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ORIGINAL ARTICLE

Various Body Measurements of Saanen Kids*

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SUMMARY

The aim of the study was to determine body measurements the birth to the age of 180th day of Saanen kids, and reveal factors such as the effects of year, dam age, birth type and sex on this parameter. 146 kids born in 2008 and 179 kids born in 2009 were utilized in the study. From various body measurements, wither height, back height, rump height, sacrum height, body length, chest length, chest depth, chest circumference, circumference of leg, cannon bone circumference, chest width, front-rump width, mid-rump width were 34.7, 33.9, 35.7, 33.9, 33.3, 19.7, 13.3, 36.0, 33.3, 5.5, 7.0, 6.2 and 8.8 cm at birth; 48.8, 47.9, 50.0, 48.3, 50.5, 26.5, 21.6, 53.5, 49.4, 6.5, 9.8, 9.9 and 12.1 cm at weaning; 56.7, 55.8, 57.7, 54.2, 58.3, 30.1, 25.1, 60.1, 55.9, 7.1, 11.3, 11.5 and 13.7 cm at age of 180 days, respectively.

Key Words *Saanen, Kid, Body measurements*

Saanen Oğlaklarının Çeşitli Vücut Ölçüleri

ÖZET

Bu araştırma, Saanen oğlaklarının doğum-180 gün arası dönemde çeşitli vücut ölçülerini tespit etmek ve bu özellik üzerine yıl, ana yaşı, doğum tipi ve cinsiyet gibi faktörlerin etkisini ortaya koymak amacıyla yapılmıştır. Araştırmada, 2008 yılı doğum sezonunda doğan 146 baş oğlak, 2009 yılı doğum sezonunda doğan 179 baş oğlak kullanılmıştır. Oğlakların doğum, 90 (sütten kesim) ve 180. gündeki vücut ölçülerinden cidago yüksekliği genel olarak sırasıyla 34.7, 48.8 ve 56.7 cm; sırt yüksekliği 33.9, 47.9 ve 55.8 cm; sağrı yüksekliği 35.7, 50.0 ve 57.7 cm; kuyruk sokumu yüksekliği 33.9, 48.3 ve 54.2 cm; vücut uzunluğu 33.3, 50.5 ve 58.3 cm; göğüs uzunluğu 19.7, 26.5 ve 30.1 cm; göğüs derinliği 13.3, 21.6 ve 25.1 cm; göğüs çevresi 36.0, 53.5 ve 60.1 cm; but çevresi 33.3, 49.4 ve 55.9 cm; ön incik çevresi 5.5, 6.5 ve 7.1 cm; kürek arkası göğüs genişliği 7.0, 9.8 ve 11.3 cm; ön sağrı genişliği 6.2, 9.9 ve 11.5 cm; orta sağrı genişliği 8.8, 12.1 ve 13.7 cm olarak bulunmuştur.

Anahtar Kelimeler *Saanen, Oğlak, Vücut ölçüleri*

INTRODUCTION

Body measurement are vital measurements for defining animals numerically, comparison of animals within same breed following growth and development of animals, determining early selection criteria for certain production trait and the evaluation animal for breeding. These measurements provide very important clues for traits affected by environment and nutrition during development of breed. Furthermore, body measurements are also useful for evaluating the results of genetic progress and selection. Some environmental factors such as genotype, sex, birth type, nutrition, age and year of birth, mother's age have some impact on body measurements (Mohammed and Amin 1996; Riva et al. 2004; Ugur at al. 2004).

Variation in body measurements are used as criteria for classification of goats. At same time, variation in body measurements helps to determine quantitative characteristics and to develop proper selection criteria. Body measurements and came other qualitative characters are also defining characters for a breed as well as economically important characters (Boztepe ve Bağ 1995; Mohammed and Amin 1996).

Stocker animals should be selected based on production type and animal body needs to reveal production type. Dairy animals grow slow and their body is long. Their body expends from front to rear and body does not look round like beef cow. Legs look slim and long (Akçapınar and Özbeyaz 1999).

In addition to genotype, the most important factor is feeding regimen, even though there are several factors affecting the growth of kids Kaymakçı and Aşkın (1997) method that kids fed high protein energy diet had superior body measurements and live body weight compared to these fed low protein-energy diets. These results showed that feeding management and environment have same effect on the growth of kids in addition to genotype.

The most commonly used body measurements in small ruminants are; head length, head depth, with between shoulders, body length, wither height, sacrum height, chest length, chest circumference, cannon bone circumference and so an (Akçapınar ve Özbeyaz 1999; Gürcan 2000).

