

## Comparison of Growth Traits in Saanen and Saanen X Hair Crossbred (F<sub>1</sub>) Kids\*

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### Abstract

This study was designed to investigate the growth, survival rate and some body measurements of 22 Saanen and 52 Saanen X Hair crossbred (F<sub>1</sub>) offspring raised by a farmer in the Black Sea region of Turkey. Mean birth weight, mean weaning weight and mean daily weight gain to the weaning period for Saanen kids were 4.04, 14.13 and 0.101 kg respectively. Those values were 4.08, 18.29 and 0.094 kg respectively for Saanen X Hair crossbred kids. Genotype and type of birth (single or twin) had a significant effect on weaning weight and live weight at 7 months (P<0.05). Significant effects of genotype and gender (P<0.05) were observed on height at the withers, body length, chest depth and chest circumference at 7 months of age. Survival rate at weaning was 91.7% for Saanen kids and 96.3% for Saanen X Hair crossbred kids (P>0.05). As a conclusion, the growth performance of Saanen X Hair kids was superior to that of purebred Saanen kids.

**Key words:** Body measurement, hair goat, Saanen, survival, weight gain.

### Saanen ve Saanen X Kıl Keçisi Melezi (F<sub>1</sub>) Oğlakların Bazı Büyüme Özelliklerinin Karşılaştırılması

#### Özet

Bu araştırma, Karadeniz Bölgesi'nde halk elinde yetiştirilen Saanen ve Saanen X Kıl keçisi (F<sub>1</sub>) melezi oğlaklarda büyüme ve yaşama gücü özellikleri ile bazı beden ölçülerinin araştırılması amacıyla yapılmıştır. Araştırmanın canlı materyali olarak 22 baş Saanen ve 52 baş Saanen X Kıl keçisi melezi oğlak kullanılmıştır. Doğum ağırlığı ve süttten kesim ağırlığı, süttten kesim dönemindeki günlük ortalama canlı ağırlık kazancı Saanen oğlaklarda sırasıyla; 4.04 kg, 14.13 kg ve 0.101 kg; Saanen X Kıl Keçisi melezi oğlaklarda ise 4.08 kg, 18.29 kg ve 0.094 kg olarak belirlenmiştir. Genotip ve doğum tipinin süttten kesim ağırlığı ve 7 aylık yaştaki canlı ağırlık değerleri üzerinde etkisinin önemli (P <0.05) olduğu belirlenmiştir. Ayrıca, 7 aylık yaştaki cidago yüksekliği, beden uzunluğu, göğüs derinliği ve göğüs çevresi gibi bazı beden ölçüleri üzerinde genotip ve cinsiyetin etkili olduğu belirlenmiştir (P < 0.05). Süttten kesim döneminde yaşama gücü Saanen oğlaklarda %91.7, Saanen x Kıl Keçisi melezi oğlaklarda ise %96.3 olarak belirlenmiştir (P >0.05). Sonuç olarak, halk elinde yetiştiriciliği yapılan Saanen X Kıl Keçisi melezi oğlakların Saanen oğlaklara oranla büyüme performansının daha iyi olduğu söylenebilir.

**Anahtar kelimeler:** Beden ölçüleri, canlı ağırlık kazancı, kıl keçisi, Saanen, yaşama gücü

#### Introduction

In order to increase the production of low cost meat and milk and consequently the amount of animal protein available per individual for the rapidly growing global population, animal production must be planned and managed efficiently. Goats are one of the important sources of animal products due to their relatively easy management under adverse environmental conditions. Because of their resilience and adaptability, they can more readily convert low quality pasture plants and hay with high cellulose levels into meat and milk than other livestock (Ozcan and Yalcin, 1985; Simsek and Bayraktar, 2006).

The most common goat breed in Turkey is the Hair goat which has a mature live weight of 40-45 kg, quite low fertility, and relatively low milk and meat production (Özcan and Yalçın, 1985; Şengonca et al., 2002). The Hair goat, which has a height at the withers of 70-75 cm, is a dual-purpose breed (Özcan and Yalçın 1985). The Saanen, which is known for its good constitution and high adaptability, has one of the highest potential production levels of the dairy goats. They grow rapidly and their body type is typical of the dairy shape; it gradually broadens from the chest to the rear. The Saanen, which is one of the most massive-bodied of the dairy goat breeds, can attain a height at withers of 78-80 cm and a mature live weight of 50-55 kg.

