Comparison of Body Weight and Dimensions at Birth and Weaning among Awassi and Chios Sheep Breeds and their Crosses

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ABSTRACT

Data were on 333 and 187 birth and weaning, lambs born in the University of Jordan Agriculture Research Station at Dear-Alla, Jordan, respectively. The objective was to compare body weight and dimensions at birth and weaning among Awassi and Chios breeds and their crosses. Measurements taken were birth and weaning weights, heart girth, body length, wither, front leg, hip, and rear leg heights, shoulder and hip widths, tail length, width and circumference. Singles were significantly (P< 0.001) weigh more than twins at birth (4.6 vs. 3.8 kg), weaning (19.4 vs. 17.4 kg) and (P<0.05) daily gain more (201 vs. 184 g). The effects of sex and dam breed on birth weight were also significant (P<0.01). Birth type had significant (P<0.001) influence on all body dimensions at birth including heart girth, body length, wither, front leg, hip, and rear leg heights, shoulder and hip widths with singles having higher values than that for twins. Dam breed significantly affected heart girth (P<0.001), shoulder and hip widths (P<0.01), with lambs of Awassi dams having higher values than those of Chios. Males had significantly (P<0.05) higher values of heart girths in Awassi sired lambs and lower values in those sired by Chios. Twin males had longer front leg than that of females, while single males and females had longer front leg than twins. Tail length at birth was significantly (P<0.001) larger for lambs with Chios sires or dams (15.4 or 15.9 cm, respectively) than those with Awassi sires or dams (14.1 or 13.6 cm, respectively). The differences were also similarly different at weaning. Average heterosis values of more than 5% were obtained from reciprocal crosses of Awassi and Chios sheep for body weight and growth to weaning. This may indicate a useful cross of Awassi and Chios for growth rates and weaning weight to be used by farmers in Jordan.

Keywords: Awassi, Chios, Crossbreeding, Body Dimensions, Sheep.

INTRODUCTION

The influences of breed and sex on characteristics of farm animals are studied by many researchers (Gutierrez et al., 2005; Kashan et al., 2005; Okendo and Moss, 2005). Breed affects growth rate, feed conversion, and resistance to disease, which in turn influence meat quality (Church and Wood, 1992). Awassi sheep breed has the ability to adapt to a wide range of climate conditions. It is the most important breed in Jordan, and it is of high economic importance to this region. The fat-tailed Awassi breed is native to the East Mediterranean, while the semi-fat-tailed Chios is a native of Greece but imported to other countries, e.g. Cyprus. The size of the fat tail varies between breeds. The fat deposited in the body or tail is laid down at a much higher cost in terms of feed energy than lean meat (Kashan et al., 2005). It is hypothesized that the size of the fat tail in progeny from Awassi x Chios crosses would be smaller than that of Awassi pure breed. Therefore, crossing with thinner-tail breeds like Chios could lead to improvement in

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production efficiency and carcass characteristics. The consumers in many instances show an increasing preference for lean meat.

The effects of sex of lamb, birth and rearing type and dam breed on body weight and dimensions at weaning were generally important (Croston et al., 1983; Al-Tarayrah and Tabbaa, 1999). Male lambs were heavier than females in different breeds. Similarly, singles were heavier than twins or triplets (Aziz and Abdelsalam, 1993). Mutton production from sheep is largely dependant upon birth and weaning weights. It has been shown that a positive relationship existed between birth weight and weaning weight in sheep (Qureshi et al., 1991). More rapidly gaining animals reach a fixed market weight at younger age or produce more live weight at the end of a fixed feeding period (Hohenboken, 1978).

Body dimensions provide information about meat productivity of the lamb. They are correlated with growth traits, carcass conformation and weight (Al-Jalili et al., 1987). Body dimensions are also of value in judging the quantitative characteristics of meat (Stanford et al., 1995) and helpful in developing suitable selection criteria (Khakanga et al., 1987). Among the most important body dimensions are body length, heart girth, shoulder and hip widths, withers and hip heights (Tabbaa, 1998). The objectives of this study were to compare body weight and dimensions at birth and weaning of different sex among Awassi and Chios sheep breeds and their crosses.