There is a positive correlation between milk and meat production of species or breed and body measurement (height, depth, length and width). The length and width of these values should be enough for animals used as stockers (Özcan 1977).

In general, these are a limited study regarding body measurements of Saanen kids in Turkey. Çağraş (1999) with Saanen kids, Eker et al. (1976) with Saanen x Kilis F_1

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* *This study was summarized from PhD thesis of first author*

(SKF_1) and Saanen x Kilis G_1 (SKG_1), Özcan (1977) with SKF_1, SKG_1, Saanen x Hair goat F_1 (SHF_1), SKG_1 x [SKG_1 x Kilis (F_1)] and SKG_1 x [SKG_1 x Hair goat (F_1)], Tozlu (2006) with SHF_1, Şimşek et al. (2007) with SHF_1, Saanen x Hair goat G_1 (SHG_1) cross-breed have carried out experiments regarding body measurements of kids.

The aim of the study was to determine body measurements the birth to the age of 180th day and reveal factors such as the effects of year, dam age, birth type and sex on this parameter.

MATERIALS and METHODS

This experiment was carried out with a total of 325 kids, 146 in 2008 and 176 in 2009. The experiment was conducted at Düzova village of Korkut county of Muş province with a Project prepared by village muhtarship (Project reference number: DG-ELARG/MEDTQ/04-01/ARD-176)

Kids were weighted and tagged with plastic tags within one day of birth. Tag number, birth weight, birth date, birth type, sex, tag number of mother and mother's age were recorded after birth of each kid. Kids were kept with their dame for three day after birth. Thus, they were kept with their dames at night and separated at morning. Kids were weaned at the age of 90th days. Kids were fed 100 gr/d/head of kids starter feed and ground alfalfa hay ad libitum level and also had free access to clean water during their suckling period. Kids grazed on pasture after weaning.

Body measurements were determined every 30 days from birth to the age of 180 days and thus, 30, 60, 90, 120, 150 and 180 days body measurement were estimated via interpolation method. But in this study, only at birth, 90^{th} and 180^{th} days values of body measurements are given.

Following model was used for different body measurements during grazing period. The model: $Y_{ijklm}= \mu+a_i+b_j+c_k+d_l+e_{ijklm}$ and where: μ: mean of population for examined trait, a_i: the effect of year, b_j: the effect of dame age, c_k: the effect of birth type, d_l: the effect of sex, e_{ijklm}: error term. It was assumed that there was no significant interaction among evaluated factors and the sum impact of factors on their sub-group was zero (Düzgüneş ve Akman 1995).

Different body measurements of kids at different periods were analyzed using GLM procedures of SAS. Means were separated by Duncan's multiple comparison tests (Sas 1999).

RESULTS

Wither and back height at Table 1, rump and sacrum height at Table 2, body and chest length at Table 3, chest depth and chest circumference at Table 4, circumference of leg and cannon bone circumference at Table 5, chest width and front-rump width at Table 6, mid-rump width at Table 7 are presented.

In the experiment, wither height, back height, rump height, sacrum height, body length, chest length, chest depth, chest circumference, circumference of leg, cannon bone circumference, chest width, front-rump width and mid-rump width of Saanen kids at birth, the ages of 90 (weaning) and 180 days were 34.7, 48.8 and 56.7 cm; 33.9, 47.9 and 55.8 cm; 35.7, 50.0 and 57.7 cm; 33.9, 48.3 and 54.2 cm; 33.3, 50.5 and 58.3 cm; 19,7, 26.5 and 30.1 cm; 13.3, 21.6 and 25.1 cm; 36.0, 53.5 and 60.1 cm; 33.3, 49.4 and 55.9 cm; 5.5, 6.5 and 7.1 cm; 7.0, 9.8 and 11.3 cm; 6.2, 9.9 and 11.5 cm; 8.8, 12.1 and 13.7 cm; respectively.

Table 1. Least square means, significance and multiple comparison test results for wither and back height of goats at different periods (cm).

