Hysi, L., Hoda, A., Papa, L., Jankulla, S., Ajçe, S. (2024): Growth pattern of goat kids from birth to weaning period of two imported breeds reared in southeast Albania. Agriculture and Forestry, 70 (4): 57-69. https://doi:10.17707/AgricultForest.70.4.05

DOI: 10.17707/AgricultForest.70.4.05

Lorena HYSI*[1]; Anila HODA[2];
Lumturi PAPA[2]; Sotiraq JANKULLA[3]; Sulltanë AJÇE[4]

GROWTH PATTERN OF GOAT KIDS FROM BIRTH TO WEANING PERIOD OF TWO IMPORTED BREEDS REARED IN SOUTHEAST ALBANIA

SUMMARY

This study aimed to evaluate the growth parameters from birth to weaning of Alpine and Saanen goat kids and determine the influence of factors like litter size and sex. The study was conducted on the farm of the Center of Agricultural Technology Transfer of Korca region located in the SothEast of Albania. The data were collected from a total of 50 goat kids, monitoring the body weight at different ages, types of birth, and sexes. The obtained results showed that Alpine goat kids weighed 3.59 kg at birth, 7.85 kg at 30 days and 13.01 kg at 60 days. At birth, Saanen goat kids' weight was 3.50 kg, at 30 days 7.66 kg, and at 60 days 12.43 kg. The differences between these two breeds for three weighed ages were not statistically significant ($p>0.05$). A statistically significant relationship ($p<0.01$) was observed between the type of birth and birth weight. Single goat kids tended to have greater weights than doubles and triples kids. Sex showed a significant influence on birth weight for Alpine goat kids. Females tended to be lighter compared to males throughout the study. Average daily gains from birth to 60 days of goat kids were 0.157 kg and 0.148 kg for Alpine and Saanen, respectively. Both Alpine and Saanen goat kids realized a satisfactory growth performance.

Keywords: goat kids, body weight, litter size, breed, average daily gain

INTRODUCTION

Goat farming is a primary agricultural activity, especially in the mountainous and hilly regions of Albania. In 2020, the total goat population was 774 thousand, while the number of milked goats reached 1619 thousand

[1]Lorena Hysi (corresponding author: lhysi@ubt.edu.al), Agricultural University of Tirana, Rruga Pajsi Vojdica, Kodër Kamëz, Tirana, ALBANIA
[2]Anila Hoda, Lumturi Papa, Agricultural University of Tirana, Rruga Pajsi Vojdica, Kodër Kamëz, Tirana, ALBANIA
[3]Sotiraq Jankulla, Center of Agricultural technology Transfer, Korca, ALBANIA
[4]Sulltanë Ajçe, Fan S. Noli Unversity, Shetitore "Rilindasit", Korca, ALBANIA
Notes: The authors declare that they have no conflicts of interest. Authorship Form signed online.
Recieved:04/07/2024 *Accepted:20/11/2024*

(INSTAT, 2020). The total goat milk production for the same year amounted to 80 thousand liters. Native goat breeds account for approximately 97% of the goat population (Jani and Kume, 2018).

The predominant rearing system is extensive, relying heavily on pasture and grazing throughout most of the year. Animals are only kept and fed indoors during rainy or snowy days. Native goat breeds, well-adapted to harsh environmental conditions, serve as an important source of milk and meat. They play a vital economic role in the lives of farmers, contributing significantly to the local community. Albanian goat farming is characterized by small farms that utilize extensive or semi-extensive management systems. These systems primarily depend on natural grazing with minimal supplemental feed, producing milk and meat mainly for family consumption.

Due to the absence of controlled breeding programs and herd books, local goat breeds exhibit significant genetic admixture and low differentiation (Hoda *et al.*, 2023). Being local breeds, their production levels for both milk and meat are relatively low. However, productivity could be enhanced through genetic selection and improved breeding systems (Răducuţă *et al*., 2007).

To address production challenges, exotic goat breeds such as Alpine and Saanen have been introduced to improve milk and meat yields. These breeds are either breed pure or used for crossbreeding with local goats to enhance productivity. The Agricultural Technology Transfer Center (ATTC) manages herds of 30 Alpine and 50 Saanen goats. These animals serve as purebred nuclei and are used for the genetic improvement of the local goat population (Hoda *et al*., 2022).

