

## RESEARCH REGARDING PRODUCTIVE POTENTIAL SPECIFIC TO GOATS BRED IN N-E PART OF ROMANIA

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### Abstract

The present paper is part of an ampler program which approaches the study of the productive potential of goats from Romania, with the purpose to elaborate a program for their genetic improvement. The genetic material taken for study is comprised of a number of 300 adult goats and 370 young goats of different ages. We monitored, through specific laboratory exams and measurements several indicators regarding the goats, such as: the weight at delivery (2,18-2,30 kg and the degree of corporal development ( $42,35 \pm 0,425$  kg in females and of  $46,5 \pm 0,353$  kg in males.), traits which characterize the pilose coating (the fine hair with a length of  $5,53 \pm 0,055$  cm and fineness of  $14,65 \pm 0,066$   $\mu$ , and the hair  $12,43 \pm 0,033$  cm and respectively  $21,31 \pm 0,26$   $\mu$ ), the lactogenic potential (over 500g in the interval May-July and similar to this value in the interval August-September ) the qualitative milk parameters (fat between 3,19% and 4,02%, proteins between 2,62% and 3,75%, and lactose around the value of 4%); aptitudes regarding the milk production (the daily average growth rates were of  $167,512 \pm 1,252$ g in the case of males and  $151,302 \pm 2,414$ g in females). The goats bred and exploited in the private sector from the North-East part of Romania are characterized through a strong heterogeneity.

**Key words:** goats, milk, weight, corporal – development

### INTRODUCTION

Considering the more and more attention paid to this species and taking into account that the respective populations have never been the object of scientific research, we carried out a large study on their main morphological and productive characteristics. The partial completion of the researches emphasizes the tardiness and heterogeneousness specific to the goats bred in Romania, that is why the elaboration of a programme of genetic amelioration of the latter is required.

### ABSTRACT

Originating from the hill and mountain zone of the Carpathians, Carpatina is a natural, vigorous, resistant race, representing over 80% of the total number of goats bred in Romania and being spread in every area of the country. From a morphological and productive point of view, the local Carpathian race goats present a great variability, as a consequence of their large habitat and of the low level of selection.

The body development and the outer appearance of the Carpathian goats are peculiar to the latish type, and the average height at withers is 62 cm. The body is generally narrow, the areas from the upper line are keen, the musculature is reduced, the skeleton is very resistant. The horns are present at both sexes. Its body constitution is vigorous; its temperament is very lively, externalized by mobility and agility. The pilose production consists of two types of fibres, respectively hair and fluff, which are distinguished from one another by length and fineness. The hair does not have textile qualities, its fineness is between 45-50 microns and its length is up to 14 cm.

The fluff's length is up to 7 cm and its fineness ranges between 20-30 microns.

The young goats' weight at birth ranges between 1.5-3.9 kg but varies depending on sex and the kidling type: the weight of the female young goats from simple kidlings ranges between 2.5-3.2 kg, and that of the male young goats between 2.7-3.3 kg; in case

of multiparous kidlings these values are diminished with 0.200-0.500 kg. A biological characteristic of the young goats is a growing pace which is more reduced during the suckling period compared to the young ovines. Thus, when they are 3 months old, the young goats have a body weight of 28-29% of the adult's weight, compared to 40-45% at lambs, but the growing pace is higher after the ab lactation, reaching 70-72% at age 1. Until two months of age, when the young goats reach the weight of 9-11 kg, their development dynamics depends on the milk production of the mother, and beyond this age on the regime and feeding level. In normal feeding and maintenance conditions, the young goats reach 25 kg on the average at 6 months old. The weight of the adult goats ranges between 35-45 kg and can reach over 55 kg. The polygraphy ranges between 130-160%.

The milk production varies according to the amelioration degree and the fodder process, ranging between 135 kg and 290 kg.

## **MATERIAL AND METHODS**

The biological material which represents the object of the research consisted in 300 adult goats and 370 young goats of various ages, belongs to the caprine species and is bred and exploited in the private farms in the North-eastern part of the country. Since the objectives were multiple and associated with activities as diverse as possible, we studied all types of young goats from the current and previous year, as well as the adult goats in order to achieve our goals.