Materials and Methods

The study was carried out at The University of Jordan Research Station in Dear-Alla flock of sheep. Mating among Awassi and Chios for two years (2001 and 2002) was designed to obtain different pure- and cross-bred lambs. That is pure Awassi and Chios and both reciprocal crosses between the two breeds (Table 1). At birth, lambs were ear tagged, weighed and data were recorded. Lambs suckled their dams until weaning. Average weaning age was 73.6 ± 7.5 days. Creep feeding was practiced with lambs throughout the suckling period. Animals were housed in semi-open sheds. Ample vegetation was available for sheep during grazing from January to late April (18 MJ ME/day). A concentrate supplement of 1.2 kg per day and barley straw of 0.3 kg per day were given to each ewe during last six weeks of gestation and during lactation starting from early October. The concentrate included barley grain 68%, wheat bran 15%, soy bean 15%, limestone 1.5%, and table salt 0.5%, in addition to 1.5kg/ton of vitamin-mineral premix. Wheat straw, mineral blocks and water were available all the time.

Table 1. Effect of sex of lamb, sire breed dam breed and birth type on body weight at birth and weaning, weight gain and daily gain from birth to weaning.

Effect	N	Birth weight kg	N	Weaning weight kg	Pre-weaning gain kg	Pre-weaning daily gain kg
Sex		**		ns	ns	ns
Female	166	4.10±0.06b	96	17.9±0.5	13.7±0.5	0.19±0.006
Male	167	4.31±0.06a	91	18.9±0.5	14.5±0.5	0.20±0.006
Sire breed		ns		ns	ns	ns
Awassi (a)	255	4.18±0.06	150	18.8±0.5	14.6±0.4	0.20±0.006
Chios (c)	78	4.23±0.07	37	18.0±0.6	13.6±0.6	0.19±0.007
Dam breed		**		ns	ns	ns
Awassi (a)	245	4.32±0.06a	138	18.5±0.5	14.0±0.5	0.19±0.007
Chios (c)	88	4.09±0.07b	49	18.3±0.5	14.2±0.5	0.19±0.007
Birth type		***		***	*	*

Effect	N	Birth weight kg	N	Weaning weight kg	Pre-weaning gain kg	Pre-weaning daily gain kg
Single	208	4.60±0.07a	110	19.4±0.5a	14.7±0.5a	0.20±0.007a
Twin	125	3.81±0.06b	77	17.4±0.5b	13.5±0.4b	0.18±0.006b
Sire breed*Dam breed		ns		ns	ns	ns
a*a	212	4.27±0.05	127	18.3±0.3	14.1±0.3	0.19±0.004
a*c	43	4.10±0.10	23	19.2±0.8	15.0±0.8	0.20±0.011
c*a	33	4.37±0.11	11	18.6±0.9	13.9±0.9	0.19±0.013
c*c	45	4.08±0.09	26	17.4±0.6	13.3±0.6	0.18±0.008
Heterosis						
a*c %		-1.90		7.74	9.49	8.56
c*a %		4.76		4.39	1.22	2.67
Average %		1.43		6.07	5.36	5.62

ns (P>0.05), * (P < 0.05), ** (P < 0.01), *** (P < 0.001).
a,b means with different superscripts are different (P < 0.05).

Body weight and dimensions and tail measurements were taken for lambs standing naturally neither twisted nor stretched with the four legs parallel to each other on a leveled place. Weights and measurements of lambs were taken at the early morning before feeding and watering. These measurements include birth weight, weaning weight, heart girth, body length, wither, front leg, hip, and rear leg heights, shoulder and hip widths, and tail length, width and circumference.

