

**UNIVERSITY OF AGRICULTURAL SCIENCES
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“ION IONESCU DE LA BRAD” IASSY
FACULTY OF ANIMAL HUSBANDRY
DOMAIN ANIMAL HUSBANDRY
SPECIALITY TECHNOLOGY OF EXPLOITATION
OF SHEEP AND GOATS**

DOCTORAL THESIS

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**RESEARCH REGARDING THE INFLUENCE OF
CERTAIN ENVIRONMENT FACTORS ON
CHARACTERISTICS OF REPRODUCTION AND
PRODUCTION OF MERINOS OF PALAS,
LINE OF PERIENI**

**Doctoral thesis
Domain Animal Husbandry**

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ABSTRACT

With the entry of Romania into the European Union it is imposed to take some measures to of reorganization of sheep breeding sector in order to bring it to EU standards. Among them include: reducing the numerical livestock, the granting of aid for breeding rams, stimulating growth yields of meat and milk by providing subsidies on products, the introduction of the European system of classification of carcasses (SEUROP scale), development of new programs of melioration, the realization of genetic progress using BLUP methodology for determining the amount of improvement observed for the pursued characters and the construction of selection indexes as a combination of breeding values observed in character selection, economically weighted, the import of specialized breeds for meat production and milk, involvement of scientific research in implementation of development strategy of the field of sheep breeding and identification of populations at risk of extinction and develop of programs to retain them as a reserve of genes.

Research conducted during the preparation of doctoral thesis had as main objective, the analysis of the actual status regarding the influence of certain environmental factors on the characteristics of production and reproduction of the Merino of Palas within the RDCSEC Perieni, Vaslui County, and on this basis to formulate a series of directions and possibilities for improving them.

The thesis is written in four (IV) chapters and is structured in two parts. The first part comprises three main chapters in which are summarized the main bibliographic data in the literature dealing with the influence of environmental factors on the characteristics of production in sheep and is a synthesis of the "*current state of knowledge*", and the second is reserved for presentation of our own results obtained based on observations, research and analysis carried out on a larger period of time. In the thesis are included 115 tables, 47 illustrations, and the references list comprises 116 titles.

The first part of the thesis is a summary of the literature regarding the influence of environmental factors on the characteristics of production and reproduction in sheep.

In Chapter I is presented the dynamics of herds of sheep and a status of production of sheep and consumption globally and nationally. There are presented and a number of ways and means of recovery of the sheep at the national level, in order to bring it to EU standards.

In Chapter II are listed the main internal and external environment factors which can influence the characteristics of production in sheep (milk production, meat and wool).

In Chapter III are listed the main internal and external environment factors that can influence the function of reproduction in sheep, making references to the methods and technologies of intensification of breeding. This chapter includes a summary of data from the literature regarding the influence of age of parental pairs on certain indicators of breeding and in determining of sex.

The part including our own research begins with a presentation of the biological material and working methods. In subchapter 4.3.1. are considered the environmental factors which can influence the characteristics of production and reproduction in sheep subject of research, taking into account the climatic conditions, vegetation, geology and geomorphology of the area. In subchapter 4.3.2 there are presented research results on the evolution of herds of sheep breed Merino of Palas in Romania and in research and development units of the AAFS, and is making an estimate of the risk status of the race.

The following are some results of research dealing with the reproductive and morfoproductive characteristics of the line of Perieni, highlighting that this sheep population is characterized by the following features:

- wool with intense silky shine, dry colorless, the degree of white over 90%, 22.5 microns finesse and a good homogeneity of finesse in the wisp;
- lactogen potential relatively good (in the first three months the lambs realizes increases of over 250 grams);
- good skills for meat production:
 - the sheep youth has a good fattening capacity growth, achieving a daily average of 207 grams with a specific consumption 5.07 UNC / kg growth;
 - the sacrifice ratio is 52.5%.

Research on the influence of environmental factors on the characteristics of production of sheep belonging to breed Perieni Merino of Palas, outline some stressing factors, such as: the high temperatures and atmospheric precipitation lead to a significant reduction in milk production, the decrease in weight growth and increased specific consumption per kg. of growth. Climatic factors and in particular air temperature, the rainfall and wind intensity can influence negatively the breeding of Merino sheep of Palas. Adult sheep is characterized by a high degree of precocity and by handling of fotoperiodic signal can manifest estru out of season.

In order to increase the benefits of sheep breeding, in the new coordinates specific to the market economy, it is necessary the approach of new methods and techniques which are able to induce a significant increase in yields and implicitly of income made by every female in the mother lot. Intensive sheep breeding creates new opportunities to increase the number of lambs

by the early use of female youth Merino of Palas for breeding at the age of 9 - 10 months. To exemplify this, three experimental groups were used and which were assigned to copulation depending on age. Thus, at the copulation date, females who constituted group 1, were 9 months old, the group 2 were 17 months old and the control group were adult sheep. In order to achieve copulations and grouped births of 30 days, before the copulation was practiced a stimulating feeding. The copulation was carried out between 20 and 30 of September, 2004, and for the sheep in the estru were used trial rams. Data collected were centralized and processed statistically, and in order to determine the differences and their significance, Fisher and Tukey test was used.

