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## WEIGHT DEVELOPMENT DURING SUCKLING PERIOD OF KIDS FROM TWO INDIGENOUS BULGARIAN GOATS BREEDS

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**Abstract:** The Kalofer longhaired goat and the Bulgarian screw-horned longhaired goat are Bulgarian native goat breeds, with status “endangered”. In the modern scientific literature there are no detailed data on their productive qualities - meat production, milk yield, etc. In a view of the sustainable conservation, and development of these local genetic resources, the knowledge of their potential for goat production is a particularly important. In recent years, with the growing popularity of these two Bulgarian goat breeds, the interest for researches in this direction has increased. In the present paper, the growth abilities of kids from Kalofer long-haired and Bulgarian long-haired goats during the mammalian period (90 days) have been investigated. The kids and their dams, were reared in traditional technology and conditions. The study was conducted in herds from the region of Kresna Municipality (Southern slopes of Pirin mountain), Southwestern Bulgaria. 98 female and 40 male kids of both breeds were studied. The average live weight at birth of the Kalofer longhaired kids was 3.6 kg, and 3.4 kg for males and females, respectively. At 30 days of age, males Kalofer kids weighed 8.7 kg, and females 8.4 kg. At 60 days of age, the live weight was - 14.7 kg, and 12.8 kg for males, and females, respectively. At weaning, at 90 days of age, the males Kalofer longhaired kids weighed 19.3 kg, and the females 17.07 kg. The average live weight at birth for the Bulgarian screw-horned longhaired kids was 3.6 kg, and 3.4 kg - in males and females, respectively. At 30 days of age, males Screw-horned kids weighed 8.7 kg, and females 8.4 kg. At 60 days of age, the live weight was - 14.7 kg, and 12.8 kg for males and females, respectively. At weaning, at 90 days of age, the males Bulgarian screw-horned longhaired kids weighed 19.3 kg, and the females 17.07 kg.

**Keywords:** Kalofer longhaired goats, Bulgarian screw-horned longhaired goats, weight development, weight at weaning.

### 1. INTRODUCTION

Over the past 20 years, interest in the local genetic resources in goat breeding has increased. The local breeds can be considered as the best variant when grown in harsh environments with unfavorable conditions (Rashamol et al, 2018). Given their relatively low productivity, there is a real danger that the local goats will become extinct as genetic resources (Klug, Cummings, & Spencer, 2010), therefore various strategies are being developed to increase their productive qualities. One possible solution to this problem is by crossing with highly productive breeds, but this would have a detrimental effect on the unique genetic code of the local, old, and perfectly adapted breed. The other option is targeted selection to increase the productive traits through the methods of purebred breeding. However, this includes better herd management and accurate breeding documentation (Miah, Uddin, Akhter, & Kabir, 2003; Manirakiza, Moula, Detilleux, Hatungumukama, & Antoine-Moussiaux, 2019). To achieve effective results in this approach to genetic progress in the local goats, it is important to prepare breeding programs and establish farmers' organizations, involved in the breeding of indigenous goat breeds (Mueller et al, 2015; FAO, 2016; Mrode, Tarekegn, Mwacharo, & Djikeng, 2018; Ibeagha-awemu, Peters, & Bemji, 2019). The systematic purposeful breeding activity with the indigenous goats breeds in Bulgaria has started relatively recently. After the establishment of the Association for Autochthonous Goats Breeds in Bulgaria (AAGBB), breeding programs for their sustainable storage were prepared, and a detailed study of the populations was started. The productive qualities of the autochthonous goats breeds in Bulgaria (Kalofer longhaired goat and Bulgarian screw-horned longhaired goat), are poorly studied. In the past, many authors has studied the local populations has identified them as low-yielding, and interest in them has shifted to "improving" the local goats, by using imported high-yielding goats breeds. However, in some of the studies, even then, the real potential of the local goats for milk and meat production, and the possibility for their increasing through purebred breeding, was impressive. Unfortunately, this approach was not in the focus of the strategy for development of the goat breeding of Bulgaria in the past. But in present days, in the context of sustainable conservation and development of local genetic resources in goat breeding in Bulgaria, and increasing its economic efficiency, it is necessary to study the main features with economic importance. Undoubtedly, the weight development of the kids during the suckling period is the main characteristic of the meat production in the goats breeds with a combined productivity. This trait is of interest from the point of view of selection in local goats breeds. The present work is a primarily study of the weight development and the growth intensity until weaning, for kids from the Kalofer longhaired, and Bulgarian screw-horned longhaired goats.

