GENETIC EVALUATION OF KARAKUL AND MARWARI SHEEP IN ARID ZONE OF RAJASTHAN: BODY WEIGHTS

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ABSTRACT

The comparative performances of Marwari and Karakul breed of sheep have been studied using data (For Marwari 817 and for Karakul 744) collected from C.S.W.R.I., A.R.C., Bikaner over six years. The least-squares means for body weight have been estimated at birth, 3, 6, 9 and 12 months of age to be 3.00±0.02, 13.00±0.01, 17.01±0.08, 20.24±0.10 and 23.40±0.10 kg in Marwari and 3.61±0.02, 12.50±0.12, 17.73±0.11, 20.70±0.14 and 21.73±0.16 kg in Karakul, respectively. The effect of breed was highly ($P \leq 0.01$) significant for birth, 3, 6, 9 and 12 months weight. Karakul lambs have been found heavier than Marwari lambs at birth weight. The effect of sex of lambs was highly significant ($P \leq 0.01$) on various body weights. The year of birth had significant effect on body weights from birth to 12 months of age.The interaction between breed and sex have been estimated to be significant ($P \leq 0.01$) for 9 and 12 months of body weights. The interaction between sex and year have been estimated to be significant for 6, 9 and 12 months body weights. The interactions between breed and year have also been observed to be significant ($P \leq 0.01$) on body weights. Dam's weight at lambing was observed to be a significant factor influencing the body weights upto six months of age. Heritability estimates for birth, 3, 6, 9 and 12 months body weight have been estimated as 0.273±0.099, 0.129±0.083, 0.187±0.090, 0.207±0.092 and 0.075±0.077, respectively. The positive and higher phenotypic correlation of weaning weight with weights at subsequent ages suggest that selection may be practiced at an early age. It was concluded that Marwari breed have higher adult body weight in comparison to Karakul breed.

Key words: Marwari, Karakul, sheep, body weight, heritability

Introduction

Sheep contribute animal protein as mutton and provide wool and skin for protection from adverse climate and add to soil fertility by providing valuable manure. Sheep are the backbone of rural economic in arid, semi-arid and hilly regions of our country. The sheep rearing and processing of wool and skin generate rural employment. Rajasthan tops the list of Indian states in sheep population It is home of to eight sheep breeds viz. Magra, Pugal, Nali, Marwari, Jaisalmeri, Chokla, Malpura and Sonadi. Marwari sheep is well built, sturdy animal having black face, predominant nose, short ear and long legs. Karakul sheep is one of the most important breeds of tropics and subtropics, famous all over the world for the outstanding quality of pelt. Before a breeding plan is implemented, it is necessary to evaluate the factors affecting economic traits. Therefore, the present investigation was an attempt to compare Marwari and Karakul sheep with respect to body weight.

Materials and Methods

The data for the present investigation were collected from the Arid Region Campus, Central Sheep and Wool Research Institute, Bikaner. Data on body weights from birth to 12 months were classified according to breed, sex and year of birth. The least-squares technique using LSMLMW computer programme designed by Harvey (1990) was utilized to study the effect of different factors and to estimate genetic and phenotypic parameters through mixed model approach with non-genetic factors as a fixed effect and sireas a random effect.

Results and Discussion

The body weight at birth, 3, 6, 9 and 12 months of age were 3.00±0.02, 13.00±0.01, 17.01±0.08, 20.24±0.10 and 23.40±0.10 kg in Marwari and 3.61±0.02, 12.50±0.12, 17.73±0.11, 20.70±0.14 and 21.73±0.16 kg in Karakul, respectively. Nirban *et al.* (2015) also reported same results. The effect of breed was highly ($P \leq 0.01$) significant for birth, 3, 6, 9 and 12 months body weight. Karynbaev (2014) also reported similar result in Karakul.Karakul lambs have been found heavier than Marwari lambs at birth. The effect of sex of lambs was highly significant ($P \leq 0.01$) on various body weights and males were heavier. The present finding is in agreement with report of Narula *et al.* (2010) and Chikurdekar (2012). The year of birth had significant ($P \leq 0.01$) effect on body weights from birth to 12 months of age. Differences in birth weight may be due to quality and quantity of nutrition over different years and management of the dams during pregnancy that influenced the birth weight of lambs.