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The current study was conducted in the central Black Sea region of northern Turkey which generally features a narrow coastal plain and highlands, and where grasslands are limited. Conditions are unsuitable for cattle breeding in the highlands but are generally suitable for goat and sheep breeding and raising. Goat breeding in the region generally involves Hair goats. However, due to the fact that they cause considerable degradation of forests through their destructive grazing activities, limited numbers of Hair goats are bred in the Black Sea region compared to other regions in Turkey. As a result of the preceding circumstances, both the improvement of the genetics of the current goat herds which are adapted to the region, and increasing their numbers and distribution, are highly desirable socio-economically. In that light, the Saanen breed has been brought to the Black Sea region by villagers in recent decades because it has good genetic and production characteristics and for using in dissemination project of Saanen Goats, were adopted from Çanakkale province by Administrative Tekkeköy District in Samsun. Therefore, this study focused on the determination of growth traits, body measurements and survival rates of the offspring of Saanen and Saanen X Hair crossbreds raised under the prevailing conditions of the Black Sea region.

### Materials and Methods

This study was conducted on 74 kid goats raised by a local breeder in Tekkeköy district, Samsun where grassland and pasture areas are generally limited. Saanen and Saanen X Hair goat crossbred herds were studied without altering existing management and feeding regimes applied by the farmers. The subject animals were pastured on grassland during the day and were fed barley, wheat and corn silage at night. New born kids were kept with their mothers full time during the ten days after birth. After that time, kids were with their mothers only during the night. In addition to suckling the doe, they were fed with alfa alfa hay, clover and corn silage, and subsequently were weaned at approximately 3 months of age.

Does were ear tagged at the start of their estrus period and after parturitions, and their kids' growth performance, survival rate and body measurements until 7 months of age were recorded. Kids were weighed following the complete drying of the body within the 6 hours maximum after birth. Growth performance of kids was determined at 15 day intervals, by using a digital balance sensitive to 50g. Additionally, to determine the survival rate from birth to weaning age, the ear tag

numbers of dead kids were regularly recorded. Body measurements of 7 months for Saanen - body length (*art. humeri-tuber ichii*), chest depth (*height at withers - sternum*), chest circumference (*at the back of the scapulas*) and height at withers (*ground level - withers*) were measured by measuring stick and tape (Çörekçi et al., 2004).

### Statistical analysis

In this study, chi-square test was used to analyse differences of values of the survival rate between the different genotype. In order to calculate growth performance, linear interpolation method was used because all births were concluded in 3 weeks periods. Parity was determined as regression effects in the model. Fixed effects of genotype, birth type and gender on growth performance and body measurements were analysed with GLM (John, 1971). All calculations and statistical tests were executed with SAS (SAS, 2008).

### Results

The growth performance data for Saanen and Saanen X Hair crossbred goat kids (survival rate, live weight, body measurements and kids' live weight) for age groups are displayed in Table 1. Differences in birth weight values between Saanen (4.04 kg) and Saanen X Hair crossbred (F1) kids (4.08 kg) were not significant ( $P>0.05$ ). Weaning weight differences between Saanen (14.13 kg) and Saanen X Hair (F1) crossbreds (18.29 kg) were significant ( $P<0.05$ ). The effect of gender and birth type (single or twins) on birth weight were not significant ( $P>0.05$ ). However, the effect of birth type on weaning weight was determined to be significant ( $P<0.05$ ). In contrast, gender was not a significant factor in the determination of birth weight ( $P>0.05$ ). When live weights at 7th month of age were compared, Saanen X Hair crossbreds (F1) were higher than those of Saanen ( $P<0.05$ ). The effect of birth type on live weight at 7th month of age was significant ( $P<0.05$ ). In contrast, the effect of gender on live weight at 7th month of age was not significant ( $P>0.05$ ).

Genotype and gender were determined to not have a significant effect ( $P>0.05$ ) on daily live weight gain at weaning age and 7th month of age, and daily live weight gain for single born kids at the 7th month of age (210 days) was higher ( $P<0.05$ ) than for twins.

Figure 1 shows average daily weight gain in the first seven months for Saanen and Saanen X Hair crossbred kids. The means of daily live weight gains for Saanen X Hair crossbred kids from 30 and 60 days of age were

higher than for Saanen kids ( $P<0.05$ ). Means of daily weight gain to weaning age were 0.101 kg in Saanen kids and 0.096 kg in Saanen X Hair crossbred kids ( $P>0.05$ ).

Figure 2 shows average daily weight gain until 7 months of age by gender, and Figure 3 shows the trend of these values by birth type. Generally, daily live weight gain in single birth kids was higher than for twins. At the weaning stage, daily live weight gain for

single born kids was 0.107 kg, while in twins it was 0.088 kg ( $P>0.05$ ).