Factors	Wither Height						Back Height					
	Birth		90^{th} d		180^{th} d		Birth		90^{th} d		180^{th} d	
	n	$\bar{X} \pm S_{\bar{x}}$	n	$\bar{X} \pm S_{\bar{x}}$	n	$\bar{X} \pm S_{\bar{x}}$	n	$\bar{X} \pm S_{\bar{x}}$	n	$\bar{X} \pm S_{\bar{x}}$	n	$\bar{X} \pm S_{\bar{x}}$
General	325	34.7 ± 0.16	307	48.8 ± 0.21	300	56.7 ± 0.23	325	33.9 ± 0.18	307	47.9 ± 0.20	300	55.8 ± 0.23
Year		–		–		–		–		–		–
2008	146	34.8 ± 0.22	133	48.7 ± 0.30	127	56.6 ± 0.33	146	34.0 ± 0.25	133	47.8 ± 0.28	127	55.7 ± 0.33
2009	179	34.6 ± 0.20	174	49.0 ± 0.26	173	56.7 ± 0.28	179	33.8 ± 0.22	174	48.0 ± 0.24	173	55.9 ± 0.28
Dame Age		*		–		–		*		–		–
1	27	33.6 ± 0.44^{b}	23	48.4 ± 0.62	23	56.6 ± 0.67	27	32.6 ± 0.49^{b}	23	46.9 ± 0.58	23	55.0 ± 0.67
2	86	34.4 ± 0.25^{ab}	78	49.3 ± 0.34	75	56.6 ± 0.37	86	33.8 ± 0.28^{a}	78	48.6 ± 0.32	75	56.3 ± 0.37
3	111	34.8 ± 0.23^{ab}	108	48.6 ± 0.31	105	56.5 ± 0.34	111	34.5 ± 0.26^{a}	108	47.9 ± 0.29	105	55.8 ± 0.34
4	69	35.1 ± 0.30^{a}	67	48.9 ± 0.40	67	56.9 ± 0.43	69	34.4 ± 0.34^{a}	67	47.9 ± 0.37	67	55.7 ± 0.43
5	32	35.6 ± 0.44^{a}	31	49.0 ± 0.58	30	56.7 ± 0.64	32	34.1 ± 0.50^{ab}	31	48.2 ± 0.55	30	56.0 ± 0.64
Birth Type		*		*		–		*		*		–
Single	88	35.0 ± 0.26	86	49.2 ± 0.35	82	57.0 ± 0.38	88	34.3 ± 0.30	86	48.3 ± 0.33	82	56.3 ± 0.38
Twin	237	34.4 ± 0.17	221	48.4 ± 0.24	218	56.3 ± 0.26	237	33.5 ± 0.19	221	47.5 ± 0.23	218	55.3 ± 0.26
Sex		*		***		***		**		**		*
Male	175	35.0 ± 0.20	168	49.6 ± 0.26	163	57.5 ± 0.29	175	34.3 ± 0.22	168	48.4 ± 0.24	163	56.2 ± 0.29
Female	150	34.4 ± 0.21	139	48.1 ± 0.28	137	55.9 ± 0.30	150	33.4 ± 0.23	139	47.4 ± 0.26	137	55.4 ± 0.30

– : P>0.05, *: P<0.05, **: P<0.01, ***: P<0.001; $^{a, b}$: Subscripts with different letters within columns significantly (P<0.05) differ.

Table 2. Least square means, significance and multiple comparison test results for rump and sacrum height of goats at different periods (cm).

Factors	Rump Height						Sacrum Height					
	Birth		90th d		180th d		Birth		90th d		180th d	
	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$
General	325	35.7 ± 0.18	307	50.0 ± 0.20	300	57.7 ± 0.22	325	33.9 ± 0.16	307	48.3 ± 0.19	300	54.2 ± 0.22
Year		–		–		–		–		–		–
2008	146	35.8 ± 0.25	133	49.9 ± 0.28	127	57.8 ± 0.30	146	33.8 ± 0.22	133	48.2 ± 0.27	127	54.1 ± 0.31
2009	179	35.7 ± 0.22	174	50.1 ± 0.24	173	57.7 ± 0.26	179	34.0 ± 0.20	174	48.4 ± 0.24	173	54.2 ± 0.26
Dame Age		*		–		–		*		–		–
1	27	34.6 ± 0.49[b]	23	49.0 ± 0.57	23	56.6 ± 0.62	27	33.0 ± 0.44[b]	23	48.2 ± 0.56	23	54.1 ± 0.62
2	86	35.6 ± 0.28[ab]	78	50.3 ± 0.31	75	57.5 ± 0.34	86	33.6 ± 0.25[ab]	78	48.5 ± 0.31	75	54.1 ± 0.34
3	111	36.4 ± 0.26[a]	108	49.9 ± 0.29	105	57.6 ± 0.31	111	34.4 ± 0.23[a]	108	48.0 ± 0.28	105	54.0 ± 0.31
4	69	35.9 ± 0.34[ab]	67	50.2 ± 0.37	67	58.4 ± 0.40	69	34.2 ± 0.30[ab]	67	48.3 ± 0.36	67	54.4 ± 0.40
5	32	36.2 ± 0.50[a]	31	50.5 ± 0.54	30	58.4 ± 0.59	32	34.2 ± 0.44[ab]	31	48.4 ± 0.53	30	54.1 ± 0.59
Birth Type		*		*		**		***		*		–
Single	88	36.2 ± 0.30	86	50.4 ± 0.32	82	58.4 ± 0.35	88	34.5 ± 0.26	86	48.7 ± 0.32	82	54.4 ± 0.35
Twin	237	35.3 ± 0.20	221	49.6 ± 0.23	218	57.0 ± 0.24	237	33.3 ± 0.17	221	47.8 ± 0.22	218	53.9 ± 0.24
Sex		**		**		*		***		***		***
Male	175	36.2 ± 0.23	168	50.4 ± 0.25	163	58.1 ± 0.27	175	34.4 ± 0.20	168	48.8 ± 0.24	163	54.8 ± 0.27
Female	150	35.3 ± 0.24	139	49.5 ± 0.26	137	57.3 ± 0.28	150	33.4 ± 0.21	139	47.8 ± 0.25	137	53.5 ± 0.28