The work methods applied in research were proper for this kind of research. Investigations, weighing and body measurements of mass and conformation for the adult goats, as well as growing measurements of the young goats categories were carried out for the assessment of the current situation and the estimation of the weight and of the body development degree.

In order to ascertain the features which characterize the pilose coating, we assayed samples from shoulders and thighs, which served to the ascertainment of the fluff and hair fibres' fineness. The fibres' fineness was objectively ascertained through microscopy, after the micrometrical value of the work device had been preliminarily established.

The fluff and hair fibres' length was assessed by measuring it with the meter rule.

The quantitative control of the milk production was carried out according to the official methodology adopted in Romania and in the European Union and was based on the control of the evening and morning milking from the day established for this purpose. The total amount of milk consumed by the young goats during the suckling period was ascertained due to the transformation quotient. In order to obtain information and data as decisive as possible during every control we assayed samples which, subsequently, served to the ascertainment of the main parameters on which the milk quality depends, especially grease protein and lactose.

The evaluation of the aptitudes for the meat production was based on the extensive fattening (traditional) of the young goats lots resulted from the kidling season of the current year and will continue the following year too.

The resulting data is centralized and statistically processed, and based on the productive performances the most valuable mother goats were identified. They were marked and mated with valuable he-goats, in order to get the anticipated genetic effect in the next generatio

## **RESULTS AND DISCUSION**

The ascertainment of the morphological peculiarities and of the body development degree. Through the investigations carried out, we tried to identify and ascertain the body development of the goats according to the age categories to which they belong, as well as other aspects such as: the ascertainment of the body conformation, colour, structure and the quality of the pilose coating. Knowing the morpho-productive features of the local goats represents an essential necessity in the application of the breeding technologies in the amelioration and exploitation of this species in conditions of economic efficiency.

At kidling, the body weight of the young goats was influenced by their number and by the mother goats' age ranged between the limits of  $2.18 \pm 0.131$  kg and  $2.90 \pm 0.213$  kg respectively, values that are presented in a centralized manner in table 1.

All these values range within the limits of the biological potential of the species and are similar to the data mentioned in the speciality literature from Romania by other authors who studied these aspects [1, 2, 3, 4, 5, 6, 7].

In the case of the young goats, determining the corporeal weight at different ages emphasizes the fact that under the conditions in which the tardiness degree characteristic to the local populations is a high one, we can consider that at the respective ages the corporeal weight has similar values to the biological potential of the local goats (table 2).

In the case of adult goats the body weight was of  $42,35 \pm 0,425$  kg in females and of  $46,5 \pm 0,353$  kg in males.

The achievement of corporeal measurements allows drawing some pertinent conclusions according to which the body format characteristic to these populations is pyriform, middle waist ( $71.55 \pm 0.73$  cm), the posterior train more developed, the superior line follows an antero-posterior trajectory, because of the fact that at the withers the average height was of  $73.12 \pm 0.75$  and in the croup the height was of  $73,12 \pm 1,22$  cm (table 3).

Table 1  
 The weight of goats at birth (kg)

Specification	Tip of birth	Number of kidling	Weight att birth	Limits
			$\bar{X} \pm s_{\bar{x}}$	
Youth female	Uniparous	25	$2.53 \pm 0.164$	1.95 – 2.76
	Multiparous	25	$2.18 \pm 0.131$	1.9 – 2.44
Youth male	Uniparous	25	$2.90 \pm 0.213$	2.2 – 3.2
	Multiparous	25	$2.67 \pm 0.168$	2 – 2.9

Table 2  
 Body weight of the young goats at different ages (kg)

Age att the weighing date (months)	Bodily weight		Limits
	$\bar{X} \pm s_{\bar{x}}$	V %	
2	$9.544 \pm 0.132$	5.64	8.32 – 11.54
4	$16.547 \pm 0.341$	7.55	13.48 – 18.43
6	$22.348 \pm 0.234$	9.85	19.55 – 25.14
10	$29.554 \pm 0.331$	8.31	24.86 – 33.19
16	$34.345 \pm 0.431$	11.14	29.54 – 36.55

Table 3  
 The main dimensions of the adult goats (cm)