## 2. MATERIALS AND METHODS

In the rearing of the local goats breeds in Bulgaria, in which the combined productivity is expressed (for meat, milk and skins), one of the main income for the farmers are the kids sold for meat, at an early age, usually immediately at weaning, without a period of intensive fattening. Therefore, the focus of this study was to be investigated some growth features of kids from two indigenous goats breeds in Bulgaria, during the suckling period. In the investigation, 98 female and 40 male single born kids from the two local Bulgarian breeds (Kalofer longhaired goat and Bulgarian screw-horned longhaired goat), were included. The animals were born in the interval February - March 2020, and produced from elite herds, controlled by an officially registered breeding organization - Association for Autochthonous Goats Breeds in Bulgaria (AAGBB). The herds are located in the region of Southwestern Bulgaria - Kresna Municipality (settlements on the southern slopes of Pirin Mountain). The follow signs was measured: live weight at birth; at 30 days; 60 days, and at weaning at 90 days of age. A marked electronic scale (Crane scale), with accuracy 0.01 kg, was used to determine the live weight of the animals. The average daily gain was calculated at certain intervals - from birth to 30 days of age; from 30 to 60 days of age; from 60, to weaning at 90 days of age. Live weight at birth was measured up to 24 hours after the birth of the kids, and when calculating the average daily gain up to 30 days of age, live weight at birth was not excluded. The data for the weight of the kids during the suckling period were established in real production conditions, with traditional feeding and rearing technology, typical for the region. The kids were traditionally raised with their mothers, and until the 25th day the main food is breast milk. After the 25th day to the end of the suckling period (90<sup>th</sup> day), the kids has constant free access to alfalfa hay and a concentrated mixture with consist: corn 50%; wheat bran 180%, soybean meal 150%, barley 160%, monocalcium phosphate 1%, vitamin premix 1%. The ration of goats consisted mainly of grazing, and in worsened meteorological conditions they were fed with alfalfa hay - 1 kg, concentrated feed (corn: barley) - 0.2 kg. The obtained data for growth of kids were processed variation-statistically.

