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Asian Journal of Animal and Veterinary Advances

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Asian Journal of Animal and Veterinary Advances 7 (2): 187-192, 2012
ISSN 1683-9919 / DOI: 10.3923/ajava.2012.187.192

Evaluation of the Relationship Between Body Measurements and Carcass Traits of Finishing Afshari and Zandi Rams

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ABSTRACT

In order to evaluate the relation between body measurements (body length, stator, chest girth, body depth and romp width) with carcass traits (live weight, warm carcass weight, warm carcass efficiency, warm carcass weight without fat-tail and warm carcass without fat-tail efficiency), records from 200 Afshari and Zandi rams collected. Genetic group had effect on the warm carcass efficiency ($p<0.01$) and Zandi rams had higher efficiency. Chest girth affected by genetic group ($p<0.05$) which Afshari rams had bigger chest girth. Both genetic groups had high correlations between chest girth×live weight, romp width×live weight, chest girth×warm carcass weight without fat-tail, live weight×warm carcass weight without fat-tail, warm carcass weight×warm carcass weight without fat-tail. Results showed that chest girth was the best index in predicting body weight to 6 months of age at both genetic groups. Live weight at 6 months could be used to predict the warm carcass weight and warm weight without fat-tail. Chest girth and romp width in Afshari and Zandi, respectively were suitable factors for predicting warm carcass weight and warm carcass weight without fat-tail.

Key words: Live weight, body measurements, carcass traits, regression, sheep

INTRODUCTION

Carcass traits are of a great importance in evaluating genetic merit in sheep industry (Kianzad, 2004). Furthermore increasing prolificacy per each animal, is the factor which breeders try to reach, consequently they tend to raise animals with higher body weight. It is essential to raise sheep that are genetically able to produce more meat that would result in increasing income of meat (Ambhore *et al*., 2003; Fouri *et al*., 2002; Riva *et al*., 2003; Vashan *et al*., 1998). In order to evaluate genetic potential of sheep to produce more meat, it is necessary to collect records from carcass and body weight; however it would be possible when animals are slaughtered (Waldron, 2003). Another problem is that the system of sheep breeding in Iran, because of the special geographic conditions, is not an intensive system that brings about more difficulties in recording traits (Vatankhah *et al*., 2004). This is why introducing a simple method of recording and evaluating animals which is practical at earlier ages, would be very useful in estimating merit and conducting selection programs, also increasing quality and quantity of carcass (Essien and Adesope, 2003). Linear measurements of body are kind of growth indicators in animal life (Attah *et al*., 2004;

Gizaw, 1995; Goe *et al*., 2010), also it is likely determining these linear measurements would help to predict body weight and carcass traits in future (Thiruvenkadan, 2005; Atta and El Khidir, 2004). Some studies indicated that live weight were highly correlated with chest girth and also the same results reported about carcass traits and other body measures (Benyi, 1997; Faizurrahman, 2007; Kuene *et al*., 2007; Sarti *et al*., 2003). Fouri *et al*. (2002) indicated that there were high positive correlation between chest girth and growth after weaning in Dorper rams, which means choosing these animals for higher chest girth would result in more rapid growth. This study conducted to estimate correlation between carcass traits and body measures and to evaluate regression of them to determine if regression could as a simple method predict carcass traits in future.

MATERIALS AND METHODS

Experiment: This experiment conducted in Jun, 2009 in Bahonar Agricultural College, Iran. One hundred 3-months-old Zandi rams and 100 3-months-old Afshari rams randomly selected and divided into raising boxes. The animals had a period of 15 days of adaptation and finished during 90 days. Body weight and body measurements measured before and after finishing period after 12 h of fasting. Body weight and measurements of Afshari and Zandi rams shown in Table 1. Traits were: 1. Body weight, 2. Body measures: body length, chest girth, body depth and romp width, Carcass traits: live weight, warm carcass weight, warm carcass efficiency, warm carcass weight without fat-tail and warm carcass without fat-tail efficiency. Eighty rams from 2 genetic groups randomly slaughtered at the end of the finishing period and carcass traits determined.

Statistical analysis: Data analyzed using statistical model by ANOVA procedure of SAS software.

$$Y_{ij} = \mu + G_i + e_{ij}$$

where, Y_{ij} is observations; μ is total mean; G_i is genetic group; e_{ij} is kandom error. Body weight at the beginning of experiment introduced as cofactor into the model. Correlation between body weight, carcass traits and body measurements estimated and regression coefficients of these traits estimated using SAS software.

