

# The productivity of Anglo-Nubian goats in the conditions of the Republic of Moldova

Oleg Maşner\*

*The Scientific and Practical Institute of Biotechnologies in Zootechny and Veterinary Medicine, v. Maximovca – Republic of Moldova*

\*mashner.oleg@gmail.com

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## Abstract

The research has been carried out over three consecutive years (2016–2018) on Anglo-Nubian goats of different origins as imported and reproduced under the conditions of the Republic of Moldova as well. The goat farm, where the animal testing has been carried out, is located in the center area of the republic being sufficiently technologized to ensure total manifestation of the genetic potential of the exploited goats. It was established that the young female goats of the Anglo-Nubian breed possess a high energy of growth and achieving an average daily increase of  $222.50 \pm 16.0$  g from birth up to 150 days, and with a maximum of  $282.50 \pm 28.8$  g per day in the age range of 60–90 days. Young female goats 1.5 years of age achieved mean body weight of 62.6–64.8 kg and production of milk per lactation of  $527.3 \pm 14.1$  liters for primary goats (American origin),  $705.55 \pm 8.7$  liters for goats in the second lactation (American origin) and  $719.83 \pm 21.65$  liters for goats in the second lactation (French origin x American origin) and of  $810.30 \pm 31.85$  liters for goats in the third lactation (French origin).

**Key words:** Anglo-Nubian goats, different origins, high energy of growth, milk production

## Introduction

The Anglo-Nubian goat breed, as reported by Taftă (1996; 2007), Pascal (2008), Zamfirescu (2009), is a result of the breeding of goats in England with the participation of the Nubian breed and the subsequent selection of the most performing representatives for milk production (quantitative and qualitative). At the same time, this breed can also be considered as one with a high potential for meat production. As a confirmation of this statement, is the great habitus of the animals and a high rate of growth of the young, especially in the first year of life, fact observed in our research, carried out so far.

Regarding the spread of the Anglo-Nubian race, its productivity and its use in different countries, it should be mentioned that more sci-

entific information in this regard is reported by Latin American researchers (Brazil, Mexico, Bolivia, etc.), where this breed is introduced and researched under various aspects, such as genetic particularities (Silvestre et al., 2015; Stemmer et al., 2009; Sousa et al., 2011), lactation curve and growth of youth (Rojo-Rubio et al., 2015), resistance to some area-specific diseases, cross-compatibility with local breeds to increase milk and meat production, etc. (Ribeiro et al., 2018).

In the Republic of Moldova the goats of the Anglo-Nubian breed were imported in 2015, in a relatively small initial number of about 20 heads of females and two males. Imported animals belonged to different lines and origins (French and American). The research on the imported goats, were carried out, up to the present stage, but is still to be continued, in the farm of the Peas-

ant House "Avibar-Baljicov I", village Bardar, district Ialoveni. The geographical location of the farm is in the Central area of the Republic of Moldova, being influenced, in some way, by pedoclimatic characteristics (altitude, minimum and maximum temperatures, the level of precipitation and humidity of the air, etc.) specific to this area. The main purpose of the farm taken under the study is the production and marketing of the breeding youth, especially the males, but also the females (not retained for reproduction), obtaining and marketing the milk for fresh consumption and the cheese prepared from the goat's milk.

### Material and methods

In the study realized for (three consecutive years) were taken a number of goats from the Anglo-Nubian breed, totaling over 100 heads (breeding animals, lactating goats of different ages, lambs during the lactation period and after weaning). The number investigated included goats of French breed, female and male goats of American breed and those obtained (raised under the conditions of the respective farm of hybrid origin (♀French Breed x ♂American Breed).

The technology of maintenance and breeding of goats on the farm is semi-intensive with the maintenance of animals in group boxes (10–25 heads – free standing and walking) resting in the paddocks, in which the feeding and watering of the animals is ensured.

Feeding of the goats is done with hay at the discretion (mainly alfalfa) and concentrated feed in granular form, which contains the necessary protein-mineral-vitamin supplements.

The milking of the goats is realized mechanized at the installation of milking of linear type (8 stations), being practiced three milking per day. The collection of milk during the milking of goats is done in a common container (vessel). At the control milking, the goats are milked separately in individual vessels.

The reproduction of the goats is done naturally with the practice of the guided insemination (by hand), and the raising of the lambs is done

through the common maintenance with their mothers and their natural milk feeding.

The weaning is practiced at the age of 60–70 days from birth, and the separation by the sex of the males and females was made at 90–100 days.

For the characterization of the goats of the Anglo-Nubian breed, raised under the conditions of the republic, the following indices were evaluated and analyzed:

- the number of goat kids obtained at birth compared to 100 females – prolificacy (%);
- body weight at birth, at 20, 30, 60, 90, 120 and 150 days (kg);
- milk production of goats throughout the lactation (liters);
- the duration and the lactation curve of the goats;
- the body weight of the reproductive flock (kg).