Least squares analyses of variance were performed on the data to study the effect of different fixed effects on all measurements taken at birth and weaning. General Linear Model (GLM) procedure of the Statistical Analysis System (SAS, 1994) was utilized for this purpose. Factors studied included sex of lamb (male or female), breed of sire and dam (Awassi or Chios), lamb birth type (single or twin), and all two-way interactions. Weaning measurements were adjusted for weaning age. Means were separated using Fisher protected lsd test at P< 0.05 for all significant effects. Heterosis (H) for both crosses and average of both were calculated for all body weights and measurements as percentage from average of purebred lambs using the following equation:

$$\% H = \frac{\text{Average phenotype of F1}}{\text{Average phenotype of pure Awassi and pure Chios}} \times 100.$$

Where F1 is each of the reciprocal crosses and the average of the two (Hohenboken et al., 1976).

Results and Discussion

The influence of sex of lamb, sire breed, dam breed, birth type and their two-way interactions on live animals characteristics and measurements are presented in this study. Table 1 shows the influence of the above mentioned factors and interaction on body weight at birth and weaning, weight gain and daily gain from birth to weaning. Birth type had highly significant (P<0.001) influence on lamb birth and weaning weights and significant effect (P<0.05) on pre-weaning weight gain and pre-weaning daily weight gain. Singles had higher values for birth and weaning weights, pre-weaning and pre-weaning daily gain than those of twins. This is in agreement with results of other researchers (Khan et al., 1991; Qureshi et al., 1991; Al-Tarayrah and Tabbaa, 1999). Qureshi et al. (1991) reported that single born Awassi lambs were heavier (4.26 vs. 3.61kg) than twin born lambs. Awassi lambs weaned at four months of age had an average weight of 27.94 kg (Khan et al., 1991). The difference in weight between single and twin lambs

increased from birth to weaning, which could be attributed to that singles were more capable of suckling their mothers than twins (Al-Tarayrah and Tabbaa, 1999). The influence of lamb sex and dam breed ($P<0.01$) on birth weight was also significant. Male had higher values than females and lambs of Awassi dams had higher values than that for lambs of Chios dams. The effect of sex, birth type and year of lambing was extended into the weaning weight (Khan et al., 1991). Khan et al. (1991) reported that the differences in birth weight due to birth type, sex and year of lambing were significant. Male lambs were also heavier than females. Notter et al. (1991) reported that singles were heavier at birth than twins. Single born lambs gained weight faster (0.214 kg) as compared with twins (0.178 kg), male lambs in the two birth types grew faster as compared with the females (Khan et al., 1991). Birth and weaning weights for Awassi sheep in Pakistan averaged 4.08 and 27.94 kg, and they varied due to sex, birth type and year of lambing (Qureshi et al., 1991). Average weight gain per day up to weaning was 0.204 kg in the two birth types and sexes. Mean weight gain for single born male and female lambs in Pakistan was 0.227 and 0.202 kg, respectively, (Khan et al., 1991) while the rate of gain for twins was 0.187 and 0.170 in male and females, respectively. Economides (1986) working on Chios sheep found that weight gain was higher for males than that for females and difference became larger as animals get older. Djemali et al. (1994) reported average pre-weaning daily gain of 146 g for the Barbarine lambs in Tunisia. Khan et al. (1991) reported that weaning weight ranged from 26.0 to 30.0 kg in Awassi lamb. In the present study, birth weight showed negative heterosis for crossbred lambs of Chios dams (-1.904%) and positive one for that of Awassi dams (4.755%). Although they were not significant, other values were higher for lambs of Chios dams than that of Awassi dams. Other researchers reported that sire and dam breeds were also important source of variation at weaning age (Fourie et al., 1970; Notter et al., 1991).

