

MAGYAR ÁLLATORVOSOK LAPJA

2018. 140 (Supplement I)

XVIII. KÖZÉP-EURÓPAI BUIATRIKUS KONGRESSZUS

XXVIII MIDDLE-EUROPEAN BUIATRICS CONGRESS

EGER & PARK HOTEL,

EGER, 2018. MÁJUS 30. – JÚNIUS 2. / MAY 30 – JUNE 2, 2018

A MAGYAR BUIATRIKUS TÁRSASÁG
XXVIII. NEMZETKÖZI KONGRESSZUSA

XXVIII INTERNATIONAL CONGRESS
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LITHO IN CANADA

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The influence of technological factors on caprine milk production

Technológiai tényezők hatása a kecskék tejtermelésére

PASCAL Constantin^{1,2,3*}, IONICĂ Nechifor², COSTICĂ Cristian³,
FLOREA Alexandru Marian^{1,3}

¹*University of Agricultural Sciences and Veterinary Medicine, Faculty of Animal Science,
Iasi-Romania*

²*Agricultural Station of Research and Development for Sheep and Goat Growing,
Popăuți-Botoșani*

³*Agricultural Station of Research and Development for Sheep and Goat, Secuieni-Bacău*

*e-mail: pascalc@uaiasi.ro

Abstract

The breeding of goats is an important sector in the process of development and modernization. By introducing support measures for farmers for the breeding of goats, there have appeared in different regions of Romania farms that apply modern and breeding technologies, but also to improve the production of milk. The purpose of the research was to identify the period during which the highest levels of milk production are obtained in relation to lactation age and month under conditions of optimization of maintenance and nutrition technology. Against this background, although the total number increased by more than 55% in 2015 compared to 2005, milk production registered only a 35% increase over the same period, due only to the

increase of the milked effectives. Therefore, starting from the fact that out of over 1,400 thousand heads of goats in Romania over 57% belong to the local Carpathian breed, we considered it appropriate to carry out some research to identify effective solutions for improving the milk production in this breed. In this respect, a group consisting of females of different ages was constituted but the same experimental treatment was applied to limit the influence of different factors.

Key words: Carpathian goat, goat milk, technological factors

Introduction

For breeding goats, it is particularly important for the selection to be intensified so that this species is also systematically

evaluated on the basis of productive performance. By doing so, we can find within the different goat populations some high-yielding females that could be nominated as goat-moms and used to produce valuable breeders. Subsequently, by promoting them in the breeding group, a greater influence can be exerted on the process of improving the production of milk for this species.

The role and importance of controlling milk production results from the fact that the data obtained can also serve for:

- the nomination of farms and the formation of elite kernels;
- conducting matings based on objective criteria;
- prompt and accurate information of farmers on the results of control to improve farm results;
- implementing an effective improvement plan.

In Romania, goat breeding is in full development and relatively similar concerns have been made on goat herds in other breeding areas (Chetroui & Călin, 2013). In the research, the objectives included in the experimental protocol aimed at assessing some technological factors that could be used to increase the productive performance of local goats. There were included in the groups of actual goats in the area represented by the Central Plateau of Moldova that were in different lactations.

The control activities were carried out according to a previously elaborated scheme, which aimed at observing all the norms and specific technical activities.

Materials and Methods

The biological material was represented by adult goats of the Carpathian breed, a breed which holds over 45% of the total goat population in Romania. In order to limit the influence of different factors, the consignments set up benefit from the same conditions of maintenance and feeding. Also, in order to diminish the influence of age on the lactogenic potential in the experimental groups, we included, in equal proportions, goats from the first to the seventh lactation.

The performance evaluation for milk yielded during the lactation submitted to the control was based on the application of successive productive checking, using for the lactation period the Nica method (this process takes into account the fact that 1 kg gain achieved by lambs in the lactating period is obtained with 4.5 kg milk until the age of 60 days), while for the period in which the females were exclusively milked the applied method has been AT4 respecting the technical specifications suggested by the International Committee for Animal Recording.

Under the applied system, the total duration of lactation was 205 days. For the period of lactation the first control was planned at 28

days from the moment of lambing and the second one during the 58th day of lactation. For the milking period after lamb weaning, controls were placed at regular intervals of 28 days.

Individual milk yields have been recorded alternated, during the morning milking and

in the evening milking at the next control to, and so on.