For the evaluation of the mentioned indices, were used the usual techniques and methods set out in the Instruction for the assessment of raised goats for milk with selection elements (Chisinau, 2013).

The statistical processing of the numerical material obtained in the researches was carried out with the computer program "STATGRAPHICS Centurion XV".

The degree of certainty of the differences between the analyzed indices was determined according to the Student criterion N. Plohinski, (1969).

### Results and discussions

An important index when evaluating introduced breeds or populations of animals is the prolificacy of the animals under new breeding conditions. It characterizes both the technological and nutritional conditions offered to animals, as well as the manifestation to some extent of the genetic potential characteristic of the investigated breed. Therefore, the study of the goats of the Anglo-Nubian breed of French and American origin showed that the prolificacy of the females is quite high. So for those of French origin

– 333 goat kids per 100 females, and for those of American origin – 260 goat kids. In both cases the values of prolificacy are quite high, which is specific to this breed.

In order to establish the growth of the young female goat under the conditions of the investigated farm, periodic weighing of the female lambs were performed up to the age of 150 days, being established the dynamics of the body weight, presented in Table 1. The data obtained denote that in all three cases the Anglo-Nubian female lambs obtained and raised under the conditions of the farm under study showed a good growth. By the age of thirty days after birth their body weight increased more than twice, and by 90 days more than five times, regardless of their origin. At the same time, it should be noted that there was a tendency of superiority in the body weight of the young female goats at birth in favor of those coming from the goats of French origin –  $4.15 \pm 0.58$  kg against  $3.68 \pm 0.28$  at those of American origin and  $3.58 \pm 0.13$  kg at those of hybrid origin (♀French x ♂American).

Towards the age of 90 days, the difference observed initially practically disappeared, and subsequently was highlighted with statistically authentic values at the age of 120 days ( $P \leq 0.05$ ) and more pronounced at the age of 150 days ( $P \leq 0.01$ ) in favor of the young female goats obtained from goats of French origin. In this context, it should be noted that the calculations of the in-

crease in body weight gain of the young female goats revealed a high growth potential of the Anglo-Nubian female breeding increased under the conditions of the republic. Thus, the average daily increase of the female lambs obtained from goats of French origin during the period of birth – 150 days constituted  $222.50 \pm 16.01$  g/day.

Simultaneously with the study of the dynamics of the growth of the female youth, under the conditions of the evaluated farm, the milk production was studied at goats of the Anglo-Nubian breed from the three groups of different origins. The results obtained (Table 2) showed that during a lactation period of 260 days from goats of French origin (third lactation)  $810.30 \pm 31.85$  liters of milk were obtained. The average daily milk production was  $3.12 \pm 0.12$  liters. From the goats of American origin (second lactation) were obtained on average for the same duration of lactation (260 days) –  $705.55 \pm 8.70$  liters, with an average daily production of  $2.72 \pm 0.04$  liter.

The goats reproduced and raised under the conditions of the hybrid (♀French x ♂American) farm on the second lactation with a duration of 260 days produced  $719.83 \pm 21.65$  liters of milk with a daily production of  $2.77 \pm 0.08$  liters. Simultaneously, from the primiparous goats of American origin in 229 days of lactation  $527.3 \pm 14.14$  liters were obtained on average per lot, and the average daily production was  $2.30 \pm 0.06$  liters.

**Table 1.** Dynamics of body weight of the young female goats of the Anglo-Nubian race of different origins

Age at weighing	Of French origin X ± Sx	Of American origin X ± Sx	Of hybrid origin (♀French X ♂American) X ± Sx
Birth	$4.15 \pm 0.58$	$3.68 \pm 0.28$	$3.58 \pm 0.13$
20 days	-	$7.87 \pm 0.41$	$7.59 \pm 0.19$
30 days	$8.43 \pm 0.86$	$10.08 \pm 0.38$	$9.80 \pm 0.11$
60 days	$16.93 \pm 1.24$	$15.15 \pm 0.55$	$15.28 \pm 0.22$
90 days	$22.03 \pm 1.57$	$20.00 \pm 0.45$	$19.80 \pm 0.20$
120 days	$30.43 \pm 1.85^*$	$24.77 \pm 0.52$	$24.68 \pm 0.27$
150 days	$40.23 \pm 3.26^{**}$	$28.75 \pm 0.48$	$28.36 \pm 0.17$

\* $P \leq 0.05$ ; \*\* $P \leq 0.01$

Regarding the individual limits for milk production of the controlled goats, it should be specified that these have high enough values that allow an individual selection to be made. This fact practically refers to all three lots.

In order to examine the specificity of the lactation at the investigated goats and to evaluate its curve, the monthly milk production of the controlled goats was highlighted (Table 3).