## 3. RESULTS AND DISCUSSIONS

In the traditional technologies of rearing of the autochthonous goats breeds in Bulgaria, the goats are kept together with their kids after birth. The suckling period usually lasts about three months. Immediately after weaning the kids are sold for meat, and the goats are milked for about 150-180 days milking period. Therefore, the growth ability of kids during the mammalian period is crucial for the formation of a certain live weight at this early stage of their development, and on other side it is an economically significant feature for goat farms with a double combined productivity - for meat, and milk. In the tables 1 и 2 has been presented the average values of some features, standart error and degree of probability in suckling kids from the two local Bulgarian goats breeds - Kalofer longhaired and Bulgarian screw-horned longhaired goat. Live weight at birth for female kids from Kalofer longhaired goats was on average 3.4 kg, ranging from 2.8 kg to 3.7 kg. In males, the live weight of birth was average 3.6 kg, with a variation from 2.8 kg, to 4.1 kg. Female kids from the Bulgarian screw-horned goats was with a lower live weight at birth compared to the Kalofer kids - on average 3.04 kg, and the differences was highly probable. The males Screw-horned kids also has a proven tendency for lower live weight of birth in comparison with the males Kalofer kids. Their weight at birth was an average of 3.3 kg. At 30 days of age, the females kids from Kalofer goats weighed an average of 8.4 kg, and the females Screw-horned kids, respectively - 7.8 kg, the differences were proven with a high degree of probability. The average live weight at 30 days of age in the males Kalofer kids was 8.7 kg, and in Screw-horned respectively 8.9 kg. Depending on the sex, the live weight at 60 days of age in kids from Kalofer longhaired and Bulgarian screw-horned longhaired goats varied within certain limits. Respectively, the female Kalofer kids at 60 days of age weighed 12.8 kg, and the Srew-horned - 12.6 kg. Males - 14.7 kg and 14.3 kg, respectively for Kalofer and Screw-horned longhaired kids. The live weight of the kids during the suckling period is an important sign of meat productivity in goats . Danda,Taylor, McCosker, & Murray (1999), divided goat carcasses into two classes according to the live weight at slaughtered. Type Capretto (light carcasses) obtained from kids with a live weight of 14-22 kg, and type Chevron (heavy carcasses) obtained from fattened kids with a live weight of 30-35 kg. The obtained data for the live weight of the kids from local Bulgarian goats breeds at 60 days of age can be a criterion for their relatively good meat productivity. However, according to the results, their realization for meat at this age (60 days) is inexpedient. Would not be underused the potential of the Kalofer and Bulgarian screw-horned goats for the production of light carcasses - the Capretto type, or class "B" (up to 10 kg), and "C" (up to 13 kg), according to the SEUROP system for qualification of carcasses from small ruminants (Marinova, Raycheva, & Katsarov, 2002). At 60 days of age, the local kids have not yet reached the live weight needed to produce carcasses with slaughtered weight about 10 kg. This fact, will certainly have a negative economic impact on farmers-producers. From the obtained results for live weight at weaning at 90 days of age, it can be seen that the Kalofer long-haired goats and the Bulgarian long-haired goats has the expressed potential to produce goat meat during the suckling period. For the mammalian period of 90 days, the goats produce production in the form of meat with a

relatively low cost, and for a relatively short time. At weaning at 90 days of age, the average live weight of the Kalofer longhaired kids was 17.07 kg, and 19.3 kg, for females and males, respectively. The Bulgarian screw-horned kids at weaning at 90 days of age, weighed an average of 16.7 kg and 19.1 kg, for females and males, respectively. In the results for the average daily gain there was an interesting trend in the growth intensity of the kids from the Kalofer and Bulgarian screw-horned longhaired goats. The kids grew more intensively from birth to 30 days of age, with a higher average daily gain from birth to 30 days, compared to the following months until weaning at 90 days of age. Among the studied animals, the highest growth energy up to 30 days of age was reported in male Screw-horned kids - 0.299 kg. The lowest growth intensity for the same period was shown in the female Screw-horned kids - 0.260 kg. In the period from the 30th to the 60th day, the intensity of growth decreased. The average values for daily gain in the female Screw-horned kids were already 0.162 kg, and for the males - 0.177 kg. For the Kalofer kids, the average daily gain for the period 30-60 days, was respectively - 0.146 kg for females, and 0.199 kg for males. In the period from 60<sup>th</sup> day, to weaning at 90 days of age, the intensity of growth was the lowest. The average daily gain ranged from 0.136 kg in the females Screw-horned kids, to 0.161 kg in the males Screw-horned kids. In the Kalofer longhaired kids the average daily gain during this period was 0.142 kg, respectively, for females and 0.154 kg for males.