Dimensions	Males		Females	
	$\bar{X} \pm s_{\bar{x}}$	% from the withers height	$\bar{X} \pm s_{\bar{x}}$	% from the withers height
Withers height	$73.23 \pm 0.75$	100.0	$69.87 \pm 0.82$	100.00
Crupper height	$74.56 \pm 0.66$	101.8	$71.68 \pm 1.07$	102.5
Body length	$75.53 \pm 0.98$	103.1	$72.69 \pm 1.14$	104.0
Thoracic dept	$35.19 \pm 0.14$	48.0	$29.53 \pm 0.19$	42.2
Breast width	$21.44 \pm 0.21$	29.2	$19.34 \pm 0.28$	27.6
Crupper width	$20.11 \pm 0.09$	27.4	$17.52 \pm 0.11$	25.0
Thoracic perimeter	$83.98 \pm 1.43$	114.6	$78.68 \pm 1.31$	112.6
Tibia perimeter	$9.79 \pm 0.03$	13.3	$7.18 \pm 0.77$	10.2

As regards the pilose coating, where the breeder disposes of a higher number of goats, the production of hair and fluff present a real interest as well. Usually, in Romania's

conditions this production is gathered at the beginning of spring, before the moulting of goats. On the analysed samples we determined that the fluff has a length of 53

$\pm 0,055$  cm and a fineness of  $4,65 \pm 0,066$   $\mu$ , and the hair  $12,43 \pm 0,033$  cm and respectively  $1,31 \pm 0,26$   $\mu$ . The colour of the pilose coating in the local goats is in the majority of cases white (72 %), but individuals with different colours, and many piebald goats are also frequently encountered

Establishing the zootechnical values based on the milk production assessment From the researches carried out, we ascertained that from the quantitative and qualitative point of view, the goat milk has a series of

particularities determined by the months, season, age, individuality and other factors.

With the purpose of determining the main characteristics that the quantity and the quality of milk depends on, we took in the study a number of 300 goats found in lactation and structured in five groups of ages according to the zootechnical generation to whom it belongs. In accordance with the objectives established every month of lactation, we assayed samples, which then were subject to chemical laboratory tests (table 4).

Table 4  
 The monthly evolution of the average milk production (ml)

The month	The milking	No.	$\bar{X} \pm s_{\bar{x}}$	V%	Limits	
					Min	Max
May	The evening	150	634.64 $\pm$ 22.879	32,15	255	1200
	The morning	150	589.45 $\pm$ 31,170	25.41	310	855
	Total day	300	612.25 $\pm$ 31.415	22.45	255	1200
	Total month (l)	300	17.43	-	-	-
June	The evening	150	680.75 $\pm$ 33,714	33.58	300	1050
	The morning	150	598.52 $\pm$ 28.783	40.22	350	1100
	Total day	300	630.05 $\pm$ 23.541	30,54	300	1100
	Total month(l)	300	17.64	-	-	-
July	The evening	150	553.64 $\pm$ 72.879	43.66	110	840
	The morning	150	518.89 $\pm$ 59.359	34.32	270	720
	Total day	300	538.00 $\pm$ 47.126	39.17	110	840
	Total month (l)	300	15.06	-	-	-
August	The evening	150	421.36 $\pm$ 34.241	38.12	200	800
	The morning	150	475.91 $\pm$ 28.457	28.05	300	730
	Total day	300	448.64 $\pm$ 22.390	33.11	200	800
	Total month(l)	300	12.56	-	-	-
September	The evening	150	482.61 $\pm$ 28.702	28.52	280	880
	The morning	150	471.82 $\pm$ 39.873	39.64	300	960
	Total day	300	477.33 $\pm$ 24.128	33.91	280	960
	Total month (l)	300	13.36	-	-	-
October	The evening	150	402.16 $\pm$ 18.270	22.45	175	630
	The morning	150	371.32 $\pm$ 27.303	35.14	185	665
	Total day	300	387.67 $\pm$ 15.813	28.25	175	665
	Total month(l)	300	10.82	-	-	-

The researches carried out emphasized the fact that, on the lactation intervals taken into consideration, the daily production of milk exceeded 500 g in May, June and July and were situated very close to it in the calendar interval August-October. This fact denotes the superior milk potential that the Carpathian race goats possess, but the rather high values determined for the variability potential indicates a strong heterogeneity of the respective character. The cause of this situation is firstly represented by the non-sustained

selection for the milk production and secondly, by the high variability, which also supposes the consequence of applying different alimentation and maintenance technique.