The interaction between breed and sex was non-significant at birth, 3 and 6 months body weight and significant ($P \leq 0.01$) at 9 and 12 months. The interaction between sex and year of birth was observed to be significant for 6, 9 and 12 months body weights and non-significant for birth weight and 3 months body weight. The interaction between breed and year of birth was highly significant ($P \leq 0.01$) from birth to 12 months of age indicating that the two breeds responded differently to the environmental conditions. Regression of various body weights on dam's weight at lambing was highly significant except that of 9 and 12 months body weight it indicated that if dam is heavier at lambing then its lambs will also be heavier at birth and subsequent ages. Regression of birth weight on 3 months body

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Table 1: The least-squares means with standard errors for body weight (kg) at birth, 3, 6, 9 and 12 months of age

Effect	Birth weight	Three months weight	Six months weight	Nine months weight	Twelve months weight
OVERALL	3.30±0.01 (1561)	12.71±0.07 (1283)	17.40±0.06 (1222)	20.47±0.08 (1129)	22.56±0.10 (1045)
BREED	**	**	**	**	**
MARWARI	3.00±0.02^{b} (817)	13.00±0.01^{a} (800)	17.01±0.08^{b} (783)	20.24±0.10^{b} (722)	23.40±0.10^{a} (678)
KARAKUL	3.61±0.02^{a} (744)	12.50±0.12^{b} (483)	17.73±0.11^{a} (439)	20.70±0.14^{a} (407)	21.73±0.16^{b} (367)
SEX OF LAMB	**	**	**	**	**
MALE	3.40±0.02^{a} (746)	13.00±0.10^{a} (564)	17.72±0.10^{a} (539)	21.00±0.13^{a} (479)	23.00±0.14^{a} (425)
FEMALE	3.20±0.02^{b} (815)	12.50±0.09^{b} (719)	17.02±0.10^{b} (683)	20.00±0.10^{b} (650)	22.19±0.11^{b} (620)
YEAR OF BIRTH	**	**	**	**	**
Yr1	3.32±0.03^{b} (336)	12.43±0.15^{c} (264)	18.56±0.14^{b} (261)	23.19±0.18^{a} (203)	26.10±0.20^{a} (190)
Yr2	3.50±0.03^{a} (218)	15.00±0.17^{a} (194)	19.80±0.17^{a} (180)	22.37±0.21^{b} (177)	22.36±0.21^{c} (162)
Yr3	3.13±0.03^{d} (265)	11.61±0.18^{d} (181)	17.08±0.20^{c} (171)	20.82±0.23^{c} (161)	25.00±0.23^{b} (157)
Yr4	3.45±0.03^{a} (255)	13.00±0.16^{b} (242)	15.23±0.14^{e} (231)	18.14±0.18^{d} (229)	21.30±0.18^{d} (218)
Yr5	3.20±0.03^{cd} (312)	11.32±0.16^{d} (256)	17.18±0.17^{c} (236)	20.83±0.22^{c} (224)	20.16±0.31^{e} (192)
Yr6	3.23±0.04^{c} (175)	13.00±0.20^{b} (146)	16.4±0.17^{d} (143)	17.46±0.14^{e} (135)	20.57±0.22^{e} (126)
INTERACTION					
Breed x Sex				**	**
Marwari x Male	3.10±0.02 (379)	13.33±0.13 (373)	17.36±0.12 (367)	22.20±0.14^{a} (329)	24.26±0.15^{a} (295)
Marwari x Female	3.00±0.02 (438)	12.60±0.12 (427)	16.65±0.11 (416)	19.29±0.13^{c} (393)	22.52±0.14^{b} (383)
Karakul x Male	3.72±0.02 (367)	12.61±0.20 (191)	18.08±0.17 (172)	20.77±0.21^{b} (150)	21.62±0.25^{c} (130)
Karakul x Female	3.50±0.02 (377)	12.33±0.14 (292)	17.40±0.13 (267)	20.62±0.16^{b} (257)	21.85±0.18^{c} (237)
Sex X Year			*	**	**
Male x Yr1	3.42±0.03 (191)	12.75±0.23 (123)	19.21±0.20 ^{b} (122)	24.74±0.28^{a} (85)	27.75±0.30^{a} (68)
Male x Yr2	3.61±0.05 (95)	15.43±0.26 (83)	20.42±0.25^{a} (79)	23.00±0.31^{b} (77)	22.60±0.32^{c} (69)
Male x Yr3	3.24±0.04 (118)	12.00±0.27 (75)	17.35±0.26^{cde} (69)	20.67±0.33^{e} (66)	25.22±0.33^{b} (64)
Male x Yr4	3.60±0.04 (109)	13.00±0.24 (101)	15.40±0.22^{h} (95)	18.74±0.27^{f} (93)	21.54±0.28^{de} (88)
Male x Yr5	3.30±0.04 (140)	11.77±0.23 (112)	17.42±0.23^{cd} (104)	20.88±0.31^{de} (94)	20.01±0.43^{g} (76)
Male x Yr6	3.26±0.05 (93)	13.17±0.28 (70)	16.54±0.25^{fg} (70)	17.84±0.31^{g} (64)	20.56±0.32^{fg} (60)
Female x Yr1	3.21±0.04 (145)	12.12±0.20 (141)	17.90±0.18^{c} (139)	21.63±0.23^{cd} (118)	24.45±0.23^{b} (122)
Female x Yr2	3.40±0.04 (123)	15.00±0.22 (111)	19.16±0.21^{b} (101)	21.74±0.26^{c} (100)	22.13±0.21^{cd} (93)
Female x Yr3	3.02±0.04 (147)	11.40±0.24 (106)	16.82±0.22^{efg} (102)	21.28±0.28^{cde} (95)	24.57±0.29^{b} (93)
Female x Yr4	3.30±0.04 (146)	13.07±0.20 (141)	15.08±0.18^{h} (136)	17.53±0.22^{g} (136)	21.06±0.22^{ef} (130)
Female x Yr5	3.10±0.03 (172)	11.00±0.20 (144)	17.00±0.21^{def} (132)	20.77±0.25^{e} (130)	20.31±0.31^{fg} (116)
Female x Yr6	3.20±0.05 (82)	12.64±0.26 (76)	16.22±0.24^{g} (73)	17.08±0.30^{g} (71)	20.60±0.31^{fg} (66)
Breed x Year	**	**	**	**	**
Marwari x Yr1	2.84±0.03^{g} (170)	12.65±0.20^{d} (169)	17.31±0.16^{c} (167)	22.85±0.24^{a} (112)	25.83±0.25^{ab} (100)
Marwari x Yr2	3.16±0.04^{e} (116)	15.65±0.21^{a} (113)	19.23±0.22^{b} (100)	22.82±0.27^{a} (99)	24.33±0.27^{c} (90)
Marwari x Yr3	3.00±0.04^{f} (124)	12.00±0.21^{d} (123)	17.08±0.20^{c} (122)	20.12±0.24^{c} (120)	24.40±0.24^{c} (117)
Marwari x Yr4	3.00±0.04^{f} (149)	14.06±0.20^{c} (147)	16.43±0.17^{d} (147)	19.20±0.21^{d} (147)	21.87±0.21^{d} (140)
Marwari x Yr5	3.03±0.03^{f} (192)	12.65±0.17^{d} (183)	15.58±0.15^{e} (182)	18.62±0.19^{d} (179)	22.26±0.20^{d} (171)