Table 2 reports the influence of the fixed effects of sex of lamb, sire breed, dam breed and birth type on lambs body dimensions at birth. As in body weights, birth type in general had highly significant ($P<0.001$) influence on all body dimensions at birth including heart girth, body length, wither, front leg, hip, rear leg and heights, shoulder and hip widths with singles having higher values than that for twins. Similarly, Khan et al. (1991) reported that birth type affected all live animal measurement at birth. Dam breed significantly affected heart girth ($P<0.001$), shoulder and hip widths ($P<0.01$), with Awassi dams having higher values than that for Chios. Also, sire breed-birth type interaction had a significant effect ($P<0.05$) on heart girth (Figure 1). Males had higher values in Awassi sired lambs and lower values in those sired by Chios. In a previous study, sex of Awassi lambs significantly affected wither and hip heights and heart girth, while body length, shoulder and hip width were not affected (Al-Tarayrah and Tabbaa, 1999). Growth rate for Awassi male lambs was higher than that for females, and that females were smaller than males at birth (Al-Tarayrah and Tabbaa, 1999). Twin males had longer front legs than that of females, while single males and females had longer front legs than twins. The interaction of sire breed and birth type had a significant effect ($P<0.05$) on hip width as shown in Figure 2. An important genetic effect of sire was reported for hip width and height, body length and shoulder width for lamb at birth (Al-Tarayrah and Tabbaa, 1999). Heterosis values of body measurements were all negative for crossbred lambs with Chios dams except for body length (Table 2).

Table 2. Effect of sex of lamb, sire breed dam breed and birth type on body dimensions at birth.

Effect	N	Heart girth cm	Body length cm	Wither height cm	Front leg height cm	Hip height cm	Rear leg height cm	Shoulder width cm	Hip width cm
Sex		ns	ns	ns	ns	ns	ns	ns	ns
Female	134	37.4±0.2	26.5±0.2	38.4±0.2	27.6±0.2	39.3±0.2	28.8±0.2	7.99±0.06	8.32±0.07
Male	136	37.9±0.2	26.8±0.2	38.7±0.2	27.9±0.1	39.5±0.2	28.7±0.2	8.04±0.06	8.42±0.06
Sire breed		ns	ns	ns	ns	ns	ns	ns	ns
Awassi (a)	203	37.8±0.2	26.7±0.2	38.6±0.2	27.7±0.1	39.4±0.2	28.7±0.2	8.01±0.06	8.38±0.06
Chios (c)	67	37.5±0.3	26.5±0.2	38.4±0.3	27.8±0.2	39.3±0.2	28.8±0.2	8.02±0.07	8.36±0.07
Dam breed		***	ns	ns	ns	ns	ns	**	**
Awassi (a)	190	38.2±0.2a	26.6±0.2	38.7±0.2	27.9±0.2	39.5±0.2	28.9±0.2	8.14±0.06a	8.50±0.07a
Chios (c)	80	37.1±0.3b	26.6±0.2	38.4±0.3	27.7±0.2	39.3±0.2	28.6±0.2	7.89±0.07b	8.24±0.07b
Birth type		***	***	**	***	***	***	***	***
Single	165	38.4±0.2a	27.2±0.2a	39.0±0.3a	28.2±0.2a	39.9±0.2a	29.3±0.2a	8.25±0.07a	8.61±0.07a
Twin	105	37.0±0.2b	26.0±0.2b	38.1±0.2b	27.3±0.1b	38.8±0.2b	28.2±0.2b	7.78±0.06b	8.13±0.06b
Sire breed*Dam breed		ns	ns	ns	ns	ns	ns	ns	ns
a*a	166	38.5±0.24	26.6±0.2	38.8±0.2	27.8±0.1	39.6±0.1	28.8±0.1	8.10±0.05	8.54±0.05
a*c	37	37.2±0.4	26.9±0.3	38.5±0.4	27.6±0.3	39.2±0.3	28.5±0.3	7.91±0.11	8.21±0.12
c*a	24	38.0±0.4	26.7±0.3	38.5±0.4	27.9±0.3	39.3±0.3	28.9±0.3	8.18±0.11	8.46±0.12
c*c	43	37.1±0.3	26.4±0.3	38.4±0.3	27.8±0.2	39.3±0.2	28.7±0.2	7.87±0.08	8.26±0.09
Heterosis									
a*c %		-1.65	1.48	-0.27	-0.66	-0.69	-0.99	-0.94	-2.29
c*a %		0.55	0.80	-0.17	0.31	-0.41	0.54	2.39	0.67
Average %		-0.55	1.14	-0.22	-0.18	-0.55	-0.23	0.73	-0.81

ns (P>0.05), * (P < 0.05), ** (P < 0.01), *** (P < 0.001).
a,b means with different superscripts are different (P < 0.05).