From the data presented in Table 3, we notice that at goats from all the controlled lots milk production gradually increases until the sixth month of lactation, and then gradually decreases. Regarding the monthly milk production, it should be mentioned that higher values were established for goats that were in lactation III (French origin), and lower values were obtained for primiparous goats – lactation I. Those in lactation II recorded intermediate values. Naturally this is justified by

the physiological laws of lactation, from which it is known that milk production gradually increases from first to third–fourth lactation, after which it enters the plateau and after the sixth lactation begins to decrease. Basically, regarding the specificity of the lactation curve at the goats of the investigated lots, it has a stable character with high values of milk production during the entire duration of lactation.

An important character for the characterization of the researched flock of goats represents the body weight of the animals, being a cumulative indicator that reflects the degree of physical development of the body and, in some way, the health of the body, especially if we are talking about productive animals.

Following the weighing of the breeding flock on the farm (y. 2017), it was established that the goats of French origin, at the age of 2.5 years,

**Table 2.** Milk production on lactation at goats of Anglo-Nubian breed

Specification	Milk production, liters		Lactation duration, days	Milked milk per day, liters
	M ± m	limitation		
Goats of import				
French origin (lactation III, n-3)	810.30 ± 31.85	758.7–841.8	260	3.12 ± 0.12
American origin (lactation II, n-3)	705.55 ± 8.70	699.4–711.7	260	2.72 ± 0.04
Goats reproduced and raised under local conditions				
French origin x American origin (lactation II, n-3)	719.83 ± 21.65	694.9–754.0	260	2.77 ± 0.08
American origin (lactation I, n-5)	527.3 ± 14.14	495.7–558.2	229	2.30 ± 0.06

**Table 3.** Monthly milk production for Anglo-Nubian goats, liters

Specification	Lactation months							
	I	II	III	IV	V	VI	VII	VIII
Imported goats								
French origin (lactation III)	103.8	103.0	107.5	108.0	111.6	109.5	93.5	73.4
American origin (lactation II)	97.8	84.0	96.9	99.8	103.1	103.1	72.8	48.2
Goats obtained and raised under local conditions								
French origin x American origin (lactation II)	91.0	86.0	95.6	100.0	105.4	103.9	78.0	59.9
American origin (lactation I)	68.8	65.4	75.4	77.9	76.4	71.8	71.6	-

**Table 4.** Body weight at goats of the Anglo-Nubian breed

Specification	Body weight, kg	
	X ± Sx	limitation
Goats of French origin (2.5 years; n-3)	64.83 ± 2.22	62.2–68,3
Breeding male goat of French origin (2.5 years; n-1)	120.0	
Goats of American origin (1.5 years; n-3)	63.03 ± 9.89	50.0–77.8
Breeding male goat of American origin (1.5 years; n-1)	85.0	
Goats obtained and raised under local conditions (1.5 years; n-4)	62.60 ± 6.0	53.1–78.6
Breeding goat obtained and raised under local conditions (1.5 years; n-1)	89.0	

had an average body weight of  $64.83 \pm 2.22$  kg with the individual limits between 62.2 kg and 68.3 kg, and the body weight of the breeding male goat of the same age and origin constituted 120 kg (Table 4).

Regarding the body weight of the goats of American origin, which at the time of evaluation were only 1.5 years old, being also during the lactation period, it constituted on average  $63.03 \pm 9.89$  kg with the wide individual limits – 50,0 kg–77.8 kg. The male in this group had a body weight of 85.0 kg.

At goats of the third lot which were obtained under the conditions of the farm from the first calving of the lot of goats of French origin, the average body weight had equally high values –  $62.60 \pm 6.70$  with wide limits of 53.1 kg–78,6 kg. The breeding male in this lot had a body weight of 89.0 kg.

### Conclusions

1. The results obtained regarding the breed of Anglo-Nubian goats raised under the conditions of a farm with the technology that allows the manifestation of the productive potential of the animals allow to conclude that, the production indices of the goats investigated have high values, specific to the characteristics and direction of production of the respective breed:

- the prolificacy of the goats constituted 260–333 lambs reported to 100 goats, according to their age;

- young female goats in the lactation period and subsequently up to the age of 5 months show a high weight gain, with a potential over 220 g/day and a maximum weight to 150 days of 40.23 kg, for those of the lot of goats of French origin, of 28.75 kg for those from the lot of goats of American origin and of 28.36 kg for those of hybrid origin (♀French X ♂ American);

- the milk production of goats during a lactation period of 260 days in the third lactation constituted on average  $810.30 \pm 31.85$  liters with a daily productivity of  $3.12 \pm 0.12$  liters at goats of French origin. High productivity was also recorded in the other lots, except that these were of a lower (lactation) age, when the lactogenic capacity physiologically is lower, having also a lower number of days of lactation, only 229 days;

- the body weight of the goats from the investigated lots reflects a good body development of the animals, even from the age of 1.5 years, having a large habitus, regardless of origin, the reached maximum individual limit was 78.6 kg.

2. Due to the fact that the number of animals investigated so far is relatively small, the research initiated needs to be continued, totaling a larger number, and the data obtained need to be considered with preliminary informative character.

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