The Alpine goat breed, widely distributed and highly versatile, performs well in both purebred and crossbred forms for milk and meat production (Xhemo *et al.*, 2013). Originating from temperate mountain ranges, Alpine goats are well-suited to cold and heat and are highly adaptable to steep mountain slopes. Known for their even temperament and robust health, Alpine goats produce high quantities of milk, necessitating close monitoring of their diets to meet nutritional needs.

Similarly, the Saanen goat is a renowned dairy breed with great potential as a milk-producing livestock species (Zurriyati *et al*., 2011). Goat milk has advantages over cow's milk, being easier to digest due to its smaller and more homogeneous fat globules (Jenness, 1980). However, Saanen goats require proper farming conditions, including adequate shade and supplemental nutrition, as they are vulnerable under suboptimal conditions. Crossbreeding programs have shown success when these conditions are met, particularly for purebred exotics and backcrosses beyond the F1 generation.

Improving milk and meat production in small ruminants can also be achieved through the implementation of advanced rearing technologies and the incorporation of supplementary feeding practices. (UNDP, Albania, 2007, Hoda *et al.*, 2009).

This study aimed to evaluate the growth performance of Alpine and Saanen goat kids from birth to 60 days (weaning period) under semi-intensive conditions in southeastern Albania. It also investigated the effects of factors such as litter size and sex on measurable growth criteria, including weight at specific ages and

average daily gain (ADG) (Aissaoui *et al*., 2019). Understanding the growth pattern during the early life stage is essential for establishing appropriate feeding practices and determining optimal weaning times based on weight rather than age. Growth data can further support breeding programs designed to enhance not only growth performance but also overall productivity. Early-life growth significantly impacts post-weaning survival and adaptability to rearing conditions.

The ATTC of Korça plays a crucial role in designing programs for goat breed improvement, aligning with market and societal needs to increase livestock production and farmers' incomes (Leka, 2019). Studying the growth capacities of goat kids is key to optimizing management practices and improving the efficiency of the birth-to-weaning period.

MATERIAL AND METHODS

The current study was performed on two imported goat breeds, "Alpine" and "Sannen" that are reared at the Agricultural Technology Transfer Center (ATTC), located in the SouthEast region of Albania. The records of the body weight of 50 goat kids were collected. Data were recorded from 27 individuals from Alpine breed and 23 from Saanen breed. For each goat kids were recorded type of birth (single, double or triple) and sex (male or female). The weighting time of each animal was performed each month from birth till weaning time (60 days). The weighting was done with electronic balance with an accuracy of 0.01 kg.

The data were analyzed by software package IBM SPSS Statistics 20 and the XLSTAT software (Data Analysis and Statistical Solution for Microsoft Excel, Addinsoft, Paris, France, 2017). Daily weight gain and weight gain at weaning were calculated. The statistical difference was reported at ($P<0.05$). The generalized linear model (GLM) was used to test the effects of factors on the variables, by applying the independent sample T test and ANOVA to estimate the significance of homogeneity between different sets of data (comparison test between the averages). The correlation results were calculated by the Pearson test for the evaluation of the relationship between live weights at different growth phases.

The growth evolution was estimated using the following growth indices:

- Growth rate: absolute (A) and relative(R);
- Growth intensity (I);
- Growth factor (F);

Growth rate expressed as absolute and relative values, indicates the average body mass increase observed in the animal between determinations (1) and (2). The increase in body mass over a certain period (t) is growth intensity (3). The growth factor is the mass achieved in a given growing period (Mt) of the final animal mass (Mf) expressed as a percentage (Dărăban, 2006).

$$A = M2 - M1/t \quad (1)$$
$$R = M2 - M1/M1 * 100 \quad (2)$$
$$I = M2 - M1/M2 + M1 * 2 * 100 \quad (3)$$
$$F = Mt * 100/Mf \quad (4)$$

Where:
M1=body mass at t1 (kg); M2=body mass at t2 (kg); Mt=body mass accumulation in a period (kg); Mf=final body mass (kg); t=period between t1 and t2 (days).

RESULTS AND DISCUSSION

Alpine and Saanen goat kids used in this study were raised at the same farm in the Agricultural Technology Transfer Center (ATTC), so they benefited from the same climatic conditions and feeding. Three birth types, were identified single birth, twin birth, and triple birth (Figure 1).