Table 1: Body weight and measures of Afshari and Zandi rams

Genetic group	Mean	SE	Min	Max	CV
Afshari					
Body weight	24.75	0.74	20.00	32.00	12.68
Body depth	19.55	0.39	17.00	22.00	8.63
Romp width	20.83	0.30	19.00	24.00	6.21
Body length	60.44	2.50	53.00	92.00	5.18
Chest girth	75.72	1.06	69.00	83.00	5.95
Zandi					
Body weight	29.69	0.80	24.50	35.00	11.45
Body depth	18.83	0.31	16.00	22.00	7.11
Romp width	20.66	0.33	18.00	23.00	6.84
Body length	56.44	0.79	52.00	63.00	5.96
Chest girth	80.33	0.91	75.00	86.00	4.84

RESULTS AND DISCUSSION

The effect of genetic group on body weight, carcass traits and linear body measurements: Means and standard errors of traits summarized in Table 2. Results showed that live weight was higher in Afshari group but the differences were not significant. Zandi rams had higher warm carcass weight and warm carcass weight without fat-tail. Warm carcass efficiency significantly affected by genetic group ($p<0.01$), Zandi rams had higher efficiency. It is likely because of thinner limbs and lower limbs to body ratio and also Zandi group had lower gastro-intestinal weight than Afshari group. Least square means and standard errors of body measurements shown in Table 3. Afshari group had higher body length, body depth and romp width but the differences were not significant. Chest girth of Afshari group was higher than Zanedi group ($p<0.05$) which is the result of bigger body size in Afshari sheep.

Correlation estimates Correlation coefficients of carcass traits and body measurements summarized in Table 4: Correlation between chest girth and romp width with live weight were high in both genetic groups ($p<0.01$), between chest girth and live weight in Afshari and Zandi groups were 0.84 and 0.91, respectively (Table 4). Vashan *et al.* (1998) studied regression and

Table 2: Least square means and standard errors of carcass traits by genetic group

Group	LW(kg)	WC (Kg)	CF (Kg)	CE (%)	CFE (%)
Sig.	ns	ns	ns	**	ns
Afshari	41.63±0.87	18.21±0.39	16.02±0.30	43.77±0.45^{b}	37.81±0.60
Zandi	40.59±0.87	19.13±0.39	16.98±0.30	46.97±0.45^{a}	38.91±0.54
Total	41.11	18.67	16.50	45.37	38.41
CV	5.73	5.64	9.15	3.03	3.50

ns: Not significant. *, **: Significant at 0.05 and 0.01, respectively. LW: Live weight, WC: Warm carcass weight, CF: Warm carcass weight without fat-tail, CE: Carcass efficiency, CFE: Warm carcass efficiency

Table 3: Least square means and standard errors of body measures by genetic group

Group	BL	CG	BD	RW
Sig.	ns	*	ns	ns
Afshari	66.41±1.12	91.56±1.00 ^{a}	22.36±0.40	22.99±0.39
Zandi	64.58±1.12	88.32±1.00^{b}	21.52±0.40	21.78±0.39
Total	65.50	89.94	21.94	22.38
CV	2.01	5.89	5.45	5.93

ns: Not significant. *, **: Significant at 0.05 and 0.01, respectively. BL: Body length, CG: Chest girth, BD: Body depth, RW: Romp width

Table 4: Correlation coefficients of carcass traits and body measures

Group	LW	WC	CF	BD	RW	BL	CG
LW	-	0.93**	0.96**	0.54^{ns}	0.65*	0.70*	0.91**
WC	0.98**	-	0.72^{ns}	0.51^{ns}	0.49^{ns}	0.65^{ns}	0.91**
CF	0.97**	0.98**	-	0.53^{ns}	0.69^{ns}	0.89*	0.95**
FW	0.87*	0.89*	0.80*	-0.03^{ns}	0.26^{ns}	0.59^{ns}	0.68^{ns}
BD	0.10ns	0.19^{ns}	0.31^{ns}	-	0.50^{ns}	0.49^{ns}	0.64^{ns}
RW	0.87**	0.90**	0.90*	0.39^{ns}	-	0.73*	0.63*
BL	0.42^{ns}	0.50^{ns}	0.87*	0.26^{ns}	0.42^{ns}	-	0.66*
CG	0.84**	0.82**	0.77*	0.16^{ns}	0.87**	0.28^{ns}	-

ns: Not significant. *, **: Significant at 0.05 and 0.01, respectively. Measures above diagonal are for Zandi rams and Under diagonal are for Afshari rams. LW: Live weight, WC: Warm carcass weight, CF: Warm carcass weight without fat-tail, BD: Body depth, RW: Romp width, BL: Body length, CG: Chest girth