Estimation of the average total production of milk was carried out using the Fleischmann method.

$$\text{Milk yield [kg]} = L_1 \cdot \text{int}_1 + \sum_{i=2}^n \left(\frac{L_i + L_{i-1}}{2} \cdot \text{int}_i \right) + L_n \cdot 14$$

where:

L_1 = milk yield of the 1st monthly test;

L_i = milk yield of the i^{th} monthly test ($i = 1, \dots, n$);

L_n = milk yield of the last test;

int_1 = number of days from kidding to 1st monthly test;

int_i = number of days between monthly tests ($i-1$) and i ($i = 1, \dots, n$);

n = total number of monthly test for a specific animal.

The achieved results have been input into the data base, used to run statistical analysis with the algorithm REML (Restricted Maximum Likelihood), which provides the achievements of the statistical parametric estimators within the normal range. The REML estimator is the maximum likelihood estimate of the parameters which uses only the information not contained in the estimate of the regression vector, and thereby automatically corrects for the degrees of freedom which are lost in estimating the regression vector.

Results and Discussion

Evaluation of the production of milking milk in relation to the lactation month.

The researches revealed that during the lactation period considered, the daily milk production exceeded 500 g in May, June and July and were very close to this value in the August-October period. This indicates the superior lactogenic potential of the Carpathian breeds, but the rather high values determined for the coefficient of variability indicate a strong heterogeneity of the character.

The reason for this situation is, first of all, the unsustainable selection for the milk product and secondly the high variability may be due to the consequent inappropriate application of various inadequate feeding and maintenance techniques. Analysing the technologies applied on each holding where

the research was carried out, a variety of them was found, but in most of them they applied technologies specific to the traditional systems, and the food applied during the stabling was done without taking into account those elements that could maintain an increase in individual performance.

Analysis of the milk quantity obtained during the same lactation period shows that the highest daily average production was 680.75 ± 33.714 g and was obtained at the evening milking of the control day applied in June (Table 1). Most of the results obtained are superior to other values published in the speciality literature (Taftă, 1994; Pascal et al., 1999; Pascal et al., 2006; Taftă & Machidon, 2006; Zaharia, 2011;

Pascal et al., 2013). This allows us to affirm that the optimization of technological factors and the application of nutritionally balanced rations can create favourable conditions for the increase of milk production in goats with minimal additional costs.

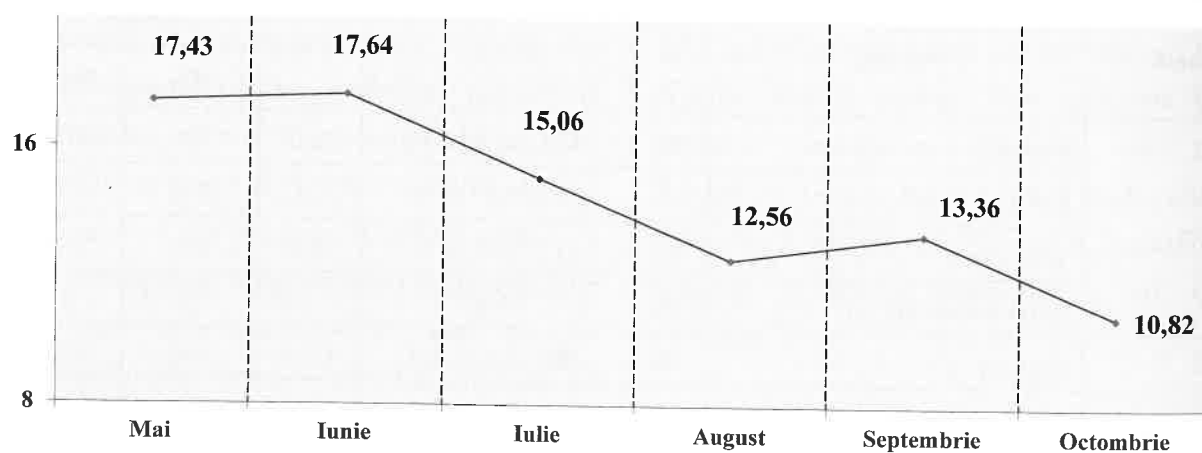
Analysing the lactation curve we can see that its tip is placed in the first two months after weaning. In August, due to extremely high heat, the average monthly individual milk quantity was with 16.60% lower than in July and with 6.37% compared to September. Referring to the monthly production of the total individual milk quantity obtained between May and October, we can see that in May and June we obtained 20.07% and respectively 20.31%.