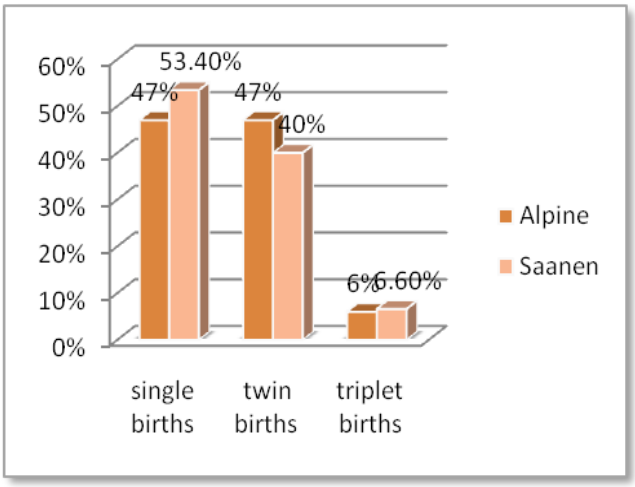

Figure 1. Number of single, twin, triplet births (%) for Alpine and Saanen goat

Alpine goats have the same number of single and twin birth (47%), followed by a low percentage of triple births (6%). Saanen goats have a small difference between single and double births, where the predominant are the single births (53.4%).

The high percentage of female kids number represents an advantage for the farm because the selection can be made much more rigorously, but also males obtained annually have an economic advantage for the farm because they accumulate body mass in relatively less time than females (Marina *et al.*, 2020). The number of female kids for Alpine breed reported in this study was higher than for males, the opposite is for Saanen breed where the predominant are males (Figure 2).

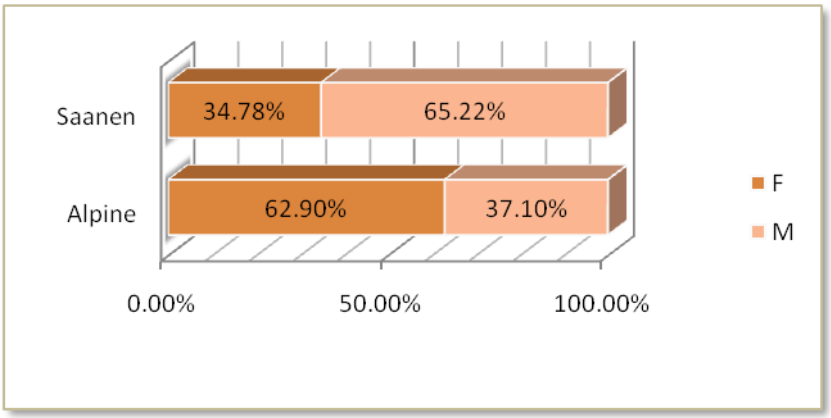

Figure 2. Percentage ratio of females (F) and males (M) for Alpine and Saanen goat kids

Table 1. Descriptive statistics for body weight at birth, at 30 days and 60 days

Breed		Weight at birth (kg)	Weight at 30 days (kg)	Weight at 60 days (kg)	Gain weight at 60 days (kg)	Average daily gain (kg)
Alpine N=27	Mean	3.59	7.85	13.01	9.42	0.157
	SD	0.605	1.186	2.701	2.463	0.041
	SE	0.116	0.228	0.519	0.474	0.007
	Min	2.00	6.00	8.00	6.00	0.10
	Max	4.50	10.30	19.00	15.00	0.25
	V	0.366	1.407	7.298	6.071	0.002
Saanen N=23	Mean	3.50	7.66	12.43	8.93	0.148
	SD	0.564	1.141	2.096	1.949	0.032
	SE	0.117	0.238	0.437	0.406	0.006
	Min	2.50	6.00	8.00	5.00	0.080
	Max	4.50	10.00	16.00	13.00	0.221
	V	0.318	1.303	4.393	3.802	0.001

The birth weight of Alpine goat kids ranged from 2.00 to 4.50 kg with an average value of 3.59±0.605 kg (Table 1). The average birth weight of Saanen goat kids was 3.50±0.564 kg which is slightly lower (0.09 kg) than the Alpine breed. It ranges from 2.50 to 4.50 kg. The differences between these two breeds were not significant (F=0.309, p=0.581).The average birth weight of kids recorded in this study is similar with those obtained from Doize *et al*, for Alpine and Saanen breeds, which recorded birth weights of (3.62 and 3.43 kg); respectively (Doizé *et al*., 2013). However, it was higher than the birth weight recorded in Sahel kids in Senegal (2.24 kg) (Djakba, 2007) the Creole goats of Guadeloupe (1.64 kg) (Chemineau and Grude, 1985), as well asin goats of Maradi breed in Niger (1.85kg) (Djıbrıllou, 1986).