Table 5: Regression models for predicting BW and carcass traits in Afshari and Zandi rams

	No.	Regression model	R^2
Afshari			
Weight at 6 month of age	1	LW = -10.03821 + 0.54651 CG	0.60
	2	LW = -42.14946 + 0.52692 BL+ 0.52701 CG	0.73
Warm carcass weight	3	WC = 0.82734 + 0.41635 LW	0.97
	4	WC+ -11.32877 + 1.26712 RW	0.83
Warm carcass weight	5	CF = 2.52044 + 0.32741 LW	0.95
without fat-tail	6	CF = -4.35750 + 0.86750 RW	0.81
Zandi			
Weight at 6 month of age	1	LW = -16.62582 + 0.65204 CG	0.57
	2	WC = -16.35708 + 0.40062 CG	0.84
Warm carcass weight	3	WC = 1.70613 + 0.42975 LW	0.88
	4	CF = 2.97805 + 0.34946 LW	0.93
Warm carcass weight	5	CF = -15.19503 + 0.36366 CG	0.90
without fat-tail			

LW: Live weight, WC: Warm carcass weight, CG: Chest girth, RW: Romp width, BL: Body length, CF: Warm carcass weight without fat-tail

correlation of body weight and type traits in Bloochi sheep and estimated 0.96 correlation between live weight and chest girth. Vatankhah *et al.* (2004) reported high correlation between live weight and body measurements in Lori sheep; however they measured 0.89 correlation of live weight and chest girth. Attah *et al.* (2004) and Sowand and Sobola (2007) in sheep and Thiruvenkadan (2005) and Khan *et al.* (2006) in goat, reported similar results.

Zandi group showed 0.75 correlation between live weight and body length which was high. Vatankhah *et al.* (2004) reported 0.71 in Lori sheep, similar studies indicated similar results in goat (Ambhore *et al.*, 2003; Thiruvenkadan, 2005; Fajemilehin and Salako, 2008; Khan *et al.*, 2006). Both genetic groups showed high correlation between warm carcass weight and warm carcass weight without fat-tail with warm carcass weight without fat-tail. It was in agreement with other reports (Vatankhah *et al.*, 2004). The correlation between live weight and warm carcass weight without fat-tail were 0.98 and 0.89, respectively. Vatankhah *et al.* (2004) estimated similar correlations in Lori sheep. It is likely because of this fact that live weight and warm carcass weight involved weight of fat-tail influenced the correlations. Sheep with heavier fat-tail, had higher live weight and warm carcass weight.

Regression coefficients of carcass traits and body measurements: Regression models represented in Table 5. The most effective body measurements in predicting weight at 6 months of age was chest girth. This measure could predict 60% and 57% of variation of BW in Afshari and Zandi groups, respectively (Table 4). Body length was the second important factor which could predict 73% of variation in body weight of Afshari rams at 6 months of age. Chest girth had the highest regression in Afshari rams which means 1 cm increase in chest girth would result in 0.54 kg higher BW. This was similar in Zandi rams (0.65). The regression coefficient of warm carcass weight was 97 and 88 in Afshari and Zandi rams, respectively, Vatankhah *et al.* (2004) reported similar results. In order to predict warm carcass weight in Afshari rams, RW was an effective measure, as the regression coefficient was 83%. In Zandi group, chest girth could predict 84% of warm carcass weight.

Vatankhah *et al.* (2004) suggested that chest girth was the best factor in predicting warm carcass weight after live weight, regression coefficient of romp width was a useful measure for predicting warm carcass weight without fat-tail in Afshari group and it predicted 81% of variation in warm carcass weight without fat-tail. Results showed that body measures were of a great importance in predicting live weight, warm carcass weight and warm carcass weight without fat-tail more correct. In order to heighten income and shorten time need for breeding, it is recommended to consider body measurements as alternative factors of body weight and carcass traits.

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