– : P>0.05, *: P<0.05, **: P<0.01, ***: P<0.001; [a, b]: Subscripts with different letters within columns significantly (P<0.05) differ.

Table 3. Least square means, significance and multiple comparison test results for body and chest length of goats at different periods (cm).

Factors	Body Length						Chest length					
	Birth		90th d		180th d		Birth		90th d		180th d	
	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$
General	325	33.3 ± 0.17	307	50.5 ± 0.19	300	58.3 ± 0.24	325	19.7 ± 0.11	307	26.5 ± 0.13	300	30.1 ± 0.18
Year		–		–		–		–		–		–
2008	146	33.4 ± 0.24	133	50.3 ± 0.27	127	58.1 ± 0.33	146	19.7 ± 0.15	133	26.4 ± 0.19	127	29.9 ± 0.26
2009	179	33.2 ± 0.21	174	50.7 ± 0.24	173	58.5 ± 0.29	179	19.7 ± 0.13	174	26.7 ± 0.17	173	30.2 ± 0.22
Dame Age		–		–		–		–		–		–
1	27	32.8 ± 0.47	23	49.8 ± 0.56	23	58.0 ± 0.67	27	19.3 ± 0.29	23	26.1 ± 0.39	23	29.5 ± 0.52
2	86	33.5 ± 0.27	78	50.1 ± 0.31	75	58.0 ± 0.37	86	19.5 ± 0.16	78	26.6 ± 0.21	75	30.1 ± 0.29
3	111	33.3 ± 0.25	108	50.6 ± 0.28	105	58.3 ± 0.34	111	19.9 ± 0.15	108	26.6 ± 0.20	105	30.2 ± 0.26
4	69	33.0 ± 0.32	67	50.7 ± 0.36	67	59.1 ± 0.43	69	19.9 ± 0.20	67	26.5 ± 0.25	67	30.1 ± 0.34
5	32	34.1 ± 0.48	31	50.6 ± 0.53	30	58.3 ± 0.65	32	20.0 ± 0.29	31	26.8 ± 0.37	30	30.4 ± 0.50
Birth Type		*		***		***		***		***		***
Single	88	33.7 ± 0.28	86	51.5 ± 0.32	82	59.4 ± 0.39	88	20.1 ± 0.17	86	27.2 ± 0.22	82	30.9 ± 0.30
Twin	237	33.0 ± 0.19	221	49.5 ± 0.22	218	57.2 ± 0.27	237	19.4 ± 0.11	221	25.9 ± 0.15	218	29.2 ± 0.21
Sex		***		*		*		**		*		**
Male	175	33.8 ± 0.22	168	50.9 ± 0.24	163	58.8 ± 0.29	175	20.1 ± 0.13	168	26.7 ± 0.17	163	30.5 ± 0.23
Female	150	32.9 ± 0.22	139	50.1 ± 0.25	137	57.8 ± 0.31	150	19.5 ± 0.14	139	26.3 ± 0.18	137	29.6 ± 0.24

– : P>0.05, *: P<0.05, **: P<0.01, ***: P<0.001.

Table 4. Least square means, significance and multiple comparison test results for chest depth and chest circumference of goats at different periods (cm).

