases;
- prospects for the exploitation of cattle herds in the North East region of Romania.

In order to achieve the objectives, the main activities carried out during the development of this doctoral thesis were:

- Analysis of the geo-climatic and socio-economic conditions where the research was carried out, through:
 - ✓ Study of environmental conditions and microclimate;
 - ✓ Analysis of the agricultural potential;
 - ✓ Study of the evolution of the cattle herds;
- Study of exploitation technologies and existing construction types
 - ✓ Growth and exploitation technologies;
 - ✓ Administered nutrition;
 - ✓ Existing constructive types,
 - ✓ Technical and material equipment.
- Study of morphological characteristics (in lactation I, II, III and above):
 - ✓ Body mass, in kg;
 - ✓ Body length, in cm;
 - ✓ Height at the withers, in cm;
 - ✓ Height at the croup, in cm;
 - ✓ Chest circumference, in cm;
 - ✓ Chest depth, in cm.
- Study of the main phenotypic characteristics regarding milk production (on LN and LT):
 - ✓ Duration of lactation (days);
 - ✓ Quantity of milk (kg);
 - ✓ Fat content (%);
 - ✓ Protein content (%).
- Study of the main reproductive indices
 - ✓ Age of first calving (days);
 - ✓ The interval between calvings (days);
 - ✓ Breast rest (days);
 - ✓ Birth rate (%).
- The effect of some factors on milk production at primiparous:
 - ✓ Age of first calving;
 - ✓ Effect of calving season and month;

In these farms, the bull populations are of the Brown breed exploited for milk production. The farms own both the cows in production and the related youth, each with the main objective of obtaining milk production, in quantity and quality under conditions of maximum efficiency.

The researches were carried out according to the plan and the proposed theme, in the period 2016-2020, carrying out numerous and in-depth researches, the data obtained being processed statistically and following the results obtained, a series of conclusions were drawn up regarding the existing technologies, with increasing applications of the Schwyz cattle for milk production.

The motivation of the topic addressed, in the framework of the doctoral thesis entitled "Contributions to the improvement of the management of the exploitation of Schwyz cattle in the north-eastern part of the country", is that the well-being of animals in zootechnical holdings is directly conditioned by genetic factors, the administered nutrition, respectively the growth system. Taking into account the complexity of the topic addressed, it was necessary to develop a general research plan.

Thus, for the proper implementation of the experimental protocol, it was necessary, first of all, to research the technologies applied in the five zootechnical holdings taken into study, namely:

- ❖ Secuieni Agricultural Research and Development Station, Neamț county;
- ❖ Private holdings in the area of Suceava county;
- ❖ Private holdings in the area of Botoșani County;

The second stage in the development of the research activity was represented by the recording and analysis of the productive performances of the cows, both qualitatively and quantitatively.

Also, another important point of research was both studying and analyzing reproductive activities.

Finally, the data obtained from each researched farm were interpreted and processed from a statistical point of view.

According to the data provided by ANZ, at the present time, in the North East region, there is the following distribution within small and medium livestock farms in terms of the number of dairy cows of the Schwyz breed:

- 88.7% of holdings own an animal;
- 9.7% of holdings have two animals each;
- 1.35% of holdings own 3 animals each;
- 0.09% of holdings own five or more animals.

Regarding the variability of the morphoproductive, reproductive and genetic parameters of the Schwyz herds within the Secuieni - Neamț Agricultural Research and Development Station, we can state that following the studies carried out on the physical development the obtained results indicate that for the parameter height at the withers, the studied animals ($n=20$) recorded an average value of 74.35 ± 1.04 cm at birth, the minimum being 68 cm and the maximum value reaching at 81 cm. Measurements taken at 18 months indicate that the mean height at the withers was 118.95 ± 0.82 cm with a range of 110 cm to 126 cm.

Another parameter analyzed was chest width, for which at birth, the average obtained on the analyzed population was 18.25 ± 0.39 cm, the minimum being 15 cm and the maximum value 21 cm. In the measurements made at 12 months, the limits of variation were between 24 cm and 43 cm, the calculated average value being 32.40 ± 1.21 cm. For the last period, at the age of 18 months, an average value of 38.55 cm was obtained and a coefficient of variation value of 12.97%, a value that reflects an average homogeneity within the analyzed batch.

A last parameter analyzed in terms of body development was represented by body weight, for which the average at calving was 29.95 ± 0.31 kg, the minimum being 27 kg and the maximum reaching 32 kg. The value of the coefficient of variation was 4.66%, which indicates a very good homogeneity within the analyzed batch. At the age of 6 months, the body weight of the analyzed products was between 200 kg and 289 kg, the average being 229.85 kg. The character studied in this case presented an average

homogeneity, the value of the coefficient of variation being 12.53%. After 12 months, an average weight of 299.85 ± 6.44 kg was reached, the limits for this age being between 270 kg and 359 kg. At the weighing performed at the age of 18 months, an average value of 359.85 ± 6.44 kg was obtained, the minimum being 330 kg and the maximum value 419 kg. The studied character presented a very good homogeneity, the value of the coefficient of variation being 8.00%.