Average daily weight gains at various age stages from birth to 7 months of age were similar but not significant ( $P>0.05$ ) for male and female kids (Figure 3). Mean daily live weight gain to the weaning stage was 0.097 kg in the male kids and 0.098 kg in the females ( $P>0.05$ ).

Table 1. Means and standard errors of live weight (kg) of the kids in various growth periods

Effects	n	Birth Weight	Day 15	Day 30	Day 45
Genotype					
Saanen	22	4.04±0.24	5.86±0.36	7.12±0.46 <sup>b</sup>	9.10±0.56 <sup>b</sup>
Saanen X Hair	52	4.08±0.17	5.88±0.26	8.64±0.34 <sup>a</sup>	13.31±0.40 <sup>a</sup>
Gender					
Male	39	4.13±0.21	5.82±0.32	7.97±0.41	11.34±0.49
Female	35	3.98±0.21	5.93±0.31	7.80±0.40	11.07±0.48
Birth Type					
Single	40	4.13±0.15	6.14±0.23	8.41±0.30	11.59±0.36
Twin	34	3.98±0.25	5.59±0.38	7.35±0.49	10.82±0.59
Effects	n	Day 60	Day 75	Day 90	Day 210
Genotype					
Saanen	22	10.82±0.64 <sup>b</sup>	12.60±0.73 <sup>b</sup>	14.13±0.87 <sup>b</sup>	20.28±1.30 <sup>b</sup>
Saanen X Hair	52	15.45±0.47 <sup>a</sup>	16.87±0.63 <sup>a</sup>	18.29±0.63 <sup>a</sup>	23.42±0.99 <sup>a</sup>
Gender					
Male	39	13.23±0.57	14.96±0.65	16.42±0.77	21.92±1.02
Female	35	13.04±0.55	14.51±0.63	16.00±0.74	21.78±1.01
Birth Type					
Single	40	14.13±0.41 <sup>a</sup>	16.24±0.47 <sup>a</sup>	17.85±0.56 <sup>a</sup>	24.81±0.88 <sup>a</sup>
Twin	34	12.13±0.68 <sup>b</sup>	13.24±0.77 <sup>b</sup>	14.57±0.91 <sup>b</sup>	18.88±1.43 <sup>b</sup>

<sup>a,b</sup>; Differences between values within the same column signed as different letter is significant ( $P<0.05$ ).

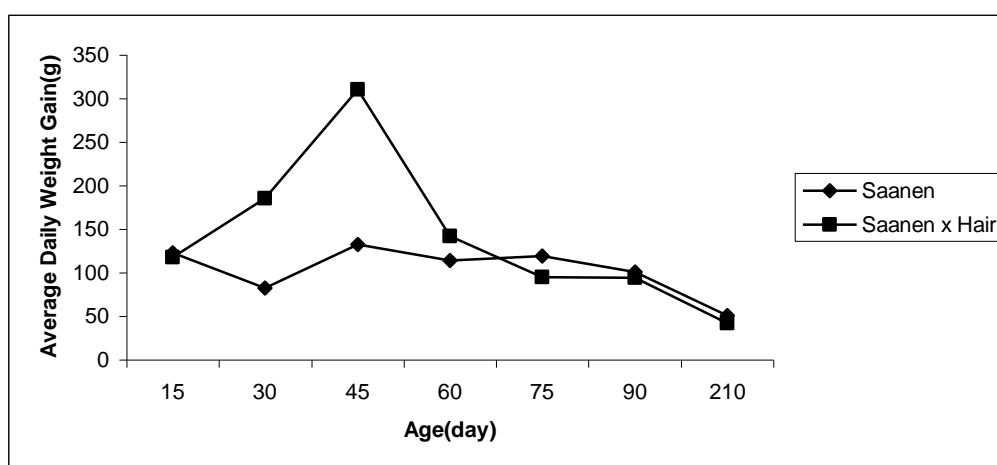


Figure 1. Average daily weight gain trend by Saanen and Saanen X Hair Crossbred kids (g/day)