Factors	Chest depth						Chest circumference					
	Birth		90th d		180th d		Birth		90th d		180th d	
	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$
General	325	13.3 ± 0.09	307	21.6 ± 0.09	300	25.1 ± 0.12	325	36.0 ± 0.17	307	53.5 ± 0.21	300	60.1 ± 0.24
Year		–		–		–		–		–		–
2008	146	13.2 ± 0.13	133	21.5 ± 0.13	127	25.1 ± 0.17	146	35.9 ± 0.24	133	53.4 ± 0.29	127	60.1 ± 0.33
2009	179	13.3 ± 0.12	174	21.7 ± 0.11	173	25.2 ± 0.14	179	36.1 ± 0.21	174	53.5 ± 0.25	173	60.1 ± 0.29
Dame Age		–		–		–		–		–		–
1	27	13.4 ± 0.26	23	21.1 ± 0.27	23	24.7 ± 0.34	27	35.6 ± 0.47	23	52.6 ± 0.60	23	59.4 ± 0.67
2	86	13.2 ± 0.15	78	21.8 ± 0.15	75	25.5 ± 0.19	86	35.9 ± 0.27	78	53.3 ± 0.32	75	59.8 ± 0.37
3	111	13.3 ± 0.14	108	21.6 ± 0.14	105	25.2 ± 0.17	111	36.2 ± 0.25	108	53.3 ± 0.30	105	59.9 ± 0.34
4	69	13.2 ± 0.18	67	21.6 ± 0.17	67	25.3 ± 0.22	69	35.8 ± 0.32	67	53.9 ± 0.38	67	60.6 ± 0.43
5	32	13.3 ± 0.26	31	21.8 ± 0.26	30	25.1 ± 0.33	32	36.6 ± 0.48	31	54.1 ± 0.56	30	60.7 ± 0.65
Birth Type		***		***		*		***		***		***
Single	88	13.6 ± 0.16	86	22.0 ± 0.15	82	25.4 ± 0.20	88	36.8 ± 0.29	86	54.3 ± 0.34	82	61.0 ± 0.39
Twin	237	12.9 ± 0.10	221	21.2 ± 0.11	218	24.9 ± 0.13	237	35.2 ± 0.19	221	52.6 ± 0.23	218	59.2 ± 0.27
Sex		**		***		**		***		***		**
Male	175	13.5 ± 0.12	168	21.9 ± 0.12	163	25.4 ± 0.15	175	36.6 ± 0.22	168	54.0 ± 0.25	163	60.7 ± 0.29
Female	150	13.1 ± 0.12	139	21.3 ± 0.12	137	24.9 ± 0.15	150	35.4 ± 0.23	139	52.9 ± 0.27	137	59.5 ± 0.31

– : P>0.05, *: P<0.05, **: P<0.01, ***: P<0.001.

Table 5. Least square means, significance and multiple comparison test results for circumference of leg and cannon bone circumference of goats at different periods (cm).

Factors	Circumference of leg						Cannon bone circumference					
	Birth		90th d		180th d		Birth		90th d		180th d	
	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$
General	325	33.3 ± 0.19	307	49.4 ± 0.22	300	55.9 ± 0.28	325	5.5 ± 0.02	307	6.5 ± 0.03	300	7.1 ± 0.03
Year		–		–		–		–		–		–
2008	146	33.3 ± 0.26	133	49.4 ± 0.31	127	56.1 ± 0.39	146	5.5 ± 0.03	133	6.5 ± 0.04	127	7.1 ± 0.05
2009	179	33.2 ± 0.23	174	49.4 ± 0.27	173	55.8 ± 0.34	179	5.5 ± 0.03	174	6.5 ± 0.03	173	7.1 ± 0.04
Dame Age		–		–		–		*		–		–
1	27	32.7 ± 0.51	23	48.6 ± 0.65	23	55.5 ± 0.79	27	5.4 ± 0.07[b]	23	6.4 ± 0.08	23	7.0 ± 0.10
2	86	33.1 ± 0.29	78	49.6 ± 0.35	75	56.4 ± 0.44	86	5.5 ± 0.04[ab]	78	6.6 ± 0.04	75	7.1 ± 0.05
3	111	33.2 ± 0.27	108	49.3 ± 0.32	105	55.6 ± 0.40	111	5.6 ± 0.04[ab]	108	6.5 ± 0.04	105	7.1 ± 0.05
4	69	33.6 ± 0.35	67	49.6 ± 0.42	67	56.0 ± 0.50	69	5.6 ± 0.05[a]	67	6.6 ± 0.05	67	7.1 ± 0.06
5	32	33.9 ± 0.52	31	49.7 ± 0.61	30	56.1 ± 0.76	32	5.6 ± 0.07[ab]	31	6.6 ± 0.08	30	7.2 ± 0.09
Birth Type		**		***		***		**		–		–
Single	88	33.8 ± 0.31	86	50.3 ± 0.36	82	56.8 ± 0.45	88	5.6 ± 0.04	86	6.6 ± 0.05	82	7.1 ± 0.06
Twin	237	32.8 ± 0.20	221	48.5 ± 0.36	218	55.0 ± 0.31	237	5.5 ± 0.03	221	6.5 ± 0.03	218	7.1 ± 0.04
Sex		***		**		***		**		***		***
Male	175	33.9 ± 0.24	168	49.9 ± 0.28	163	56.7 ± 0.34	175	5.6 ± 0.03	168	6.6 ± 0.03	163	7.2 ± 0.04
Female	150	32.7 ± 0.24	139	48.9 ± 0.29	137	55.2 ± 0.36	150	5.5 ± 0.03	139	6.4 ± 0.04	137	7.0 ± 0.04