On the interval of the same lactation, the analysis of the same quantity of milk obtained emphasizes the fact that the highest production was of  $680.75 \pm 33,714$  g and was obtained at the evening milking from the day of the control applied in July.

Analysing the lactation curve we can determine that its top is placed in the first two

months after the young goats are weaned , in August, because of the extremely high heats, the monthly individual quantity of milk was 16.60% more reduced compared to July and with 6.37 % compared with September.

Reporting the monthly production to the individual quantity of milk obtained in the interval May-October, we can notice that in May and June we obtained 20.7% and respectively 20.31% (fig. 2).

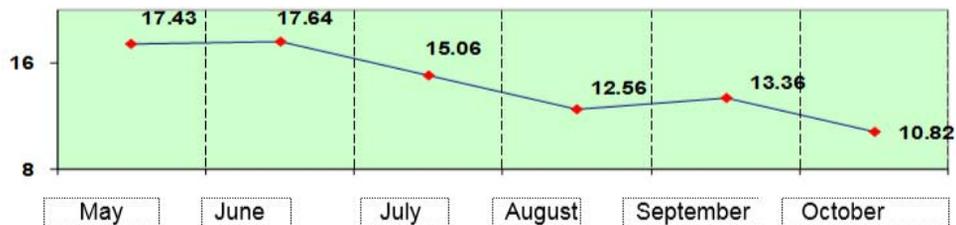


Fig. 1 The Lactation curve in the Carpathian race goat (l)

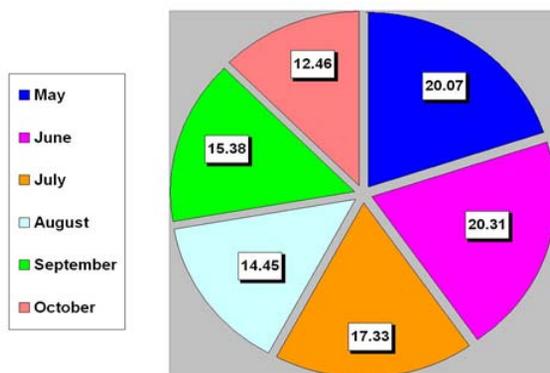


Fig. 2 The ponderosity of the monthly production from the total individual quantity obtained from the Carpathian goats (%)

The chemical laboratory tests carried out in view of establishing the values of the basic components of milk show the fact that, while the dry substance is maintained on the interval of the same lactation around the value of 12%, the percent of protein and fat in the milk has an ascendant evolution. Thus, while the fat contents of milk reaches the highest values in October ( $4.02 \pm 0.064$ ) the protein percentage continues to grow reaching the highest values in the last month of lactation taken into consideration.

The goat milk presents a high content of lactalbumin and an advanced dispersion of the fat globules, which increases its digestibility a lot

The goat milk is consumed, most of the times, as such, and only seldom is it processed in mixture with the cow and sheep milk.

The chemical composition of milk represents an extremely important quality indicator since it directly influences the quality of products derived from the milk processing. Besides, in countries such as France, Italy, Spain and Greece, in the selection of goats the protein contents in milk represents an extremely important factor.

Within the researches carried out, the chemical composition of milk was determined with samples assayed from the collected milk the day when the quantitative control of the milk production was carried out. The statistical processing of the data

obtained shows that, in the case of goats bred and exploited in the North-east part of the country, the milk contains 86.65 % water and 13.35 % dry substance. The monthly variation of the basic components represented by fat, protein and lactose, is presented in tables 5, 6 and 7, data presented in table 5 we can determine that the fat percentage has an inverse evolution as comparative sense with the average total quantity. Thus, in the first months of the lactation, when the milk quantity is the highest, the fat percentage has average values of  $3.19 \pm 0.033$ , in May it increases gradually and reaches  $4.02 \pm 0.064$  in October.