**Table 1. Growth traits during suckling period of a females Kalofer longhaired (n-49), and Bulgarian screw-horned longhaired kids (n-49).**

Signs	Breeds		Kalofer longhaired kids n-49				Bulgarian screw-horned longhaired kids n-49				P
	X	Sx	min	max	X	Sx	min	max			
Body weight at birth, kg	3,429	0,036	2,8	3,7	3,045	0,050	2,6	3,6	***		
Body weight at 30-th days of age, kg	8,425	0,082	7,2	9,3	7,812	0,143	5,9	9,4	***		
Body weight at 60-th days of age, kg	12,810	0,111	11,5	14	12,677	0,194	9,5	14			
Body weight at 90-th days of age, kg	17,079	0,162	14,5	19,5	16,783	0,244	13	18,5	*		
Absolute growth, kg	13,649	0,150	11,35	15,8	13,737	0,232	10,1	15,9			
Average daily gain up to 30 days, kg	0,280	0,003	0,24	0,31	0,260	0,004	0,196	0,313	***		
Average daily gain 30-60 days, kg	0,146	0,001	0,128	0,176	0,162	0,004	0,12	0,233	***		
Average daily gain 60-90 days, kg	0,142	0,003	0,09	0,213	0,136	0,003	0,083	0,166	*		
Average daily gain 0-90 days, kg	0,189	0,001	0,161	0,216	0,186	0,002	0,144	0,205	*		

**Table 2. Growth traits during suckling period of a males Kalofer longhaired kids (n-20), and Bulgarian screw-horned longhaired kids (n-20).**

Signs	Breeds		Kalofer longhaired kids n-49				Bulgarian screw-horned longhaired kids n-49				P
	X	Sx	min	max	X	Sx	min	max			
Body weight at birth, kg	3,645	0,077	2,8	4,1	3,39	0,091	2,8	3,9	**		
Body weight at 30-th days of age, kg	8,735	0,109	7,8	9,8	8,98	0,246	6,4	10,4			
Body weight at 60-th days of age, kg	14,71	0,0779	13	17	14,31	0,257	11,3	16	*		
Body weight at 90-th days of age, kg	19,335	0,279	17,4	22	19,14	0,332	15,5	21			
Absolute growth, kg	15,69	0,286	13,5	18,1	15,75	0,307	12,7	17,7			
Average daily gain up to 30 days, kg	0,291	0,003	0,26	0,326	0,299	0,008	0,213	0,346			
Average daily gain 30-60 days, kg	0,199	0,003	0,143	0,25	0,177	0,004	0,153	0,218	***		
Average daily gain 60-90 days, kg	0,154	0,008	0,08	0,233	0,161	0,005	0,116	0,2			
Average daily gain 0-90 days, kg	0,214	0,003	0,193	0,244	0,212	0,003	0,172	0,233			