– : P>0.05, *: P<0.05, **: P<0.01, ***: P<0.001. [a, b]: Subscripts with different letters within columns significantly (P<0.05) differ.

Table 6. Least square means, significance and multiple comparison test results for chest width and front-rump width of goats at different periods (cm).

Factors	Chest width						Front-rump width					
	Birth		90th d		180th d		Birth		90th d		180th d	
	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$
General	325	7.0 ± 0.06	307	9.8 ± 0.06	300	11.3 ± 0.08	325	6.2 ± 0.05	307	9.9 ± 0.05	300	11.5 ± 0.06
Year		–		–		–		–		–		–
2008	146	6.9 ± 0.08	133	9.7 ± 0.09	127	11.2 ± 0.12	146	6.1 ± 0.06	133	9.8 ± 0.06	127	11.4 ± 0.09
2009	179	7.0 ± 0.07	174	9.9 ± 0.08	173	11.3 ± 0.10	179	6.2 ± 0.06	174	9.9 ± 0.06	173	11.5 ± 0.08
Dame Age		–		–		–		–		–		-
1	27	6.8 ± 0.16	23	9.7 ± 0.19	23	11.3 ± 0.24	27	6.0 ± 0.12	23	9.7 ± 0.13	23	11.2 ± 0.18
2	86	7.0 ± 0.09	78	9.8 ± 0.10	75	11.2 ± 0.13	86	6.1 ± 0.07	78	10.0 ± 0.07	75	11.5 ± 0.10
3	111	7.0 ± 0.09	108	9.6 ± 0.09	105	11.1 ± 0.12	111	6.2 ± 0.07	108	9.8 ± 0.07	105	11.3 ± 0.09
4	69	7.1 ± 0.11	67	9.9 ± 0.12	67	11.5 ± 0.15	69	6.2 ± 0.08	67	10.0 ± 0.09	67	11.7 ± 0.12
5	32	7.0 ± 0.16	31	9.9 ± 0.18	30	11.4 ± 0.23	32	6.3 ± 0.12	31	10.0 ± 0.13	30	11.5 ± 0.18
Birth Type		–		–		–		–		–		–
Single	88	7.0 ± 0.10	86	9.9 ± 0.11	82	11.4 ± 0.14	88	6.2 ± 0.07	86	9.9 ± 0.07	82	11.5 ± 0.11
Twin	237	7.0 ± 0.06	221	9.7 ± 0.07	218	11.1 ± 0.09	237	6.1 ± 0.05	221	9.8 ± 0.05	218	11.4 ± 0.07
Sex		–		–		–		–		–		–
Male	175	7.0 ± 0.74	168	9.7 ± 0.08	163	11.3 ± 0.10	175	6.2 ± 0.06	168	9.9 ± 0.06	163	11.5 ± 0.08
Female	150	6.9 ± 0.08	139	9.8 ± 0.08	137	11.3 ± 0.11	150	6.2 ± 0.06	139	9.9 ± 0.06	137	11.4 ± 0.08

– : P>0.05, *: P<0.05, **: P<0.01, ***: P<0.001.

Table 7. Least square means, significance and multiple comparison test results for mid-rump width of goats at different periods (cm).