Table 1. Monthly dynamics of milk production (g)

Month	Milking	n	$\bar{X} \pm s_{\bar{x}}$	V%	Limits	
					Min	Max
May	Evening	35	634.64± 22.879	32,15	255	1200
	Morning	35	589.45 ± 31,170	25.41	310	855
	Total day	70	612.25± 31.415	22.45	255	1200
	Total month May (l)	70	17.43	-	-	-
June	Evening	35	680.75 ± 33,714	33.58	300	1050
	Morning	35	598.52 ± 28.783	40.22	350	1100
	Total day	70	630.05 ± 23.541	30,54	300	1100
	Total month June (l)	70	17.64	-	-	-
July	Evening	35	553.64 ± 72.879	43.66	110	840
	Morning	35	518.89 ± 59.359	34.32	270	720
	Total day	70	538.00 ± 47.126	39.17	110	840
	Total month July (l)	70	15.06	-	-	-

Month	Milking	n	$\bar{X} \pm s_{\bar{x}}$	V%	Limits	
					Min	Max
August	Evening	35	421.36 ± 34.241	38.12	200	800
	Morning	35	475.91 ± 28.457	28.05	300	730
	Total day	70	448.64 ± 22.390	33.11	200	800
	Total month August (I)	70	12.56			
September	Evening	35	482.61 ± 28.702	28.52	280	880
	Morning	35	471.82 ± 39.873	39.64	300	960
	Total day	70	477.33 ± 24.128	33.91	280	960
	Total month Sept. (I)	70	13.36	-	-	-
October	Evening	35	402.16 ± 18.270	22.45	175	630
	Morning	35	371.32 ± 27.303	35.14	185	665
	Total day	70	387.67 ± 15.813	28.25	175	665
	Total month Oct. (I)	70	10.82	-	-	-

Figure 1. Lactation curve relative to the lactation month in the Carpathian breed (kg)



The evaluation of total milk production obtained from goats in different lactations, but benefiting from the same experimental treatment, was a first objective of the research carried out. For the purpose of

determining the main attributes on which milk quantity depends, a representative number of goats found in different lactations were studied.

In order to assess the productive level in relation to age, the investigated effective was structured into seven age groups depending on the livestock generation to which it belongs. The study shows that the largest quantities of milk were obtained from goats that were in the third and fourth lactation and belonged to the age group of five to six years.

This is of particular practical significance because, through technical control measures

carried out in the first lactations, we can obtain early enough information on the productive level characteristic of the goats, which also allows for a more efficient selection of the breeding biological material.

Compared with the average milk production obtained from the whole analysed effective, only the production obtained in the first lactation and in the last two have absolute average values below the average of the performance of the whole effective.

Table 2. Milk production specific to goats kept in stabbing in relation to age and lactation number

Lactation	n	Level of production (l)		Difference from first lactation		Age of goats (years)
		$\bar{X} \pm s \bar{x}$	V%	absolute (l)	relative (%)	
I	5	157.534 ± 0.654	11.87	-	-	2.5
a - II ^a	5	183.974 ± 0.327	12.34	26.440	14.38	4
a - III ^a	5	232.098 ± 0.341	9.41	74.564	32.12	5
a - IV ^a	5	218.987 ± 0.401	11.63	61.453	28.06	6
a - V ^a	5	188.896 ± 0.243	12.13	31.362	16.60	7
a - VI ^a	5	163.988 ± 0.189	9.20	6.454	3.93	8
a - VII ^a	5	148.977 ± 0.274	9.31	- 8.573	- 5.43	9
Total	35	181.438 ± 0.322	10.33	23.904	13.17	-

The carried out research has confirmed that there are kernels and individuals with superior productive potential in the local goat populations. Under these conditions, if these populations are subject to an intense selection process, it can be anticipated that in a not too long time, a radical change in the quality of the biological material will

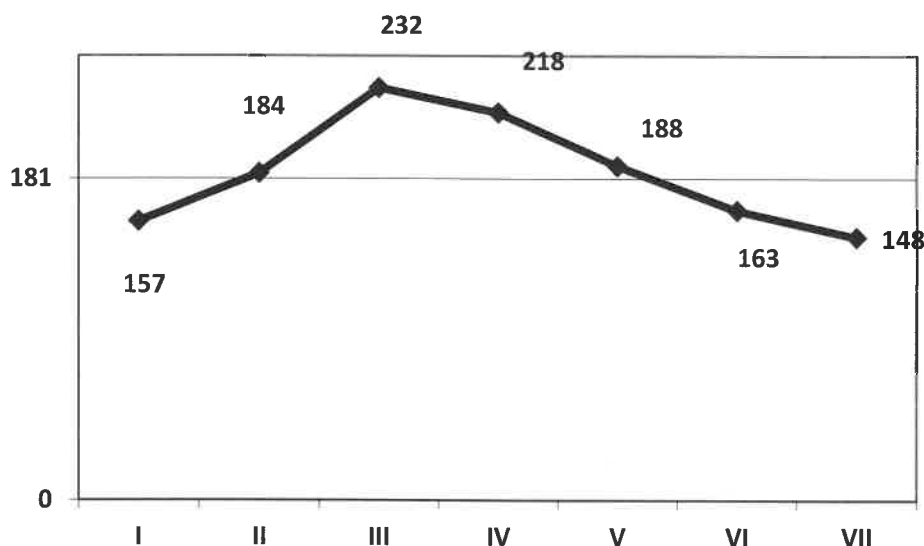
occur as well as a particular increase in productive performance.