Such as the fat contents, the protein contents has a growing evolution, confirming thus the positive correlation which is established between the milk quantity and the protein level that is contains (1), thing emphasized in other studies carried out on

other populations by Taftă V [3] and Pascal C [2, 4, 5]. In May, when the average individual quantity was of 17.43 l, the protein contents of milk was of 2.62 %, then it increased at 3.23 % in August and reaches the value of 3.75 % in October (table 6).

The lactose or the sugar in milk gives the sweetish taste of freshly milked milk. Its sweetening power is about four times smaller than sucrose. It is secreted by the mammal gland, and is encountered in nature only in milk. From the chemical point of view, it is a disaccharide formed of a molecule of glucose and one of galactose.

The researches carried out until the present prove the fact that, unlike the other appreciated components, the lactose keeps a constant evolution ciphered around the value of 4%, not being influenced by the dynamics of milk production.

Table 5  
 The monthly dynamic of the fat contents in milk (%)

The month	The milking	No.	$\bar{X} \pm s_{\bar{x}}$	V%	Limits	
					Min	Max
May	Evening	150	3.06±0.201	11.42	2.15	3.91
	Morning	150	3.16±0.101	12.31	2.58	4.12
	Total day	300	3.19±0.033	15.33	2.15	4.12
June	Evening	150	3.20±0.102	10.15	3.00	4.45
	Morning	150	3.30±0.150	11.54	3.10	4.00
	Total day	300	3.25±0.033	12.31	3.00	4.45
July	Evening	150	3.26±0.101	10.28	2.72	3.69
	Morning	150	3.26±0.110	10.12	2.90	3.93
	Total day	300	3.26±0.073	9.94	2.72	3.93
August	Evening	150	3.98±0.130	15.99	3.03	5.73
	Morning	150	3.82±0.121	15.49	2.74	5.48
	Total day	300	3.90±0.088	15.73	2.74	5.73
September	Evening	150	4.18±0.135	15.81	3.41	6.11
	Morning	150	3.66±0.114	14.91	2.53	5.04
	Total day	300	3.93±0.096	16.71	2.53	6.11
October	Evening	150	4.77±0.151	13.83	3.47	6.21
	Morning	150	3.87±0.105	15.22	2.51	5.13
	Total day	300	4.02±0.064	15.15	2.51	6.21

Table 6  
 The monthly dynamics of the protein content in milk (%)

The month	The milking	No.	$\bar{X} \pm s_{\bar{x}}$	V%	Limits	
					Min	Max
May	Evening	150	2.70±0.011	8.54	2.44	3.25
	Morning	150	2.48±0.033	7.18	2.37	3.25
	Total day	300	2.62±0.035	7.78	2.37	3.25
June	Evening	150	2.90±0.074	8.49	2.57	3.82
	Morning	150	2.74±0.088	8.45	2.57	4.75
	Total day	300	2.85±0.057	8.58	2.99	5.36
July	Evening	150	2.80±0.071	8.45	2.47	3.25
	Morning	150	2.84±0.083	8.76	2.39	3.27
	Total day	300	2.82±0.053	8.41	2.39	3.27
August	Evening	150	3.42±0.096	13.76	2.76	4.75
	Morning	150	3.04±0.060	9.71	2.57	3.82
	Total day	300	3.23±0.062	13.39	2.57	4.75
September	Evening	150	3.76±0.097	12.64	2.99	5.36
	Morning	150	3.36±0.051	7.24	2.83	3.74
	Total day	300	3.56±0.062	12.00	2.83	5.36
October	Evening	150	3.94±0.071	12.41	2.97	5.42
	Morning	150	3.55±0.015	8.21	2.77	3.74
	Total day	300	3.75±0.026	9.13	2.77	5.42

Table 7  
 The monthly dynamics of the average percentage of milk lactose (%)