Factors	Mid-rump width					
	Birth		90th d		180th d	
	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$	n	$\bar{X} \pm S_{\bar{X}}$
General	325	8.8 ± 0.05	307	12.1 ± 0.05	300	13.7 ± 0.06
Year		–		–		–
2008	146	8.7 ± 0.06	133	12.1 ± 0.07	127	13.6 ± 0.09
2009	179	8.8 ± 0.06	174	12.2 ± 0.06	173	13.7 ± 0.08
Dame Age		–		–		–
1	27	8.6 ± 0.12	23	12.0 ± 0.14	23	13.6 ± 0.18
2	86	8.7 ± 0.07	78	12.2 ± 0.07	75	13.6 ± 0.10
3	111	8.9 ± 0.07	108	12.1 ± 0.07	105	13.5 ± 0.10
4	69	8.8 ± 0.08	67	12.2 ± 0.09	67	13.8 ± 0.11
5	32	8.9 ± 0.12	31	12.3 ± 0.13	30	13.8 ± 0.17
Birth Type		–		–		–
Single	88	8.8 ± 0.07	86	12.2 ± 0.08	82	13.8 ± 0.10
Twin	237	8.7 ± 0.05	221	12.1 ± 0.05	218	13.6 ± 0.07
Sex		*		–		–
Male	175	8.9 ± 0.06	168	12.2 ± 0.06	163	13.7 ± 0.08
Female	150	8.7 ± 0.06	139	12.1 ± 0.06	137	13.6 ± 0.08

– : P>0.05, *: P<0.05, **: P<0.01, ***: P<0.001.

DISCUSSION and CONCLUSION

Wither height of Saanen kids at birth, the ages of 90 (weaning) and 180 days were 34.7, 48.8 and 56.7 cm, respectively in this study. When the wither heights observed in this study were compared to values reported in the literature, the wither heights high at birth was similar to the value reported by Çağraş (1999)(32.50 and 34.50 cm for male and female Saanen kids, respectively), but the wither heights at the ages of 90 and 180 days were less than the values reported by Çağraş (1999) (51.64 and 57.60 cm at 90th days and 62.30 and 59.67 cm at 180th days for male and female Saanen kids, respectively). When these values were compared to values reported for Saanen cross-breed talk of the wither heights were higher than that of Eker et al. (1976)(32.0 and 31.2 cm at birth, 54.3 and 50.9 cm at 90th day, 60.7 and 56.4 cm at 180th day for male and female SKG_1 cross-breed, respectively) and similar to that of Özcan (1977)(34.3 and 35.2 cm at birth, 47.9 and 50.9 cm at weaning, 54.3 and 55.4 cm at 180th day for SKG_1 and SKG1 x [SKG_1 x Kilis (F_1)] cross-breed, respectively). The wither height at weaning was less compared to the value of Tozlu (2006)(54.23 cm at weaning) but wither heights at birth and weaning were higher than that of Şimşek et al. (2007)(27.52 and 29.13 cm at birth, 45.18 and 57.81 cm at weaning for SHF_1 and SHG_1 cross-breed, respectively).

In the experiment, among factor affecting the wither height, the effect of year was not significant ($P>0.05$) but the effects of mother's age, birth type and sex were significant ($P<0.05$) at birth. The effects of year and mother's age were not significant whereas the effects of birth type and sex were significant ($P<0.05$ and $P<0.001$) at weaning. However the only effect of sex was significant at the age of 180 days. Similar to the results of the current study, Özcan (1977) has reported a significant year effect on wither height. The significant sex effect observed in the current study was in agreement with the result of Tozlu (2006) and Şimşek et al. (2007) weaning but was not similar to that of Çağraş (1999) for all periods and Şimşek et al. (2007) at birth. The significant dame age effect at weaning was in agreement with the result of Şimşek et al. (2007). Similarly, Tozlu (2006) noted a significant birth type effect at weaning.

In the experiment, body length of Saanen kids at birth, 90th (weaning) and 180th days were 33.3, 50.5 and 58.3 cm, respectively. When these results were compared to the values reported in the literature, body length of birth was similar to the value reported by Çağraş (1999)(33.50 and 33.30 cm for male and female Saanen kids, respectively), but the values for the ages of 90 and 180 days were less than the values reported by Çağraş (2007)(56.10 and 61.20 cm at 90th days and 67.30 and 64.74 cm at 180th days for male and female Saanen kids, respectively). When the values were compared to the values observed for Saanen cross-breed, the body length were higher than those of Eker et al. (1976)(29.8 and 29.3 cm for male and female SKG_1 cross-breed, respectively) at birth, Tozlu (2006)(46.75 cm for SHG_1 cross-breed) at weaning and Şimşek et al. (2007)(24.11 and 25.78 cm at birth, 43.46 and 46.44 cm at weaning for SHF_1 and SHG_1 cross-breed, respectively) at birth and weaning, but similar to those of Eker et al. (1976)(53.6 and 51.7 cm at 90th day, 61.3 and 58.2 cm at 180th day for male and female SKG_1 cross-breed, respectively) at the ages of 90 and 10 days and Özcan (1977)(31.9 and 30.5 cm at birth, 50.7 and 51.4 cm at weaning, 57.2 and 57.2 cm at 180th day for SKG_1 and SKG1 x [SKG_1 x Kilis (F_1)] cross-breed, respectively) at birth, weaning and the age of 180 days.