Birth weight is a good indicator of mothers' diets in the last weeks of gestation (Reveau *et al*., 1998), during which the fetus would acquire 75% of its birth weight (Nadon, 2017). Ensuring the mother receives sufficient inputs is

crucial for maintaining her physiological functions and providing the necessary energy and nutrients for fetal growth (Aissaoui *et al*., 2019). The influence of maternal factor in the first 30 days of life of goat kids is very important but after 30 days this factor tend to decrease and in general the accumulation of body mass is provided by the consume of goat milk and also by additional feed. (Călin *et al.*, 2015).

The lowest average body weight at 30 days of age was found in Saanen goat kids (7.66 kg) and the highest value was found in Alpine (7.88kg), a small differences between breeds which is not statistically significant (F=0.318, p=0.575).

The average body weight of Alpine and Saanen kids at 60 days was 13.01 kg and 12.43 kg respectively. Saanen breed displayed a lower body weight but again this difference is not statistically significant (F=0.709, p=0.404).

For Alpine breed were observed higher values of body weight in the three different periods of life, but this difference is not significant. So we can say that in this case the breed does not affect body weight, $p>0.05$ at three weighing periods. (t-test and ANOVA). F=0.707, p=0.405. The F tests the effect of Breed. Both Alpine and Saanen are imported milk breeds similar to each other and the feeding level practiced in ATTC of Korca is the same for both breeds. According to R. Rojo-Rubio *et al*, (2016) study, the pre-weaning weight, weaning weight (WW), and daily weight gain (DWG) of kids from Alpine (AG), Saanen (SG), and Anglo-Nubian (ANG) breeds were unaffected by the type of kidding and breed, and were higher in males than in females. There may be individual variations, but the breed does not significantly affect the body weight at the specified ages when compared across these breeds.

Regarding the intensity of the growth, the same increasing trend is observed for Alpine and Saanen breeds, with similar values, having an average daily increase (ADG) of 0.157±0.041 kg from 0 to 60 days for Alpine kids and for Saanen breed 0.147±0.032 kg. The average weight gain for Alpine kids from 0 to 60 days was 9.42±2.463 kg compared with Saanen kids which reached a lower weight gain 8.93±1.949 kg. Alpine kids achieved an average daiy gan and a total weight gain 6.8% and 5.5% higher compare to Saanen kids, proving a better capacity to convert milk to body mass (ICDCOC Palas, 2010).

The average body weight of kids at birth, variance, the minimum and maximum values and the significance of the statistical differences for Alpine and Sannen breed are shown in the table below (Table 2).

Many factors influence the growth of the animals and the most important are breed, sex, litter size, age of mother, nutrition, and breeding management (Janos *et al*., 2018). Also growth technology, maintenance level, and microclimatic factors influence the growth and development from birth to weaning.

Table 2. The average birth weight (kg), variance, the minimum and maximum values, confidence interval and the significance of the statistical differences

recorded for Alpine and Saanen goats according to the type of birth and sex of goat kids (kg)

	Alpine			Saanen		
n	8	16	3	8	12	3
type of birth	single	double	triple	single	double	triple
Min	3.00	2.00	3.00	3.00	3.00	2.50
Max	4.50	4.50	3.50	4.50	3.50	3.00
Mean	3.937	3.500	3.166	4.000	3.333	2.833
SD	0.495	0.632	0.288	0.597	0.246	0.288
CI 95%	3.523-4.351	3.163-3.837	2.449-3.883	3.50-4.499	3.176-3.489	2.116-3.55
V	0.246	0.400	0.083	0.357	0.061	0.083
p value		*	**		**	***
n	10		17	15		8
sex	M		F	M		F
Min	3.50		2.00	2.50		3.00
Max	4.50		4.50	4.50		4.50
Mean	3.850		3.441	3.533		3.437
SD	0.411		0.658	0.611		0.495
CI 95%	3.555-4.144		3.102-3.779	3.194-3.871		3.023-3.851
V	0.169		0.434	0.374		0.246
p value		*				ns

M-male; F-female; V-variance; CI-confidence interval; MEAN-average; SD-standard deviation * $p<0.05$, ** $p<0.01$, *** $p<0.001$