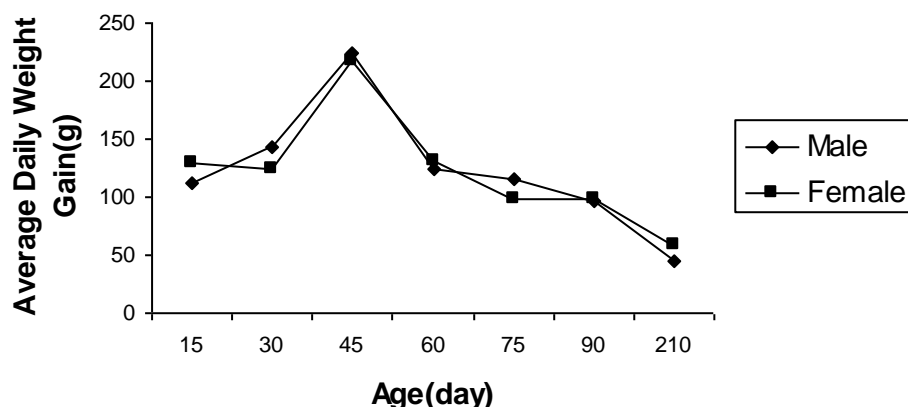


Figure 2. Average daily weight gain trend by gender (g/day)

Table 2 gives the values of some body measurements for Saanen and Saanen X Hair offspring. Body length, height at withers, chest circumference and chest depth for Saanen X Hair crossbred kids were higher than for Saanen kids ( $P < 0.05$ ). Additionally, it was determined that male kids have higher values than females and that the differences were significant ( $P < 0.05$ ). Despite the same management regime, values for single born kids were higher than for twins, although only the difference in chest circumference was significant ( $P < 0.05$ ).

The survival rates of the kids to weaning age are presented in Table 3. Survival rate up to weaning stage in Saanen and Saanen X Hair kids was 91.7 % and 96.3 %, respectively ( $P > 0.05$ ). It was also determined that genotype, gender and birth type did not have a significant effect on survival rate to weaning age ( $P > 0.05$ ).

## Discussion

This study determined the survival rate and growth performance of Saanen and Saanen X Hair crossbred kids. Their live weights from birth to 30 days of age were close, but after 30 days, Saanen X Hair kids gained weight faster. Saanen X Hair kids had achieved significantly higher average daily weight gain than Saanen kids at 75 days of age. After 75 days, the average daily weight gain values of both groups were again similar. It can therefore be inferred that feed conversion efficiency is better in Saanen X Hair crossbred kids than in Saanen kids up to 75 days of age. In addition, it was demonstrated that the growth rate, as measured by the time required for doubling the birth weight, was higher in Saanen X Hair crossbred kids (Akçapınar and Özbeyaz, 1999). The time required for doubling of birth weight was between 30 and 45 days in

Table 2. Means of the body measurements (cm) and their standard errors in Saanen and Saanen X Hair crossbred goat kids for ages at breeding

Effects	n	Body Length	Cidago Height	Chest Circumference	Chest Depth
<b>Genotype</b>					
Saanen	22	65.50±1.2 <sup>b</sup>	63.03±0.8 <sup>b</sup>	65.12±0.9 <sup>b</sup>	29.32±0.4 <sup>b</sup>
Saanen X Hair Goat	52	68.50±0.6 <sup>a</sup>	64.99±0.4 <sup>a</sup>	68.36±0.5 <sup>a</sup>	31.25±0.2 <sup>a</sup>
<b>Gender</b>					
Male	39	69.30±1.0 <sup>a</sup>	66.39±0.6 <sup>a</sup>	69.42±0.8 <sup>a</sup>	31.20±1.4 <sup>a</sup>
Female	35	64.70±0.9 <sup>b</sup>	61.62±0.5 <sup>b</sup>	64.06±0.7 <sup>b</sup>	29.37±1.1 <sup>b</sup>
<b>Birth Type</b>					
Single	40	67.91±0.8	64.25±0.5	67.83±0.7 <sup>a</sup>	30.59±1.4
Twin	34	66.02±1.0	63.77±0.6	65.65±0.8 <sup>b</sup>	29.98±1.1

<sup>a,b</sup>, Differences between values within the same column signed as different letter is significant ( $P < 0.05$ )

Table 3. Survival rate (%) of the kids in periods weaning age

Traits	Initial (n)	Day 90 (Weaning age)		$\chi^2$ score
		(n)	%	
Genotype				
Saanen	22	20	91.7	0.732
SaanenXHair	52	50	96.3	
Gender				
Male	39	38	97.5	1.166
Female	35	32	92.1	
Birth Type				
Single	40	39	97.6	1.285
Twin	34	31	91.9	