Breeding indicators during 2005 – 2007 were analyzed on the 3 experimental groups. The fecundity in the three lots remained within constant limits and it is a consequence of the very good state of maintenance that characterized the breeding females. In 2005, differentiations of calculated values for other indicators of reproduction (birth, fertility and prolificacy) occur in group 1, compared with group 2 and group M (control). In the second, but especially in the third calving, these differentiations disappear and the values of breeding indicators fall within the specific breed.

The assessment of the degree of development of the female body of the 3 groups was done by analysis of body weight found in relation to age at the date of birth, and for more real analysis of the actual level of development and growth were performed also body measurements. At the date of copulation, in all L1 and L2 experimental lots, average body weight exceeded 75% of the specific adult sheep (LM), thus satisfying the requirements for use in breeding. The reduced value of the coefficient of variance certify that the individuals who constituted the lots are characterized by a certain homogeneity of bodyweight at copulation. Regarding the copulation weight there were differences of all lots, but they were significant for $P > 0.01$ only between the LM and L1, L2 and L1. Differences recorded for age at copulation and at calving were significant between all lots for $P > 0.01$.

Analyzing the lot consisting of females whose age at the time of copulation was lowest i. e. 292.21 ± 1.91 days, they had a body weight of 42.070 ± 0.379 kg, which represents 75.5% of weight of the sheep in LM at the time of copulation. The age at the time of calving was influenced by the duration of pregnancy.

Simultaneously it was studied also the evolution of other development indicators resulting from carrying biometric measurements in sheep of three groups differentiated by age among themselves at the time of copulation. The results obtained allow to specify that although in the case of lots consisting of female youth, the average values of the parameters studied are

close to those specific the the adult sheep, the differences are significant in most cases for $P > 0.01$. During pregnancy, the evolution of bodyweight recorded considerable growth, due primarily to the development of fetuses and their number at birth. The highest increases of weight of animals at the time of calving compared with weight at copulation were 17.51% and was recorded at the females in L2. To make a more comprehensive analysis of the evolution of body weight products derived from the 3 experimental groups, statistical processing of data was performed on body weight according to sex products obtained at birth, at 3, 6, 9 and, 12 months, both in 2005 and 2006.

The smaller weight of lambs at birth (L1) is a consequence of the low weight of females used to copulation. In 2006, the difference in weight between the three groups started to decrease and tend to disappear as the age of animals increases. Differences between the weight at birth of lambs in L1 compared to L2 and LM are not significant, which shows that when the sheep mothers have a good state of maintenance at copulation, age and body weight minimize their influence on weight of lambs at birth. This shows that the youth used to copulation at the age of 9 months has a good lactogen potential and show a good maternal instinct. From data presented above a conclusion can be drawn that the youth resulted from females used to copulation at the age of 9 months is not felt in terms of growth and have the necessary vitality to have a normal development.

Data referring to duration of pregnancy were analyzed aiming the average total for each of the three lots and then separately for the sheep that gave birth to products different as sex, for those that had twinning calvings. By analyzing the data obtained, it can be noted that the two experimental groups consisting of young females, compared with the control group, the duration of pregnancy was lower, hence it can be concluded that age is a major factor of influence of the duration of pregnancy. The highest average duration of pregnancy, when the analysis is done according to sex product was found at the sheep who produced males. This finding is also relevant for the analysis of the average duration of gestation depending on product obtained. Thus, at ewes with twinning calvings, the average duration of pregnancy was higher compared with that recorded when the sheep who produced only one lamb. These results makes us to say that the sex of the product of conception and their number are factors of influence of the total pregnancy period.

Comparative data on wool production show that at the first clip (2005), the youth that was given to copulation at the age of 9 months (L1), gave an average production of 4.987 kg of wool. Individuals of the same generation which were used to fit the age of 17 months gave on average 5.36 kilograms wool, and those of the control group, gave on average 5.527 kg wool. There is a lower production of sheep in L1 (7% lower compared to L2 and 10% lower compared

to LM). In the second clip (2006) the difference in production of three batches decreases obviously. This difference appears to be passenger and is likely to disappear in the coming years.

Experimental results have demonstrated the possibility of using to early breeding without unfavorable results of the young females Merino of Palas, which at the age of 9 months made 75% of the weight of the adult age. For widespread use of this method it is necessary to ensure appropriate conditions for feeding and maintenance, and ewes in the first year as young mothers must not be milked.