Birth weight was influenced by the type of birth and significant differences were observed in the Alpine and Saanen breeds. Single born Alpine kids had higher birth weight (3.937 kg) compared with twins (3.50 kg) and triple born kids (3.166kg). Higher differences were observed between single and triples birth ($p<0.01$). Also single birth of Saanen kids had higher birth weight (4 kg) followed by twin birth (3.33 kg) and the lower value of birth weight was recorded in triple birth (2.83 kg). The difference is statistically significant ($p<0.001$). $R=0.325$, so 32.5% of variation in birth weight is explained by the factor of litter size. The kids from single birth have a better growth rate (Pascal *et al*, 2011). Single kids tended to have greater weights than twins and triples during all the

experimentation, (Figure 3). As reported in Doizé *et al*. (2013), and Meza-Herrera *et al*. (2014), cited by Nadon (2017) the type of birth had a significant effect on birth weight; a similar result was reported in Burundi kids (Djıbrıllou, 1986).

It was appeared that competition between fetuses for nutrients and uterine space increased with fetus' number during gestation, reducing their weights (Lawrence *et al.*, 2012). In a study conducted by Amoah *et al.* (1996) on several goat breeds including Alpine and Saanen, it was found that each increase of one fetus per litter was associated with a weight decrease of 0.45 kg per kid. Similar were our values where Alpine single birth kids were 0.437 heavier than twin birth kids. For Saanen breed the difference was higher (0.666 kg).

Differences were observed also between male and female kids. (Figure 3). Females of Alpine breed tended to be lighter compared to males throughout the study.

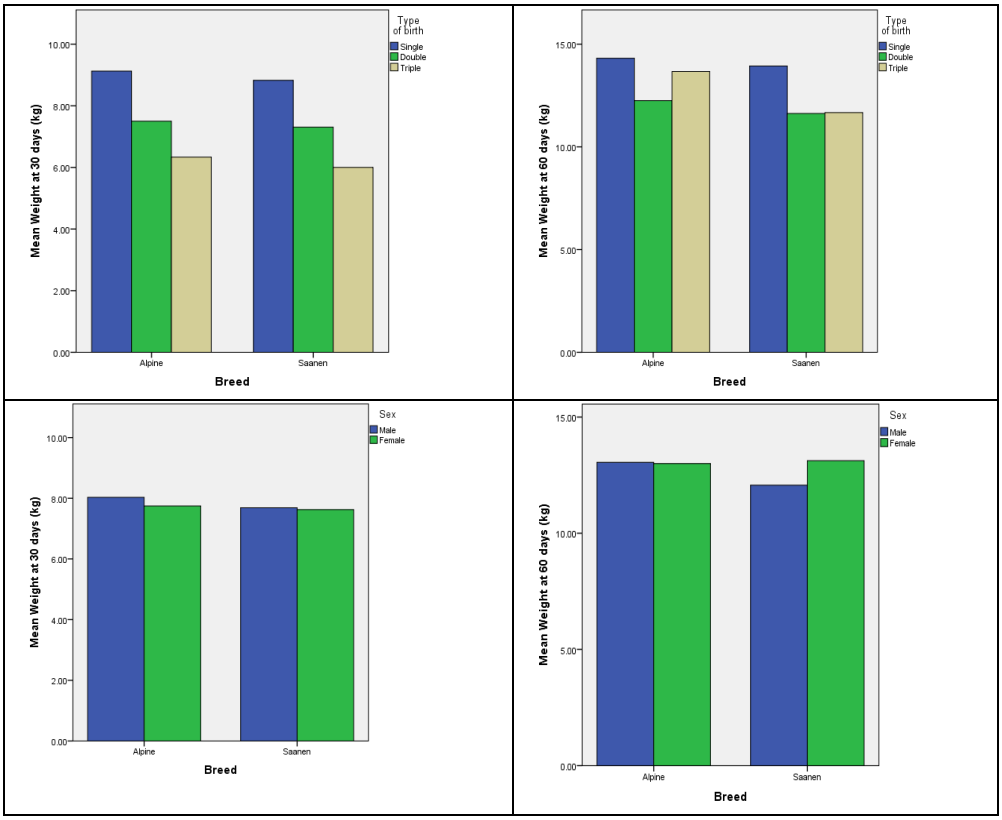

Figure 3. Variation of weight at 30 and 60 days by litter size and sex in Alpine and Saanen goat kids

The average birth weight for Alpine male goat kids was 3.85 kg and for female 3.44 kg the significant difference ($p<0.05$). Saanen male kids had slightly

higher value of birth weights compared to females, 3.53 kg and 3.43 kg recpectively, but the difference was not significant (p>0.05).