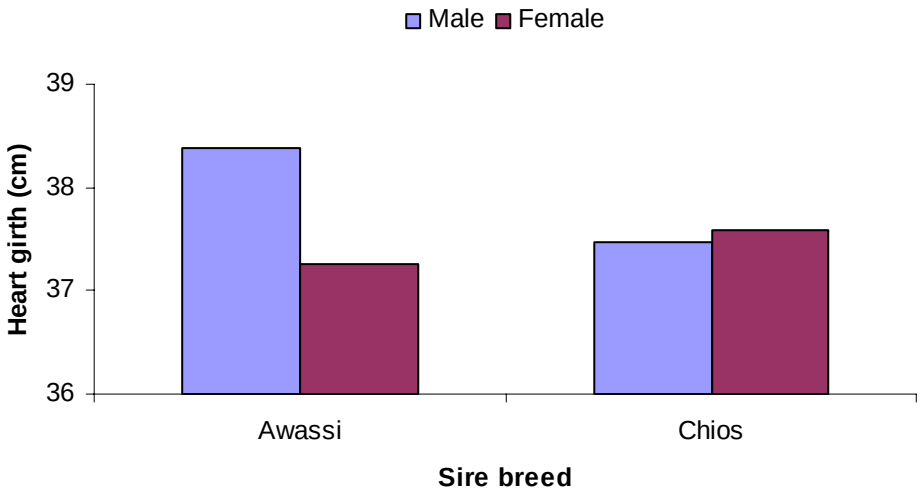

Figure 1. Interaction effect of sire breed and sex on heart girth, shoulder and hip width for lambs at birth.

Figure 2. Interaction effect of sire breed and birth type on hip width for lambs at birth.

Tail measurements at birth were highly significantly (P<0.001) affected by sire and dam breeds while birth type significantly (P<0.01) affected only tail length (Table 3). Lambs of Chios sires or dams had longer tails, while those of Awassi sire or dam breeds had wider tails and circumferences. Singles are born with longer tails than twins. Sire-dam breeds interaction had no significant effect on tail width, while pure Awassi lambs had the widest tails. Crossbreds with Awassi dams were in the second place. Crossbreds with Chios dams in the third place and pure Chios lambs have the thinnest tails. Heterosis values were highly different for lambs of Awassi or Chios sires and for different tail measurements (Table 3). Some were positive and others were negative.

Table 3. Effect of sex of lamb, sire breed dam breed and birth type on tail measurements at birth.

Effect	N	Tail length cm	Tail width cm	Tail circumference cm
Sex		ns	ns	ns
Female	134	14.8±0.2	7.46±0.17	12.0±0.2
Male	136	14.7±0.2	7.56±0.16	12.2±0.2
Sire breed		***	***	***
Awassi (a)	203	14.1±0.2b	8.15±0.16a	13.5±0.2a
Chios (c)	67	15.4±0.244a	6.87±0.19b	10.8±0.2b
Dam breed		***	***	***
Awassi (a)	190	13.6±0.216b	8.68±0.17a	14.1±0.2a
Chios (c)	80	15.9±0.247a	6.34±0.19b	10.2±0.3b
Birth type		**	ns	ns
Single	165	15.2±0.235a	7.58±0.18	12.2±0.2
Twin	105	14.4±0.208b	7.44±0.16	12.10±0.2
Sire breed*Dam breed		ns	ns	ns
a*a	166	12.9±0.177	9.55±0.14a	15.4±0.2
a*c	37	15.4±0.384	6.75±0.307c	11.5±0.4
c*a	24	14.3±0.391	7.82±0.30b	12.7±0.4
c*c	43	16.5±0.294	5.93±0.23d	9.0±0.3

Effect	N	Tail length cm	Tail width cm	Tail circumference cm
Heterosis				
a*c %		4.55	-12.71	-6.14
c*a %		-2.61	1.00	4.06
Average %		0.97	-5.86	-1.04

ns (P>0.05), * (P < 0.05), ** (P < 0.01), *** (P < 0.001).
a,b means with different superscripts are different (P < 0.05).