**Fig.1. Kalofer longhaired goat (left), and Bulgarian screw-horned longhaired goat (right) with newborn kids.**  
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The live weight measured at regular intervals is an important characteristic of meat productivity in the goats. The birth weight is an important sign from point of view for the selection. The kids born with a higher live weight, also have a higher survival rate until weaning, as well as a higher weight at a later age (Maknev, 1951; Combellas, Martinez, & Conzolez, 1980; Fraser & Saville, 2000). The postnatal growth is affected by birth weight (Sebei, McCrindle, & Webb, 2004; Otoikhian, Orheruata, & Utulu, 2013). The two Bulgarian autochthonous goats breeds give birth relatively large kids, with a relatively high live weight (fig.1). However, births are mild, and usually do not require obstetric care. The high vitality of the newborns kids, who are ready to follow their mothers 30-40 minutes after birth, is impressive. The results for a sign live weight at birth of the kids from the two autochthonous Bulgarian goats breeds were similar to those achieved by Marković, Marković, & Josipović, (2011), for the local Macedonian breed Balkan goat. Güney, Torun, Özuyanık, & Darcanet (2006), found that the kids from Damascus goat breed are born with a higher live weight, compared to the kids from the two Bulgarian indigenous breeds. A similar results cited by Rojo-Rubio et al (2016), in kids from Alpine, Saanen and Anglonubian goats breeds, at weaning at 90 days of age. However, Merlos-Brito, Martínez-Rojero, Torres-Hernández, Mastache-Lagunas, & Gallegos-Sánchez (2008), cited lower weight of weaning in crossbred kids at 90 days of age (15.1 kg). The males Kalofer and Bulgarian screw-horned kids reached a heavier weaning weight than females. A similar results were cited Rojo-Rubio et al (2016) in Alpine, Saanen and Anglonubian goats breeds. The males kids reached a heavier at weaning at 90 days of age, than females kids with about 8.1% (20 versus 18.13 kg for male and female kids, respectively). Similar results were reported by Merlos-Brito et al. (2008) who found significant differences due to sex of kids, where males kids were higher (16.5 kg) than females kids (12.4 kg). It is noteworthy that these results are common when working with kids weaned at the same age (Otuma & Osakwe 2008). Until the 30th day after birth, the growth potential of the kids is largely dependent on the quantity and quality of suckled breast milk, as well as on the expression of maternal instinct in the goats. The small quantities concentrated feed and hay, received from the kids during this period, are not essential for live weight up to 30 days of age. This agrees with findings of Luo, Cameron, & Goetsch (2000), who reported that kids did not consume significant amounts of starter diet until when they have reached 5 weeks of age. From the results for the average daily gain during the suckling period it is impressive that the kids of the two Bulgarian autochthonous goats breeds grew especially intensively in the first 30 days after birth. During the second half of the mammalian period, the growth intensity decreased significantly. The established average daily gain in the kids from Bulgarian autochthonous goats breeds, up to 90 days of age, is similar to the ones established by Rojo-Rubio et al (2016), in kids from Alpine, Saanen and Anglonubian goats breeds, at weaning in the same age. Lower results were cited by Htoo et al (2015) in a crossbred kids at 84 days of age.

#### 4. CONCLUSIONS

On the basis of the research performed and the obtained results for the growth development during the suckling period of kids from Kalofer longhaired goats and Bulgarian screw-horned longhaired goats, it can be concluded:

The two Bulgarian autochthonous goats breeds give birth relatively heavy kids, with intensive growth during the suckling period. The average live weight at birth of the Kalofer longhaired kids was 3.6 kg, and 3.4 kg for males and females, respectively. For the Bulgarian screw-horned longhaired kids, live weight at birth was 3.6 kg, and 3.4 kg - in males and females, respectively.

At 30 days of age, males Kalofer kids weighed 8.7 kg, and females 8.4 kg. At 30 days of age, males Screw-horned kids weighed 8.7 kg, and females 8.4 kg.

At 60 days of age, the live weight in males and females Kalofer kids was - 14.7 kg, and 12.8 kg for females, and for the Bulgarian screw-horned kids - 14.7 kg, and 12.8 kg for males and females, respectively.

At weaning at 90 days of age, the males Kalofer kids weighed 19.3 kg, and the females - 17.07 kg. The weights at weaning for the Bulgarian screw-horned kids were -19.3 kg, in the males, and 17.07 kg in the females.

The kids from the two indigenous Bulgarian goats breeds has more intensive growth at the beginning of the mammalian period, and to the end the growth was decreasing. The average daily gain up to 30<sup>th</sup> day was 0.291 kg in the males Kalofer kids, and 0.280 kg for the females. In the Bulgarian screw-horned kids, the average daily gain up to 30<sup>th</sup> day was - 0.299 kg, and 0.260 kg for males and females respectively. In the period 60<sup>th</sup> – 90<sup>th</sup> day the average daily gain was 0.154 in the males Kalofer kids, and 0.142 in the females. In the same interval of suckling period, the average daily gain for the males Bulgarian screw-horned kids was 0,161 kg, and 0.136 kg in the females.

#### ACKNOWLEDGEMENTS

This paper has been realized and funded by virtue of the results obtained from Research project № 01-19 at the Center for Scientific Researches of the Agricultural University of Plovdiv - Bulgaria.

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