In the study conducted by Hagan *et al.* (2012) was found that males were heavier at birth than females with respective weights of 1.25 and 1.15 kg. The same findings were made by Meza-Herrera *et al.* (2014), in Mexico, where was found a significant difference in mean birth weight, by sex (3 kg for males, and 2.77 kg for females).

The difference in growth between the sexes lay in conformation and metabolism; according to Benevent *et al.* (1971), each sex evolved under the control of its own endocrine balance, which favored a more or less important organ development.

The absolute growth rate (A) from 0-30 days for Alpine single kids were 0.172 kg. Twin kids had an absolute growth of 0.133kg and triple 0.105kg (Table 3).

Table 3. Variation of growth indices calculated according to type of birth, kids goat sex for Alpine and Saanen goat to birth at 30 days

	Trait		n	A (kg) X±sX	R (%) X±sX	I (%) X±sX	F (%) X±sX
0-30 days							
Alpine	birth type	S	8	0.172±0.022	132.78±17.42	79.50±6.60	56.81±3.45
		D	16	0.133±0.013	119.59±35.58	73.61±11.80	53.57±5.94
		T	3	0.105±0.009	100±0.00	66.66±0.00	50.00±0.00
	Level of segnificance			**	*	ns	ns
	Sex	M	10	0.139±0.023	108.56±12.74	70.16±5.33	51.89±2.92
		F	17	0.143±0.029	128.83±34.93	77.18±11.79	55.45±5.97
	Level of segnificance			ns	*	ns	ns
Saanen	birth type	S	8	0.160±0.018	123.60±27.44	75.66±9.82	54.73±5.05
		D	12	0.132±0.023	120.71±27.98	74.40±11.02	54.00±5.95
		T	3	0.106±0.008	113.33±23.09	71.89±9.05	52.77±4.81
	Level of segnificance			*	*	ns	ns
	Sex	M	15	0.138±0.032	119.12±29.42	73.68±11.32	53.61±6.04
		F	8	0.139±0.012	123.80±20.52	76.06±7.40	55.01±3.80
	Level of segnificance			ns	ns	ns	ns

*p<0.05, **p<0.01, ns- p>0.05. X - average; sx-standard deviation; V-variance; S-single; D-twin; T-triple; M-male; F-female; A-absolute growth; R-relative growth ; I-growth intensity; F-growth factor

The differences between type of birth were significant ($p<0.01$). The same situation is for the Saanen breed also, where a higher value of absolute growth was recorded in the single births.

Table 4. Variation of growth indices calculated according to type of birth, kids goat sex for Alpine and Saanen goat from birth to 60 days

	Trait		n	A (kg) X±sX	R (%) X±sX	I (%) X±sX	F (%) X±sX
0-60 days							
Alpine	birth type	S	8	0.173±0.052	266.54±87.52	111.82±14.93	71.47±6.02
		D	16	0.145±0.035	253.55±50.37	110.39±12.00	70.94±5.13
		T	3	0.175±0.014	334.92±54.98	124.65±8.23	76.73±3.17
	Level of significance			*	*	*	*
	sex	M	10	0.153±0.034	239.26±51.02	107.78±11.04	69.88±4.72
		F	17	0.159±0.045	282.42±75.43	115.11±13.55	72.83±5.58
	Level of significance			ns	*	*	ns
Saanen	birth type	S	8	0.166±0.022	253.81±50.37	110.82±10.70	71.17±4.56
		D	12	0.138±0.038	251.58±82.42	109.13±13.87	70.37±5.62
		T	3	0.147±0.012	315.55±58.24	121.77±8.51	75.63±3.26
	Level of significance			*	*	ns	ns
	sex	M	15	0.142±0.024	247.47±57.36	109.29±11.14	70.51±4.65
		F	8	0.161±0.012	285.51±89.48	115.26±14.78	72.87±5.97
	Level of significance			*	**	ns	ns

* $p<0.05$, ** $p<0.01$, ns- $p>0.05$. X-average; sx-standard deviation; V-variance; S-single; D-twin; T-triple; M-male; F-female; A-absolute growth; R-relative growth; I-growth intensity; F-growth factor

Table 5. Pearson's correlation coefficients between growth parameters and weight at different ages for Alpine and Saanen goat kids