At weaning, sex had significant effects on body dimensions (Table 4). Males had significantly higher withers and longer rears (P<0.05) and front legs (P<0.01). Growth rate of Awassi male lambs was higher than that of females, and females were smaller than males and these differences between males and females increased from birth to weaning for body weights and dimensions (Al-Tarayrah and Tabbaa, 1999). Al-Tarayrah and Tabbaa (1999) reported that the effect of sire were more important for body length at weaning and hip and withers heights and heart girth. Birth type had highly significant (P<0.001) influence on withers height and shoulder width, highly significant (P<0.01) influence on heart girth, body length, rear leg height, and hip width and significant (P<0.05) influence on front leg height, with singles as expected, having higher values. The difference in weight between single and twin lambs increased from birth to weaning. This could be attributed to that single lambs were more capable of suckling their mothers than twin lambs do (Al-Tarayrah and Tabbaa, 1999). Lambs of Awassi sires had numerically wider hips than that of pure Chios and other were in between. In other breeds, sire and dam breeds had influence on almost all live animal measurements at weaning (Fourie et al., 1970; Notter et al., 1991). Awassi singles had numerically longer front legs than twins and Chios. Tail was longer in singles, however Chios singles had the longest tails. Awassi sired crossbred lambs have positive heterosis values for all body measures at weaning, while those of Chios were mostly negative.

Table 4. Effect of sex of lamb, sire breed dam breed and birth type on body dimensions at weaning.

Effect	N	Heart girth cm	Body length cm	Wither height cm	Front leg height cm	Hip height cm	Rear leg height cm	Shoulder width cm	Hip width cm
Sex		ns	ns	*	**	ns	*	ns	ns
Female	95	64.6±0.9	45.4±0.6	56.3±0.5b	36.5±0.4b	57.1±0.6	37.9±0.4b	15.9±0.2	16.7±0.2
Male	91	65.3±0.9	45.2±0.6	57.5±0.5a	38.0±0.5a	57.7±0.6	38.9±0.4a	16.1±0.2	16.9±0.2
Sire breed		ns	ns	ns	ns	ns	ns	ns	ns
Awassi (a)	150	65.9±0.8	45.7±0.6	57.0±0.5	37.2±0.4	58.1±0.6	38.5±0.4	16.0±0.2	17.0±0.2
Chios (c)	36	64.0±1.0	44.9±0.7	56.8±0.6	37.3±0.5	56.7±0.7	38.3±0.5	15.9±0.3	16.7±0.3
Dam breed			*	**	**	ns	**	ns	ns
Awassi (a)	138	64.3±0.9	44.2±0.6b	55.9±0.6b	36.2±0.5b	56.7±0.6	37.4±0.5b	16.0±0.2	16.9±0.2
Chios (c)	48	65.5±1.0	46.3±0.7a	58.0±0.6a	38.2±0.5a	58.1±0.7	39.4±0.5a	15.9±0.3	16.7±0.2
Birth type		**	**	***	*	ns	**	***	**
Single	110	66.5±0.9a	46.4±0.6a	58.1±0.6a	37.8±0.5a	58.0±0.7	39.3±0.5a	16.9±0.3a	17.2±0.2a
Twin	76	63.4±0.8b	44.1±0.6b	55.7±0.5b	36.7±0.4b	56.8±0.6	37.5±0.4b	15.5±0.2b	16.4±0.2b
Sire breed*Dam breed		ns	ns	ns	ns	ns	ns	ns	ns
a*a	127	64.7±0.6	44.1±0.4	56.5±0.4	36.4±0.3	57.4±0.4	37.6±0.3	15.8±0.2	16.8±0.2
a*c	23	67.0±1.5	47.2±1.1	57.5±0.9	38.1±0.8	58.9±1.1	39.4±0.8	16.2±0.4	17.2±0.4
c*a	11	63.9±1.7	44.3±1.2	55.3±1.0	36.1±0.9	56.0±1.2	37.2±0.9	16.3±0.5	17.1±0.4
c*c	25	64.1±1.1	45.4±0.8	58.40.7	38.4±0.6	57.3±0.8	39.4±0.6	15.6±0.3	16.3±0.3
Heterosis									
a*c %		4.10	5.33	0.12	1.84	2.61	2.54	3.26	3.82
c*a %		-0.73	-1.15	-3.80	-3.50	-2.35	-3.29	3.41	3.42

