

## HERITABILITY DETERMINATION FOR REPRODUCTION CHARACTERS IN THE NEW MILK POPULATION FORMED IN THE NORTH-EAST PART OF ROMANIA

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### Abstract

The purpose of carrying out activities related to determining the heritability of characters in a new type of sheep population was to know the share of influence of genetic factors in the expression of the characters taken into account. The biological material subjected to the research was represented by the young male and female sheep as well as adults belonging to the Țigaie breeds and to the new milk breed resulting from its crossing with genitors belonging to the Awassi breed. In order to determine the specific values of the genetic estimators, the obtained results were entered in the database used to run statistical analyzes with the REML (REstricted Maximum Likelihood) algorithm, which allows an analysis of the normal estimators specific limits. In the case of determining the heritability coefficient for the specific reproduction function characters, the resulting values fit them in the group of the weak heritable ones (<0.23). All this suggests that in order to increase the reproductive performance in the selection of breeders other criteria should be taken into consideration.

**Key words:** amelioration, Țigaie, Awassi, heritability, production characters

### INTRODUCTION

The application of the principles of quantitative genetics has proven to be successful in the genetic improvement of animal species because it made it possible to combine populations, or save endangered ones, with one or more breeds established in multi-breed (composite) populations for specific objectives. Forming of composite populations does not directly increase the number of animals in the breeds threatened by endangerment or extinction. However, the high productivity of the newly developed composite population not only promotes the conservation of potential in some rare breeds and with considerable genetic potential but can also ensure their use in various breeding practices, marketing policies and consumer preferences for the prospects of future animal

populations and for the market use of animal products [7].

Regarding the new sheep and goat populations forming, at the international level, many of them have resulted based on the application of a crossing program between two or more breeds. Also, in the formation of new type populations, the main objective was either production or reproduction characters or a combination of them.

Such is the case with the Finnish Landrace breed, which is recognized for its ability to improve fertility and prolificacy. Due to this quality, after 1963, genitors of this breed were imported into more than 40 countries where, by crossing with the local sheep, they contributed to the formation of other breeds that succeeded, by genetic transfer, the biological maximization of new characters (prolificacy, growth intensity, reduced consumption, etc.) with a positive effect but also a substantial reduction of costs for each lamb obtained and marketed from each sheep in the herd [3].

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Major achievements in the field of animal husbandry are based on the application of specific principles of quantitative genetics to achieve new levels of production and reproduction performance in sheep and goats.

## MATERIAL AND WORKING METHOD

The biological material subjected to the research was represented by the young male and female sheep as well as adults belonging to the Țigaie breed and to the new milk breed resulting from crossing Țigaie with parents belonging to the Awassi breed.

**Statistical processing of data** was based on the use of the computer software **S.A.V.C.** (Statistical Analysis of Variance and Covariance 2003) to determine the arithmetic average ( $\bar{X}$ ), the error of the arithmetic average ( $\pm s$ ) the standard deviation ( $s$ ).

Also, based on the data obtained from the mating and calving period, an evaluation of the breeding season was carried out, determining for this purpose the main specific indices.

In order to determine the specific values of the genetic estimators, the obtained results were entered in the database used to run statistical analyzes with the REML (REstricted Maximum Likelihood) algorithm, which allows an analysis of the normal estimators specific limits. The REML estimator allows a maximization of the probability estimation of the parameters that use only the information that is not contained in the regression vector estimation, and therefore automatically corrects the values of degrees that are lost in the regression vector estimation.

## RESULTS AND DISCUSSIONS

Genetic improvement programs of current sheep populations are a common practice in many countries with advanced livestock breeding. Their purpose is to identify solutions, methods, pathways and technologies that can induce an increase in the lactogen potential of farm animals. Most of these programs include characters and features that are economically important in

order to achieve higher productivity, higher income and lower costs per unit of product.

The development and implementation of these programs is a consequence of the high demand for sheep production, an aspect highlighted by many specialized bibliographic sources, which show that milk and meat arouse greater interest due to the properties that support the health of consumers, and milk is increasingly used as a substitute food for infants [2].

For the zootechnical practice the ameliorative effect due to breeding programs applied depends mainly on the breed and the genetic baggage that it possesses for the most economically important features.

Genetic parameters estimations for production, and also for breeding and growing characters form essential attributes for the implementation of realistic programs, which is why they are not lacking in breeding programs.

Knowing the components of the (co)variance and for estimating the heritability of the characters involved in the production will support the breeding strategies of the animals by selecting those with a higher genetic baggage to anticipate and optimize the response to the selection applied to improve the features according to the breeder's desire. [1], [5], [6] and Sullivan et al., 1986, Barillet, 2007, cited by Pascal, 2015).

### Heritability of reproduction characters.

In general, these characters fall short of the improvement goals due to their low heritability. Heritability of reproductive characters has predominantly low values (<0.23), placing these characters in the group of the weak heritable ones, and those specific to milk and meat production have slightly higher values, framing them in the group of the medium heritable characters (table 1).

Knowing the specific values of the reproductive characters is extremely important as it indicates the individual's ability to reproduce, and the characters of viability and disease resistance express their ability to adapt. Due to their very low heritability, these characters are not subject to selection and are rarely targeted for improvement.

However, when the technological factors and also the conditions in which a certain population evolves are assured at optimal parameters, the selection according to these characters can bring an improvement of each character.

By the values determined on a representative population within the two types of sheep, we can see a closeness of the average values for expressing heritability. However, because the character represented by age at first lambing has an average heritability of 0.27 in young females from the milk population, obtained by crossing local

sheep Țigaie with Awassi rams, it turns out that if during the breeding period all conditions are assured at an optimum level there is a probability that some of them will develop faster, offering the possibility of being introduced earlier in the reproductive and productive circuit.

This is very important because it not only contributes to speeding up the genetic gain for each new generation obtained, but it also supports the implementation of a viable breeding program and not least contributes at reducing the intergenerational gap.

Table 1 Heritability of reproductive characters in the analyzed populations

Character	New milk population		Țigaie	
	n	h <sup>2</sup>	n	h <sup>2</sup>
Age at first lambing	187	0.27	875	0.18
Fertility	208	0.28	374	0.22
Birth rate	208	0.14	587	0.13
Prolificacy	208	0.18	477	0.19
Productive longevity	87	0.29	213	0.28
Organic resistance	241	0.28	302	0.27

On the other hand, imposing among the amelioration criteria the objective represented by the improvement of prolificacy, birth and fertility is not appropriate as all these characters being weakly heritable will be permanently influenced by the environmental factors. In this case, in order to improve them, the actions that bring the flocks of sheep in good breeding conditions (prepare for breeding herds, additional fodder, guided breeding, breeding surveillance, etc.) are more important.

For two of the analyzed characters, in both populations, higher values for heritability were obtained. The fact that the average heritability of the production character for the productive longevity is 0.28 and respectively 0.29 suggests that even in the new population each female can be kept in herd and economically exploited for a longer period of time.

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## CONCLUSIONS

1. Heritability of reproductive characters has predominantly low values (<0.23), so they are poorly heritable, and those specific to milk and meat production fall within the group of medium heritable characters.

2. By the fact that breeding age has an average value of heritability of 0.27 in young females within the milk population, they can be introduced earlier in the reproductive and productive circuit with the conditions of optimizing the influence factors.

3. The fact that heritability of the two populations is 0.28 and respectively 0.29 for the exploitation duration suggests that even in the case of milk population, each female can be kept in a herd and economically exploited for a longer period of time.

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