Results regarding the body development, on the lactations of the population of Schwyz cattle from the Secuieni Agricultural Research and Development Station indicated that for the period of the three lactations, the body weight of the animals, an index for which at the first lactation an average of 533 was recorded, 35 ± 4.98 kg with variation limits between 499 kg and 570 kg. The value of the coefficient of variation was 4.18%; a value that gives the population a very good homogeneity. In the second lactation, the average value for the weight of the analyzed animals was 546.38 kg, the standard deviation of the average was 4.90 kg and the standard deviation was 21.90 kg. The studied character presented a very good homogeneity, the coefficient of variation being at a level of 4.01%. For the third lactation, the average was 595.20 ± 4.87 kg, the standard deviation was 21.77 kg and the coefficient of variation was only 3.66%. Regarding the limits of variation, the analyzed animals fell within values between 559 kg and 630 kg.

With regard to the assessment of the body development and conformation of the constitution in the population of Schwyz cattle from the Secuieni Agricultural Research and Development Station, the recorded results indicated that both the body weight and the dimensions that reflect the body format record average values that describe a short, medium type of wide but with a relatively long length, being characteristic of the morphological type with main milk skills.

Regarding the average value for this characteristic, in the analyzed population, it was 527.29 ± 3.62 kg, the limits being between 426 kg and 570 kg. Regarding the studied character, it can be observed that the batch is much more homogeneous, the value of the coefficient of variation being 4.60%. Therefore, in the studied population there were 11.10% cows weighing between 426 kg and 518 kg; 84.46% had a weight between 518 kg and 541 kg and only 4.4% recorded weight values in the first lactation between 541.01 kg and 564 kg.

The average values and the variability of the production indices per lactation in the population of Brown cattle from the Secuieni Agricultural Research and Development Station show the fact that the duration of total lactation over successive lactations can be seen that the first lactation is also the longest, 395.65 days, recording a slight downward trend until the fourth lactation (357.56 days). Regarding the average quantitative production of milk per total lactation, a value of 6288.98 kg was recorded in the first phase, having an ascending phase until the third lactation (7759.36 kg), also observing a pronounced variability of character, with slight decreasing tendencies in the fourth lactation. Regarding the percentage of protein in the total lactation, as in the case of the percentage of fat, it can be observed that the highest level was found in the first lactation, 3.57%, the limits of variation being between 3.34% and 4.10%; being followed by a slight decrease in the other lactations. The amount of protein per total lactation recorded the highest value in the fourth lactation, namely 287.91 kg, the limits of variation being between 234.22 kg and 356.53 kg.

The body measurements carried out with the aim of knowing the general and overall development of young Schwyz from the area of Suceava county were represented by the height at the withers, the oblique length of the trunk, the length of the rump at the ischials and the body mass. Regarding the measurements performed on the youth of the Brown race distributed in the area of Suceava county, the following average values for the main body measurements were highlighted; the height at the withers at

birth ($n = 16$) recorded an average value of 76.31 ± 0.98 cm, the limits of variation being between 69 cm and 84 cm.

Regarding body weight, the average value at birth was 31.06 ± 0.23 kg, with the limits of variation being between 28.6 kg and 34 kg. At the age of 18 months, the mean weight was 367.25 ± 11.43 kg with a range between 297 kg and 425 kg. The standard deviation was 39.59 and the value of the coefficient of variation was 11.30%, which gives the population an average homogeneity.

The results regarding body development, during lactation in Schwyz cattle from the area of Suceava county, the average value of the body weight of the entire population during the first lactation was 505.98 ± 7.01 kg with variation limits between 460 kg and 601 kg. Although there were differences between the Schwyz cattle from the analyzed farms, the value of the coefficient of variation at this period was 8.59%, a value that gives the studied population a very good homogeneity. For the second lactation, the limits of variation were between 479 kg and 627 kg, the average being in this case 558.46 ± 15.97 kg and the studied character being one that presented an average homogeneity, the value of the coefficient of variation being of 10.31%. In the taurine herd in the third lactation, the average value in terms of body weight was 601.00 ± 11.85 kg and the standard deviation recorded a value of 42.74 kg.

The average values and the variability of the production indices per lactation in the population of Schwyz cattle from the area of Suceava county, for the duration of the total lactation, reveal the fact that the first lactation was the longest, namely, of 397.79 ± 16.40 days, being followed by lactation the III where the duration was 372.01 ± 24.62 days. The lowest value in terms of the duration of total lactation was recorded in the second lactation where the average was 339.18 ± 14.31 days. As for the values of the variance of the standard deviation and those of the coefficient of variation, they were very high, a fact that gives the analyzed population a very heterogeneous character.