Saanen kids and 15 and 30 days in Saanen X Hair kids. Birth weight values in the present study were higher than those in previous reports on Saanen (Pfefer and Rodehutsord, 1998; Freitas et al., 2004; Ugur et al., 2004; Tozlu, 2006) and Saanen X Hair offspring (Şengonca et al., 2002; Şimşek and Bayraktar, 2006). The current study's birth weights for Saanen and Saanen X Hair crossbreds were higher than those recorded by Oral and Altinel (2006) for Hair goats. Furthermore, for Saanen kids, weaning weight, weaning period and daily weight gain were lower than the values reported by some researchers (Uğur et al., 2004; Yanez et al., 2007) but were similar to those stated by Freitas et al. (2004). In addition, weaning weight and live weight gain of the Saanen X Hair kids were higher than the values from earlier studies performed on the same lineage (Şengonca et al., 2002, Şimşek and Bayraktar 2006; Tozlu 2006) and on different lineages (Ünalán and Cebeci, 2001; Karaca, 2004; Longbin et al., 2008). Oral and Altinel (2006) reported a weaning weight of 13.58 kg for Hair goat kids weaned at 3 months which was considerably lower than the value determined in the current study for Saanen X Hair kids. In comparing on

body measurements of the kids (body length, height at withers, chest circumference and chest width) from the different parents line, Saanen X Hair kids had higher values than Saanen kids, and by inference crossbred kids had better body size. Moreover, higher values for birth weight and the live weight for various periods indicated a higher growth rate for crossbred kids. Body measurements determined for Saanen X Hair crossbred kids in the present study were higher than those reported by Şimşek and Bayraktar (2006) for the same cross, and lower than those reported by Longbin et al. (2008) for Saanen x Chinese local goat kids.

When weight and daily live weight gain were evaluated in the context of birth type, no differences were found between single born kids and twins up to 60 days of age. However, values for single born kids were higher than for twins between 60 and 210 days of age. When single born kids were further compared to twin kids, the only meaningful difference was found in chest depth ( $P < 0.05$ ), while length, height at withers and chest circumference in single born kids had a general tendency to be higher. The higher live weight and body measurements for single born kids are indicators of better growth performance in this group. This result is in accordance with that of other authors (Şengonca et al., 2002; Şimşek and Bayraktar, 2006). In addition, male kids had higher birth weight than female kids (Akçapınar and Özbeyaz, 1999; Şengonca et al., 2002; Uğur et al., 2004; Şimşek and Bayraktar, 2006). Although the difference between the live weight of male and female kids in the first 7 months of age was insignificant ( $P > 0.05$ ), generally the weight of male kids tended to be higher than that of female kids at the same developmental stage; body length, chest circumstances, chest depth and height at the withers were higher in male kids than female kids.

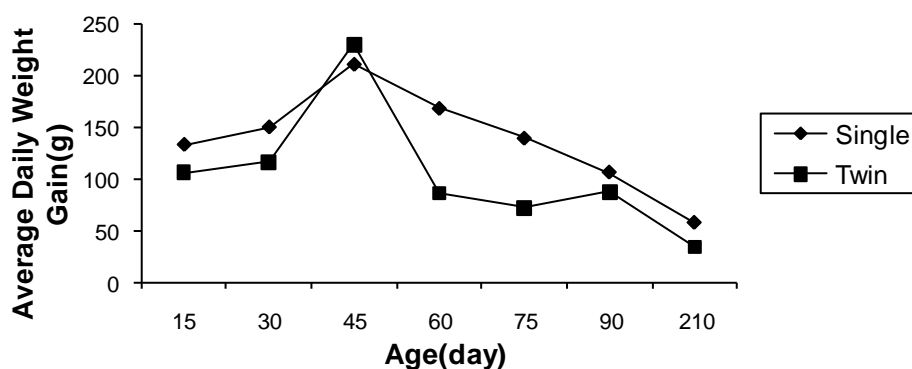


Figure 3. Avarage daily weight gain (g/day) trend by birth type

The survival rates for Saanen (91.7%) and for Saanen X Hair kids (96.3%) determined in this study were higher than those of Simsek and Bayraktar (Simsek and Bayraktar, 2006) for the same genotypes, while they approximated the values of some researchers' for different breeds (Taşkın et al., 2003, Şengonca et al., 2002; Şengonca et al., 2003). The survival rate of 95.44% stated by Oral and Altinel (2006) for Hair goats at 3 months of age was higher than the value determined in the current study for Saanen but was similar to that for Saanen X Hair offspring.

In conclusion, Saanen X Hair crossbreds demonstrated higher growth performance and survival rate than Saanen goats. Hence the use of Saanen X Hair crossbreds may be more productive than using purebred Saanens in the Black Sea region. However, there is a need to carry out further investigations on the adaptability, behavior and other traits which have implications for the economic viability of utilizing crossbred kids.

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