From the analysis of the lactation curve in goats, we notice that the maximum yields are obtained from goats that are at the third lactation. This aspect is very important because in the case of goats, the maximum

milk yield is obtained when the age is of 3-4 years and we can intensify the selection by removing those with modest production

from the circuit and using as buck mothers of reproduction goats from those with superior productions.

Figure 2. Milk production curve in relation to lactation number and average of population (l)



Success can be complete if all these activities are combined with others which aim at improving the conditions of maintenance, nutrition in accordance with the nutritional requirements specific to each physiological state, the directed breeding of the young goat, the improvement of the pastures, the extension of the maintenance in the permanent setting, the optimal dimensioning of the age structure, etc.

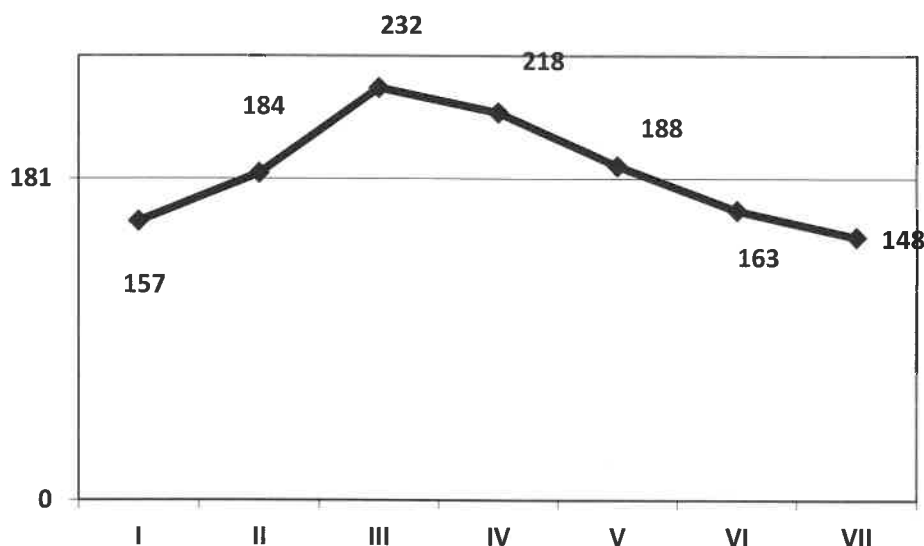
Conclusions

1. The assessment of productive performance in relation to the number of lactations shows that the highest level was obtained in the third lactation, the level reached being with 32% superior to the amount of milk obtained from the females which were at the first lactation.
2. The processing of the data obtained from the application of the productive control also highlights the fact that from the females at the seventh lactation a lower milk production is obtained by more than 8% compared to those at the beginning of the milk exploitation.
3. Analysis of the quantity of milk obtained from goats in the milking situation exclusively shows that the highest average daily yield was 680.75 ± 33.714 g and was obtained at the evening meal of the control day applied in June.
4. Since August due to the extremely high heat, the individual monthly average

milk yield is obtained when the age is of 3-4 years and we can intensify the selection by removing those with modest production

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5. Referring to the monthly production of the total individual milk quantity obtained between May and October we can see that in May and June we obtained 20.07% and respectively 20.31%.
6. The milk quality analysis shows that an average of 86.65% water and 13.35% SU was recorded on the total period of lactation.
7. In the first month under control it was found that the average milk protein level

was 2.62%, rising to 3.23% in August and reaching the maximum value of 3.75% in October.

8. The analysis of economic efficiency based on incomes achieved through the capitalization of the base production indicates a reduction of more than 25% in August and 38% in October.

Acknowledgment

The research carried out was financed by Foundation of the Academy of Agricultural Sciences in Bucharest-Romania.

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