Note: figures in parenthesis indicate number of observations.* =($P \leq 0.05$), **= ($P \leq 0.01$). Means with superscripts within effect differ significantly from one another

Table 2: Heritability's, phenotypic and genetic correlations among body weights

Traits	Birth weight	Three months weight	Six months weight	Nine months weight	Twelve months weight
Birth weight	**0.273±0.099**	0.269±0.356	0.015±0.290	-0.137±0.319	0.215±0.361
Three months weight	0.243	**0.129±0.083**	0.732±0.156	0.803±0.169	0.474±0.319
Six months weight	0.197	0.747	**0.187±0.090**	0.735±0.122	0.225±0.311
Nine months weight	0.165	0.683	0.814	**0.207±0.092**	0.627±0.206
Twelve months weight	0.265	0.681	0.649	0.788	**0.075±0.077**

Note: Upper triangle present genetic correlation; Lower triangle present phenotypic correlation; Diagonal present heritability

weights was also significant ($P \leq 0.01$) whereas, regression of 3 months body weights on 6, 9 and 12 months weights were highly ($P \leq 0.01$) significant.

Heritability estimates for birth, 3, 6, 9 and 12 months weight were 0.273±0.099, 0.129±0.083, 0.187±0.090, 0.207±0.092 and 0.075±0.077, respectively. Phenotypic correlations of birth weight with 3, 6, 9 and 12 months of body weight were positive. The positive correlation suggested those animals weighing heavier at birth are likely to be heavier at subsequent ages. The genetic correlation of birth weight with 3, 6 and 12 months were positive. There was positive genetic correlation of 3 months body weight with 6, 9 and 12 months body weight. The phenotypic correlation of 3 months body weight was positive and high with 6, 9 and 12 months of body weight. The genetic correlation of 6 months body weight was observed to be positive with 9 and 12 months body weight. The phenotypic correlation of 6 months body weight was also observed to be positive and high with 9 and 12 months body weight. The positive and high phenotypic and genetic correlation was observed for 9 months body weight with 12 months body weight.

The positive and higher phenotypic correlation of weaning weight with weights at subsequent ages suggest that selection may be practiced at early age.It was concluded that Marwari breed have higher adult body weight in comparison to Karakul breed.

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