Food is for the beginning and development of sexual cycle, the factor of vital importance. Sheep should be fed according to their physiological status and adequate food. The level of nourishment and status of maintenance of sheep before copulation are key factors that influence the indicators of breeding, feeding level previous to the act of copulation is one of the main factors influencing the prolificacy. The experiment whose results will be shown in this paper, aimed to verify this theory, in which the experiment was carried out on lots of Merino of Palas, to whom in preparation for the copulation, the same amount of concentrated food was given in daily dosages or with different deadlines.

The results come both from original observations made in production conditions and which are considered to be from an preliminary experience (EP1), and from two experiments conducted in the years 2003 and 2004. EP1 results represent data recorded in three years (2000, 2001 and 2002). Animals used were Merino of Palas sheep, whose maintenance condition was good in all cases, with marks between 2.5 and 3.0 on Bocquier scale (INRA, 1988), and as physiological state during the preparation for copulation and copulation. During this period they were given a "Flushing" diet by increasing the energy intake, which is achieved by appropriate intake of concentrated fodder. Energy supplement given during this period was, as appropriate, 10-30% above the level of maintenance requirements. The application of nutritional Flushing has been considered to be carried out over a period of 2 - 3 weeks before the copulation took place and continued a week after setup. This stimulation was achieved by improving both quality and quantity of basic ratio (green weight) and the assigned supplement concentrated of sheep moms. The experiment itself has been conducted in the years 2003 and 2004 when over two experiments (EI and EII) it was worked on 7 lots of sheep (in the experiment EI) and on 4 groups (the experience EII). In terms of body weight, values were similar on plots that the bodyweight was between 47 - 49 kg and the age of sheep was between 4.5 - 5 years. In the years preceding those in which the experiments EI and EII took place, respectively in the years 2000, 2001 and 2002 have made observations on the large herds of sheep mothers (1350 heads) on the consumption of main food and breeding. These data were used for comparison with those recorded in the actual experiments and are considered preliminary (EP).

EI experiments made in 2003 to work with 7 lots of sheep, and a control lot (EIA) and 6 groups, experiments (EI.1 - EI.6), each lot is composed of 15 heads of sheep moms. EIA batch was used throughout the experiments (June 20 - August 9) only the green mass, the crib, the experimental plots the green mass was used in food and a mixture of concentrated (AC1) in the amount of 7.65 kg period and sheep, each returning an average of 150 g daily. Daily administration of concentrates has been used only in EI.1 lot, other lots being given 2, 3, 4, 5 or 6 days in amounts determined so that the entire experimental period to be used amount of the 7.65 kg / ewe.

In the second experience (EII) it was worked with 4 lots of sheep mothers, with a control lot (EIIM) and three experimental groups (EII.1, EII.2 and EII.3). In experimental lots the green mass administered and the mixture concentrated in AC2 amount of 14.28 kilograms per ewe and per period. Group (EIIM) was administered daily green mass and experimental plots for the total quantity of concentrates was thus broken, that they were given daily (group EII.1) in three days (group EII.2) or six days (EII.3 lot).

Feed administered to sheep was produced in the RDCSEC Perieni facilities and consisted of green mass used by grazing or ripping "the crib". Besides the green mass, supplements were used and concentrates according to purpose (production or research). If EI green mass was used in feed for sheep in preparation for the copulation and copulation, came from the meadow planted with *Bromus inermis*; after mowing and slight paling, feed was given to the sheep specially prepared for the individual consumption of food.

In the second experiment the number of lots decreased from 7 to 4, corresponding to increasing the number of animals in the lot (from 15 to 30 heads). The dosage of food was made of green mass (mixed peas and oats) in group (EIIM) and green mass and mix of concentrates on experimental lots. The amount of concentrates (AC2) lots and the period was 14.28 kg in group EII.1, 9.52 kg in group EII.2 and 7.14 kg in group EII.3. concentrated mixture was administered daily at the first batch (280 g / sheep), every 3 days in batch EII.2 (560 g / sheep) and at 6 days in batch EII.3 (840 g / sheep).

As with the first group experiment (EIIM) was administered only green meal mass. The results on key indicators of breeding show that the most significant indicator is prolificacy that is determined to a large extent by the rate of ovulation. From the data obtained it is found that the lowest (106.7%) for this indicator has been made in group (EIA), which is explainable by the lack of concentrated supplement ration of this lot. This is confirmed by the results observed in the preliminary observations made in production conditions during 2000 - 2002, and established in 2005, obtained under the same conditions.

In the results reported in the experimental lots it is found that the highest values of the index prolificacy (120 - 123%) were observed in batches EI.3 - EI.6. This confirms the idea that it can induce a nutritional Flushing and administration of greater quantities of energy at intervals of time, being required daily administration of it.