Among factors affecting body length evaluated in this study, the effects of year and dame age were not significant but the effects of birth type and sex were significant. Similarly, Özcan (1977) have reported that the effects of year were not significant for all of three periods. Şimşek et al. (2007) at birth and weaning and Tozlu (2006) at weaning has reported a significant sex effects which was in agreement with the result of the current study.

The chest depth of Saanen kids were 13.3, 21.6 and 25.1 cm for birth, the ages of 90 (weaning) and 180 days, respectively in this study. The chest depth values obtained in this study was similar to that of Çağraş (1999)(14.50 and 15.30 cm for male and female Saanen kids, respectively) at birth but less that of Çagdaş (1999)(27.37 and 27.95 cm at 90th days and 32.19 and 31.03 cm at 180th days for male and female Saanen kids, respectively) at weaning and age of 180 days. When these values were compared to values observed with Saanen cross-breed, they were higher than those of Eker et al. (1976)(10.8 and 10.6 cm at birth, 19.2 and 18.4 cm at 90th day, 23.4 and 21.8 cm at 180th day for male and female SKG_1 cross-breed, respectively) and Özcan (1977)(11.4 and 11.3 cm at birth, 19.6 and 19.6 cm at weaning, 22.6 and 22.7 cm at 180th day for SKG_1 and SKG1 x [SKG_1 x Kilis (F_1)] cross-breed, respectively) at birth, weaning and the age of 180 days but similar to that of Tozlu (2006)(19.61 cm for SHG_1 cross-breed) at weaning.

In the experiment, among factors affecting the chest depth, the effects of year and mother's age were not significant whereas the effects of birth type and sex were significant. Similarly, Özcan (1977) also noted an insignificant year effect on chest depth at all periods. The significant sex effect observed in the experiment was in agreement with the results of Çağraş (1999) for birth and weaning, but not at the age of 180 days old. None significant mother's age and significant birth type and sex effects observed in the experiment were similar to that Tozlu (2006) at weaning.

Chest circumference of Saanen kids at birth, the age of 90 (weaning) and 180 day old age were 36.0, 53.5 and 60.1 cm, respectively. When the chest circumference values observed in the study was compared to values in the literature, it was similar to the value of Çağraş (1999)(38.10 and 37.73 cm for male and female Saanen kids, respectively) at birth but less that of Çağraş (1999)(67.37 and 69.95 cm at 90th days and 78.62 and 73.80 cm at 180th days for male and female Saanen kids, respectively) at weaning and the age of 180 d. When this value was compared to the value obtained with Saanen cross-breed, it was similar to those of Özcan (1977)(34.2 and 34.4 cm at birth, 53.8 and 55.2 cm at weaning, 62.1 and 62.9 cm at 180th day for SKG_1 and SKG1 x [SKG_1 x Kilis (F_1)] cross-breed, respectively) at birth, weaning and the age of the 180 d, and less than that of Tozlu (2006) (57.41 cm for SHG_1 cross-breed) at weaning, but higher than that of Şimşek et al. (2007)(31.70 and 34.62 cm for SHF_1 and SHG_1 cross-breed, respectively) at birth.

In the experiment, among factors affecting chest circumference the effects of year and mother's age were not significant ($P>0.05$) but the effects of birth type ($P<0.01$) and sex ($P<0.001$) were significant. The insignificant year effect observed in the study was in agreement with the finding of Özcan (1977) for all periods. The significant sex effect was similar to that of Çağraş (1999) at birth, weaning and 180 days that was different from that of Şimşek et al. (2007) at birth and weaning. The

non-significant mother's age effect was similar to the findings of Şimşek et al. (2007) at birth and weaning but different from that of Tozlu (2006) at weaning. The significant sex and birth type effects were different from that of Şimşek et al. (2007) at birth and weaning whereas they were agreement with the results of Tozlu (2006) at weaning.

This study showed that there is a limited number of researches on body measurements of Saanen kids. Therefore, a further detailed experiment on the various body measurements of Saanen kids should be carrying out.

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