For the fat content, the highest value was found in the first lactation, namely $4.05 \pm 0.04\%$, followed by the average content recorded in the sixth lactation, where the average value was $3.86 \pm 0.02\%$. Regarding the milk protein content, the highest value was found in the first lactation, namely $3.76 \pm 0.04\%$, followed by the content found in the second lactation, namely $3.64 \pm 0.05\%$ and from the one in the third lactation where the average was $3.63 \pm 0.08\%$. Regarding normal milk production during normal lactation depending on the sequence of lactations, the average values were between 2985.56 ± 101.25 kg (at lactation I) and 3394.14 ± 260.91 kg at lactation V, value which also represents the maximum lactation from the six lactations analyzed.

The graphic analysis of fat content variability highlights the fact that in the population of Schwyz cattle from the area of Suceava county there are 44.82% plus variants with a fat level higher than 4.07%, while among the individuals of the population that present a fat between 3.31% and 4.06% are in the proportion of 53.07%; the difference up to 100% being represented by the 2 minus variants that have a fat content of less than 3.3%.

The results regarding the physical development of the young Schwyz cattle from the area of Botoșani county regarding the physical development recorded average values for the height at the withers of 71.97 ± 0.76 cm at birth, the minimum value being 64 cm and the maximum reaching a level of 79 cm. For body weight, immediately after calving, no very large differences were recorded between the farms analyzed; therefore the limits of variation were between 29 kg and 34 kg, the average being 31.40 ± 0.25 kg. Six months after calving, the average value was 205.65 ± 8.91 kg, the variability of this character being particularly pronounced, the value of the standard deviation reaching 55.63 kg and that of the coefficient of variation at 27.05%, a fact that prints population a very heterogeneous character. At 12 months after calving, the average value was 277.38 ± 7.02 kg and at 18 months after calving, an average value of

361.61±8.26 kg was reached, with limits between 274.57 kg and 436.22 kg and with a standard deviation value of 51.60 kg.

The results regarding the body development during the lactations of the Schwyz cattle from the area of Botoșani county, in terms of body weight, during successive lactations, average values of 498.38±16.38 kg and 530.69±19.70 kg were recorded for the second lactation population.

For those in the third lactation, the limits of variation were between 400 kg and 698 kg, the average value being 596.41±16.24 kg. The data on airworthiness indicate a very high level, the value of the standard deviation being 79.57 kg and that of the coefficient of variation of 13.34%.

The average values and the variability of lactation production indices in the population of Schwyz cattle from the area of Botoșani county regarding the duration of the total lactation recorded values between 367.17±13.63 days and 318.28±13.23 days. The highest value was found in the first lactation and the lowest in the second lactation. The data on the variation values were very high values ranging between 109.13 days and 165.28. The data on the amount of milk (kg) obtained in successive lactations in the Schwyz cattle from Botoșani county indicate average values of 2976.37±215.67 kg in the first lactation, of 2779.13±117.46 kg in the first lactation second, 3105.05±158.95 kg in the third lactation, 3077.33±162.61 kg in the fourth lactation, 3443.62±181.60 kg in the fifth lactation and 3096.64±56.31 kg in the 6th lactation.

Regarding the data regarding the fat content (%) of milk in the total lactation, the highest value was found in the first lactation, namely 3.91±0.03%, and the lowest content was in the second lactation -a, namely 3.57±0.04%. The data regarding the milk protein content obtained in the total lactation indicate average values between 3.32±0.04% value obtained in the second lactation and the third lactation and 3.41±0.02% average value obtained in the fourth lactation.

Regarding the reproductive characteristics of the Brown breed exploited at the Secuieni Agricultural Research and Development Station, the age at first calving was 871.22 days, with limits between 673 and 983 days. These average values demonstrate that the Brown population studied in this area is characterized by a good precocity, if we consider the averages for Moldova and the country for this breed, which were higher in 2009.

From the data analysis, we note that breast rest (RM), on successive lactations, was located between 66.1 days (7th lactation) and 71.4 days (Vth lactation), with an average of 67.8 days per productive life. The average value obtained is good and falls within the data from the specialized literature, but there were also extreme values of 26 days and 130 days, respectively.

In the case of young cattle from the area of Suceava county, the majority of primiparous cows (60.08%) had the age at first calving between 702 days and 944 days, proving a good reproductive precocity. At the same time, in the analyzed population there were 79 cows (39.92%) whose age at first calving was over 31 months, which highlights a normal growth of female reproductive youth.

In the case of cattle exploited on farms in Botoșani county, the age at first calving in the analyzed population was, on average, 907 days, with limits between 709 and 1121 days.