Effect	N	Heart girth cm	Body length cm	Wither height cm	Front leg height cm	Hip height cm	Rear leg height cm	Shoulder width cm	Hip width cm
Average %		1.69	2.09	-1.84	-0.83	0.13	-0.38	3.33	3.62

ns (P>0.05), * (P < 0.05), ** (P < 0.01), *** (P < 0.001).
a,b means with different superscripts are different (P < 0.05).

Tail dimensions at weaning were influenced by both sire and dam breeds (Table 5). Sire breed highly significantly affected tail circumference (P<0.001) and width (P<0.01). However, dam breed highly significantly affected (P<0.001) all tail measurements. For both effects, Awassi breed had higher values of thickness measures and lower values for length. Singles had significantly longer (P<0.01) and wider (P<0.1) tails than twins. Figure 3 shows the interaction effect of birth type and sex on tail width (P<0.01), with single females having the largest values. Awassi sired crossbred lambs have positive heterosis value on tail length and negative values on thickness measures of tail, while visa versa values for Chios sired lambs.

Table 5. Effect of sex of lamb, sire breed dam breed and birth type on tail dimensions at weaning.

Effect	N	Tail length cm	Tail width cm	Tail circumference cm
Sex		ns	ns	ns
Female	95	24.4±0.6	15.0±0.5	29.7±0.9
Male	91	23.8±0.6	15.8±0.5	29.3±0.9
Sire breed		ns	**	***
Awassi (a)	150	24.2±0.6	16.4±0.5a	31.9±0.8a
Chios (c)	36	24.1±0.7	14.4±0.6b	27.0±1.0b
Dam breed		***	***	***
Awassi (a)	138	20.8±0.7b	17.6±0.5a	35.7±0.9a
Chios (c)	48	27.4±0.7a	13.2±0.5b	23.2±1.0b
Birth type		**	ns	ns
Single	110	25.3±0.7a	15.9±0.5a	30.0±1.0
Twin	76	23.0±0.6b	14.9±0.5b	28.9±0.9
Sire breed*Dam breed		ns	ns	ns
a*a	127	20.6±0.4	18.7±0.3	38.2±0.6
a*c	23	27.7±1.1	14.1±0.9	25.6±1.6
c*a	11	21.0±1.2	16.5±1.0	33.2±1.8
c*c	25	27.1±0.8	12.3±0.6	20.9±1.1
Heterosis				
a*c %		16.02	-9.00	-13.49
c*a %		-11.98	6.09	12.30
Average %		2.02	-1.45	-0.60

ns (P>0.05), * (P < 0.05), ** (P < 0.01), *** (P < 0.001).
a,b means with different superscripts are different (P < 0.05).