The results on indicators of breeding out the track record that in all experimental plots prolificacy was higher than that recorded in group, and average results recorded during 2000 - 2002 and 2005. Thus, compared with values obtained from group (EIIM) in experimental plots prolificacy was higher by 4.5 - 17.7%, and average over three years plus the differences were 6.3 - 13.5 %.

Important is that the results of this experience confirms the experience of the EI in the sense that management supplement energy by mixing concentrated at intervals of 3 - 6 days, has the same effect on prolificacy of sheep as if the supplement is administered daily. Compared with the results recorded in the EI experiment, in the second experiment the results were higher on prolificacy in both groups and the experiments. This may be due to the increase in EII experience, supplement concentrates and from 150 g / day / sheep (in EI) to 280 g / day / sheep (the EII). Prolificacy has mostly been obtained from batch EII.3 (131%), which brings us to the conclusion that by taking the supplement once concentrated in 6 days to create a possible nutritional stress, hormonal determined, which can increase ovulation rate and embryonic survival. At the same time, in EII experiment, the basic ration was composed of green mass. By analyzing the prolificacy of sheep in control batches, it was observed that the group who consumed EIIM feed mash basic green mass that is 113.3% compared to batch EIA Bromus who consumed green mass (106.7%) and the average batch (Table 4.96) who consumed green pasture mass and concentrated mixture of AC1 (111.5% 108.9% respectively). One may conclude that green mass can be used with good results in feeding sheep during preparation for copulation and copulation itself, to increase the ovulation rate and the default prolificacy. This would be due on one hand to better nutrition (0.91 UFL / kg and 89 SU POI g / kg SU) versus mass Bromus green (0.53 UFL / kg and 44 SU POI g / kg SU) and green pasture mass (0.66 UFL / kg and 58 SU POI g / kg SU), and secondly because any content phytoestrogens.

Age as an internal factor of environment has influence on the phenotypic characteristics, age structure fluctuation being translated as a fluctuation in production. Age may influence the quantity of wool, milk quality and quantity and potential for growth and fattening. It may also influence the estrum event frequency, repetition frequency of estrum and certain indicators of reproduction in sheep. In some circumstances it may influence the age and gender of the products obtained. By mating young sheep (1.5 years) with older rams (6.5 and 7.5 years) to obtain a greater number of males. By mating young rams (1.5 and 3.5 years) with older ewes (5.5

and 7.5 years) to obtain a greater number of females. The greater the age difference between sheep individuals is higher, the possibility that the future product to be male is bigger and the age difference between ram and ewe is larger, the possibility that future product to be female is more big. By matching pairs according to age can be used to obtain a greater number of males or females, depending on aim.

In ruminants there is a link between mineral metabolism of the maternal sex determination and to survivors. In 2003 there were a series of observations on this matter on the breed of Merino sheep of Palas. There were chosen two groups namely: 1 lot of 12 head sheep mothers in the age of 5.3 years and an average weight of 52 kg that had calved in 2000, 2001 and 2002 predominantly females (2000 - 100% females, 2001 - 6.67% 93.33% males and females, 2002 - 5% males and 95% females) and group 2 of 12 sheep heads older mothers averaged 6.4 years and average weight of 51 kg that have calved in 2000, 2001 and 2002, predominantly male (2000 - 100% male, 2001 - 100% male, 2002 - 94.44% 5.56% males and females). In 2003, the group 1 with 21 days before the mount was given the green mass and in addition was administered a mixture of concentrated feed (A1) containing 2% sodium chloride and 0.5% potassium sulphate. In batch no. 2 was given the same amount of green mass and a concentrated mixture containing 4% calcium carbonate and 0.5% magnesium sulphate. In 2004 lots were placed in charge. In 2003 and 2004 were analyzed indicators of breeding the two groups were gathering data on the number of lambs at birth, sex, the relationship between sex and were compared with 2000, 2001 and 2002.

In 2003, following the administration of the mixture with excess of minerals rich in Ca and Mg (ratio of 1 / 3, between 23 and required Ca Ca insured and 1 / 4, 6 between Mg and Mg insured) have calved 43, 75% males and 56.25% females. In 2004, the batch was placed in charge when food had no excess of minerals and were calved 16.67% 83.33% males and females. Again, it was observed the trend of female predominance.

One could see that in the period 2000 - 2003, in batch 2 were calved on average 1.85% females and 98.15% males. In 2003, following the administration of the mixture with excess of mineral-rich N and K (ratio of 1 / 2, between 0 and required Na Na insured and 1 / 21, between 8 K and K necessary insured) have calved 42, 11% female and 57.89% male. In 2004 have calved 31.25% and 68.75% females and males is observed the trend towards the male predominance. From analyzing the results one may conclude that in ruminants there may be a link between mineral metabolism of the maternal sex determination of survivors. By implementing the results in the production, the benefits can be substantial, leading to continuous improvement and progress of technology.