The month	The milking	No.	$\bar{X} \pm s_{\bar{x}}$	V%	Limits	
					Min	Max
May	Evening	25	4.05±0.017	5.14	3.07	4.35
	Morning	30	4.18±0.088	6.21	3.56	4.45
	Total day	55	4.12±0.047	6.66	3.07	4.45
June	Evening	30	4.12±0.021	5.21	3.55	4.58
	Morning	25	4.21±0.052	8.54	3.16	5.05
	Total day	55	4.18±0.033	7.48	3.16	5.05
July	Evening	11	4.11±0.051	4.11	3.86	4.39
	Morning	9	4.18±0.068	4.88	3.87	4.50
	Total day	20	4.14±0.041	4.44	3.86	4.50
August	Evening	24	4.02±0.062	7.55	3.07	4.35
	Morning	24	4.10±0.047	5.60	3.56	4.45
	Total day	48	4.06±0.039	6.63	3.07	4.45
September	Evening	24	4.20±0.035	4.11	3.92	4.47
	Morning	23	4.24±0.042	4.73	3.78	4.64
	Total day	47	4.22±0.027	4.40	3.78	4.64

Evaluating the aptitudes for the meat production of local goats. In the last years, the goat meat has gained a significant percentage in the world market of animal products, because of its dietetic properties and high digestibility. From this point of view, we create a favourable opportunity for exploiting the annual surplus of young goats.

In order to evaluate the potential specific to the meat production, within the researches

carried out we organized series of young goats that were subject to extensive fattening. The technology applied in fattening was the traditional one, based on fattening on the grassland, and supplementing the daily rate with a variable addition of concentrates.

The average daily increases were of 167,512 ± 1,252 g in the case of males and 151,302 ± 2,414 g in females (table 8).

Table 8  
The aptitudes of the Carpathian race for the meat production (kg)

Specification	Initial weight (kg)	Final weight (kg)	Fatening duration (days)	Total spore (kg)	Medium daily spore (g)
Males	15.245	40.313	150	25.068	167.120
Females	13.897	36.592		22.695	151.302

The skeletons obtained, although with a good conformation, had little resemblance with the characteristics of races with good aptitudes for meat.

The totality of values obtained because of the fattening of young goats can be considered eloquent as regards the aptitudes of the Carpathian race for the production of meat and justifies, from the economic points of view the capitalization of the surplus of young goats, but after a previous fattening.

Determining the fattening degree on the living and slaughtered animal confirms the adipose deposits in relation with the fattening level of each individual, with the exception of the under-skin area in which the adipose tissue was found in large quantities.

Establishing the physical and tissue structure of the skeleton shows the tardiness degree of the race, since, after the carving, the regions which were included in the II and III quality category predominated, and the ratio between bones and meat on the whole skeleton was of 1/2.78.

The most important aspects that confer the goat meat the qualities for which it is appreciated, consist in the lipid and caloric levels significantly inferior compared with the meat coming from the rest of the species of economic interest. The lipid level is about 8 times below that of beef and represents only a third of that of chicken without skin. In addition, the cholesterol content of the goat meat is inferior compared to the rabbit meat and venison. The caloric level of the goat meat (122 calories) is similar to the chicken without skin (120 calories) and twice smaller than the beef (245 calories).

As regards the vitamin contents, we notice a significant difference between the significant level of vitamins from the B group (thiamine – B1 and riboflavin – B2), and niacin (vit. PP), their percentage being almost double compared to that of beef, veal and lamb.

The identification of the most valuable goats is based on the performances achieved and established with the occasion of the milk production assessment. Since the lactation ended, the researches continue and the final dates regarding the objective, and the activities associates to it, will be reported subsequently.

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#### CONCLUSION

As a result of the researches carried out, the most important conclusions which we draw are:

- at birth, the body weight of billy goats is generally reduced being influenced by the maintenance state and the fertility of mother goats;

- in the young goats of different ages, we can consider that the body weight assessed has values similar to the biological potential of local goats;

- based on the data obtained after evaluating the conformation and carrying out the body measurements, we can establish that the adult goat populations bred in the North-East part of the country present a body conformation similar to the one typical to milk animals.

- because of the lack of the major preoccupations and selection works, and of the different states of maintenance, the local goat populations are characterized by a strong heterogeneity as regards the milk potential.

- the total milk production reaches maximum values in the first four lactations after which it gradually decreases.

- the monthly evolution of the milk production increases progressively until the

fifth lactation then it ceases in the following two-three lactations; afterwards it significantly decreases.

- towards the end of lactation, a slow value increase of the three milk components occurs, reaching maximum values in the last two months.

- the goats bred and exploited in the private sector from the Northeast region of the country are characterized through a strong heterogeneity as regards the quantity and quality of milk.

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