Variables	W0	W30	W60	A	R	I	F	ADG
W0	**1**							
W30	**0.759****	**1**						
W60	**0.451****	**.480****	**1**					
A	0.366*	**0.884****	0.362**	**1**				
R	-0.509*	0.153	-0.118	**0.586****	**1**			
I	**-0.478****	0.201	-0.074	**0.631****	**0.992****	**1**		
F	**-0.463****	0.219	-0.057	**0.645****	**0.983****	**0.999****	**1**	
ADG	0.231	0.326*	**0.973****	0.299*	0.004	0.043	0.059	**1**

The same parameters mentioned above were analyzed for the period from birth to 60 days (Table 4). No significant differences were observed in growth parameters between Alpine and Saanen goat kids. The difference between males and females was not significant for all the growth parameters. Sometimes individual factors influenced more weight and performance variations than sex, or even litter size (Leimbacher and Tatareau, 1991).

Mean values of growth parameters were analyzed and reported in Table 5. Pearson correlation test at two levels of significance (0.05 and 0.01) showed significant correlations, mostly positive, and linking growth parameters ($r>0.5$). Significant correlations were noted between weights at 30 and 60 days with ADG. Also, significant and strong positive correlations were observed between absolute growth rate and weight at different ages.

CONCLUSIONS

The type of birth significantly influenced birth weight, with statistical support at $p<0.01$. Single kids tended to have greater weights than twins and triples. Sex showed a significant influence on birth weight for Alpine goat kids. Females tended to be lighter compared to males throughout the study. Average daily gains from birth to 60 days of kids were 0.157 kg and 0.148 kg for Alpine and Saanen, respectively. Both Alpine and Saanen goat kids realized a satisfactory growth performance.

The differences and variationsin the growth pattern of the Alpine and Saanen kids would be very helpful for better understanding of the production characteristics of these breeds. The results of the study canserve to goats breeder, in choosing the breed that fits better to their farming system and improve the production level for both milk and meat. These breeders can be put in the genetic breeding program. Growth data can be used for selective breeding programsconducted by ATTC of Korca to improve growth rates and overall productivity.

REFERENCES

Aissaoui, M., Deghnouche, K.., Boukhalfa,H.H. & Imen, Saifi. (2019). Growth Performance of Goat Local Breed Reared in Southeastern Algeria. World J Environ Biosci, 8, 2:59-66.

Amoah, E A., Gelaye, S., Guthrie, P. & Rexroad, C E. (1996). Breeding season and aspects of reproduction of female goats. J. Anim. Sci, 74(4):723-728

Benevent, M., Bressot, C. & Paolantonacci, S. (1971). Relative postnatal growth in both sexes of the major tissues and organs of Arles Merino lamb (in French). Annales Biologie animale, Biochimie, Biophysique, 11(1): 5-39.

Călin, I., Răducuţă, I., Dărăban, S., Vlad, I., Priseceanu, H., Pascal, C. & Padeanu I. (2015). Research On Quantitative Skills in Meat Production Direction at Youth Goats from Carpathian Breed in Relation with the Rearing System. Agriculture and Agricultural Science Procedia, 6, 191–196.

Chemineau, P. & Grude, H. (1985). Mortality, birth weight and growth of kid Creoles born in semi- intensive breeding. Annales de zootechnie, INRA / EDP Sciences, 34 (2), pp.193-204.

Dărăban, S. (2006). Sheep breeding technology. Cluj-Napoca, RO: Risoprint Publishing House, pp. 70-75.

Djakba, A. (2007). Evaluation of reproductive parameters in Sahelian goat artificially inseminated in the Fatick region. Thèse.Doc.

Djibrillou, O. (1986). Factor influencing age-old weights of red goats.Maradi station in Niger.

Doizé, F., Beauregard, M., Dion, M., Brunelle, C., Doyon, A., Maher, G., Clair, F., Grothé, S., J. Marcoux, S.,Vermette, J.,Jolin, R,Lussier. & Vetermeerschen, J. (2013). Development of a breeding plan dairy goats, Final report. Project Number: 6527. Funded by Agriculture and Agri-Food Canada, Canadian Agricultural Adaptation Program.Page 111.Quebec Dairy Goat Breeders' Society.