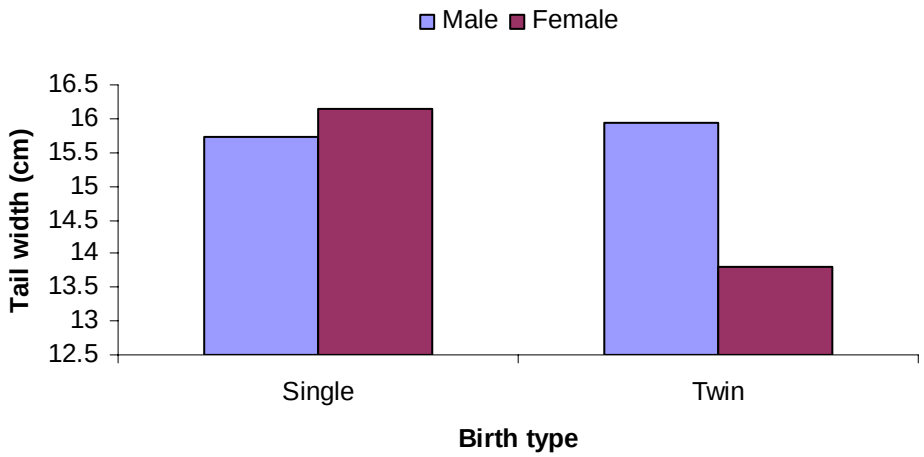

Figure 3. Interaction effect of type of birth and sex on tail width and circumference for lambs at weaning.

Sex of lambs had effects on live animal measurements. Singles were heavier and grow faster than twins. Average heterosis values of more than 5% were obtained from reciprocal crosses of Awassi and Chios sheep for boy weight at weaning and for growth to weaning. Heterosis values for other body measurements were positive but low, except for tail width at birth which was above 5%. This may indicate a useful outcome from cross of Awassi with Chios for growth rates and weaning weight to be used by farmers in Jordan.

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مقارنة وزن الجسم وأبعاده عند الولادة والفطام بين أغنام العواسي والكيوس والهجين الناتج منهما

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ملخـص

استخدمت معلومات عن 333 و187 سجل ولادة وفطام حملان ولدت في محطة البحوث الزراعية التابعة للجامعة الأردنية في دير علا، وكان الهدف مقارنة وزن الجسم وأبعاده عند الولادة والفطام بين سلالتي العواسي والكيوس وهجائنها، حيث أخذت قياسات الحملان على الولادة والفطام وهي الوزن ومحيط الصدر، وطول الجسم وارتفاع الكتف والأرجل الأمامية والكفل والأرجل الخلفية وعرض الكتف والكفل وطول وعرض ومحيط الذيل، وكان الحمل المفرد يزن معنويا ($P< 0.001$) أكثر من التوأم عند الولادة (4.6 مقابل 3.8 كغ) وعند الفطام (19.4 مقابل 17.4 كغ) ومعنويا ($P<0.05$) أكثر في معدل الزيادة اليومية (201 مقابل 184 غ)، وكان تأثير جنس الحمل وسلالة الأم على وزن المواليد عال المعنوية ($P< 0.01$)، وكان لنوع الولادة تأثيرا معنويا ($P< 0.001$) في جميع أبعاد الجسم عند الولادة بما فيها محيط الصدر وطول الجسم وارتفاع الكتف والأرجل الأمامية والكفل والأرجل الخلفية وعرض الكتف والكفل، وكانت القيم للحمل المفرد أعلى من تلك للحمل التوأم، وكان لسلالة الأم أثرا معنويا في محيط الصدر ($P< 0.001$) وعرض الكتف والكفل ($P< 0.01$)، وكانت أعلى للحملان التي أمها عواسي من أولئك الذين أمهاتها كيوس، وكان للذكور التي آباؤها عواسي محيط صدر أكبر ($P< 0.05$) من تلك التي آباؤها كيوس، وكانت القوائم الأمامية للتوائم الذكور أطول من تلك للإناث، بينما كان للحملان المفردة والإناث قوائم أمامية أطول من تلك التي للتوائم، وكان طول الذيل عند الولادة أكبر معنويا ($P< 0.001$) للحملان التي آباءها أو أمهاتها كيوس (15.4 أو 15.9 سم) من أولئك الذين آباؤهم أو أمهاتهم عواسي (14.1 أو 13.6 سم)، وكانت الفروق مختلفة بالمثل عند الفطام، وتم الحصول على أكثر من 5% كمعدل قيم قوة الهجين للهجن المتبادلة من العواسي والكيوس لوزن الجسم ومعدل النمو للفطام، وتوحي هذه النتيجة بإمكانية الاستفادة من هجين العواسي والكيوس في معدل نمو الحملان ووزن الفطام بالنسبة لمربي الأغنام في الأردن.

الكلمات الدالة: عواسي، كيوس، تهجين، أبعاد الجسم، أغنام.

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