Hagan, J., ObengApori, S., Bosompem, M., Grace, A. & Mawuli, A. (2012). Morphological Characteristics of Indigenous Goats in the Coastal Savannah and Forest Eco-Zones of Ghana. Journal of Animal Science Advances.(J Anim Sci. Adv), 2. 13-821

Hoda, A., Dobi, P., Hyka, G. (2009). Genetic diversity and distances of Albanian local sheep breeds using microsatellite markers. Livestock Research for Rural Development. Jun 17;21(6):93.

Hoda, A., Hykaj, G., Hysi, L., Bixheku, XH. (2023). Genetic structure of three Albanian local goat breeds based on micosatellite markers. Agriculture and Forestry, 69 (2): 7-19. doi:10.17707/AgricultForest.69.2.0

Hoda, A., Mecaj, R., Hykaj, G. (2022). Morphometric characterization of four sheep breeds reared in South East of Albania. Agriculture and Forestry, 68 (3): 241-253. doi: 10.17707/AgricultForest.68.3.18

I.C.D.C.O.C. Palas. (2010). Improving milk productionin goat populations by crossing with the best specialized breeds.Research report, Sector Stage Project V, Constanţa.

Instat: (2020). INSTAT database. Retrieved May 21, 2022, from http ://www.instat.gov.al/en/themes/agriculture-and-fishery/livestock/.

Jani, S. & Kume, K. (2018). Agrobiodiversity in Southeast Europe - assessment and policy recommendations - country report Albania. Deutsche Gesellschaftfür Internationale Zusammenarbeit (GIZ) GmbH

Janoš, T., Filipčík, R. & Hošek, M. (2018). Evaluation of growth intensity in Suffolk and Charollais sheep. Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis, volume 66, pg 61-67.

Jenness, R. (1980). Composition and Characteristics of Goat Milk Review 1968-1979. Journal of Dairy Science, 63, 1605-1630.

Lawrence, T L J., Fowler, V R. & Novakofski, J E. (2012): Growth of farm animals. Antonín Holub, 45(4), pp: 217–218.

Leimbacher, F. & Tatareau, J C. (1991). Evolution of goat performance control results in Guadeloupe. High Magazine Med. Vet.Puystoo. 63-68.

Leka, F. (2019). Mapping the genetic resources of autochthonous farm animals in Albania. UNDP-GEF Project “Strengthening human resources, legal frameworks, andinstitutional capacities to implement the Nagoya Protocol” (Global ABS Project).

Marina, A., Dărăban, S., Constantinescu, R., Cocan, D.,Răducu, C., Laţiu,C.,Uiuiu, P.,Avram, C. & Mireşan, V. (2020). Dynamic of body weight evolution of carpathian kids goat and kids breed goat (♂saanen x ♀carpathian) from birth to weaning. Scientific Papers.Series D. Animal Science. Vol. LXIII, No. 1.

Meza-Herrera, C A., Serradilla, J M M E., Munoz-Mejias, F., Baena-Manzano. & A. Menendez-Buxadera (2014). Effect of breed and some environmental factors on body weights till weaning and litter size in five goat breeds in Mexico. Small Ruminant Res, 121(2/3):215- 219.

Nadon, S. (2017). The weight of dairy goats at breeding: association with age and the probability of birthing.doc

Pascal, C., Pădeanu, I., Călin, I., Daraban, St. & Nacu, G. (2011). Researches related to meat yield aptitudes of Carpatina breed reared in Romania. Lucrări Ştiinţifice, SeriaZootehnie, 55, 328–331.

Răducuţă, I., Marmandiu, A., Cristian, C., Grigoraş, G. & Iftimie N. (2007). Research regarding the morpho-productive parameters to the Carpathine goat breed from Slobozia-Ialomiţa area. Acta Universitatis Cibiniensis, Agricultural Sciences, 1(7), 121–126.

Rojo-Rubio, R., Kholif, A.E., Salem, A.Z.M., Mendoza, G.D., Elghandour, M.M.M.Y. J., Vazquez-Armijo, F. & Lee-Rangel, H. (2016). Lactation curves and body weight changes of Alpine, Saanen and Anglo-Nubian goats as well as pre-weaning growth of their kids. Journal of Applied Animal Research. Volume 44, 2016 - Issue1 331-337

UNDP, Albania. (2007). Assistance to the livestock trade (alt).

Xhemo,F., Hajno, L., S, Gjançi. & R. Hoxhallari. (2013). Goat production in Albania: a review of goat breeding. Proceedings – 24th International Scientific-Expert Conference of Agriculture and Food Industry – Sarajevo