Canadian Journal of Applied Sciences; 2011; 1(3): 121-128, October, 2011
Intellectual Consortium of Drug Discovery & Technology Development Inc.
ISSN 1925-7430 Available online http://www.canajas.com

Original Research Article

EFFECT OF NON-GENETIC AND GENETIC FACTORS ON BIRTH WEIGHT OF MENGALI SHEEP OF BALOCHISTAN

Mohammad Masood Tariq[1], Masroor Ahmed Bajwa[1], Shakeel Babar[1], Abdul Waheed[2], Farhat Abbas Bukhari[1], Tahir Hameed[1], Illahi Bakhsh Marghazani[3], Yasir Javed[1]

[1]Center for Advanced studies in Vaccinology and Biotechnology (CASVAB), University of Balochistan, Quetta, Pakistan. [2]Faculty of Veterinary Sciences, Bahauddin Zakariya University, Multan**,** Pakistan. [3]Livestock and Dairy Development Department, Balochistan, Pakistan.

ABSTRACT

Data on birth weight of 2377 lambs obtained from 581 dams and 56 sires of Mengali sheep born during 2005 and 2009 were recorded and analyzed to identify the factors affecting birth weight of Mengali lambs. Mengali flocks were kept under semi-intensive condition in four stations at three different locations (Experimental Station Center for Advanced studies in Vaccinology and Biotechnology (CASVAB), University of Balochistan, (ESC), Quetta, Killi Hassni, Quetta; Khadkucha, Mastung and Peer Wala (Mal), Nushki). The lambing occurred spring and autumn, however majority of the Mengali sheep (85 %) lambed during spring between (February and March months). Among the total lambs born, the male to female sex ratio was 49.43: 50.57 respectively and shown no significant difference between two sexes. The overall least-squares means for birth weight of males and females pooled over parity and type of birth were 3.61±0.36 and 3.48±0.39 kg respectively. The estimate of heritability for birth weight was observed as 0.39±0.06. Study on non-genetic factors revealed that the birth weight was significantly ($P<0.05$) affected by period of birth, season of birth, sex of the lamb, parity and location of flock. Hence, efforts should be made for better management of pregnant ewes when the climatic conditions are not conducive to them.

Keywords: Heritability, lambs, meat, parity, sex ratio

Corresponding Author: Mohammad Masood Tariq, Center for Advanced studies in Vaccinology and Biotechnology (CASVAB), University of Balochistan, Quetta, Pakistan. Email tariqkianiraja@yahoo.com, Tel.: +9222855679, Fax: +9220913134

INTRODUCTION

Sheep and goat dwell in a special place in the rural economy of Pakistan. Mengali sheep is an important sheep breed of Balochistan. The main features of this breed are compact body with

notable height, pendulous belly, fat tail, body color is black/tan or brown with white patches on the belly or vise versa (Kakar and Ahmad, 2004; Khan et al., 2007, Tariq et al., 2011), and ears are usually medium in size, big black face and white spots on the head with Roman nose, both males and females are polled. Mengali sheep are spread in Mustung, Kalat, Khuzdar and Quetta districts. They are reared mainly for meat, milk, wool and the primary by-product is skin. The animals are well adapted to the local conditions of most of the Districts of Quetta, Khuzdar, Chaghi, Kalat, Mastung, Awaran and Kharan of Balochistan Province. Source of origin of Mengali sheep is still unknown. This sheep breed is mostly raised by native Baloch tribe "Mengal" (main tribe of Chaghi area), therefore known as Mengali (Tariq et al., 2011). Sheep raising in Pakistan (especially in Balochistan) and neighboring countries is mostly kept by local pastoralists on extensive production system. In such a system, output is lower than in an intensive system. Within local area natural selection of breeds is a suitable method for genetic improvement in the traditional low input production systems (Khan et al., 2007; Ali, 2008). Performance traits of farm animals are determined not only by an animal's genetic potential for growth but also by maternal genetic and permanent and temporary environmental effects. Hence, to achieve optimum genetic progress in a selection program, both direct and maternal genetic components should be taken into account, especially if there is not an antagonistic relationship between them (Snowder and Van Veilk, 2003). Birth weight is the first observed trait in life of an animal on which growth, production, and reproduction traits are dependent. So the present investigation was carried out to study the various non-genetic factors affecting birth weight of Mengali lambs born under semi-intensive farm conditions.

MATERIALS AND METHODS

The data used in this study were scored from 2005 to 2009 on 2377 lambs obtained from 581 dams and 56 sires of Mengali sheep. Mengali flocks were kept in four stations at three different locations (Experimental Station CASVAB, UoB, Quetta (ESC), Killi Hassni, Quetta; Khadkucha, Mastung and Peer Wala (Mal), Nushki). The Mengali sheep were reared under semi-intensive system of management. The animals were grazed from 8.00 to 17.00 hours. In addition ewes were maintained with 150 to 250 g of concentrate mixture. During the shortage of fodder, animals were fed dry roughages (maize and sorghum and orchard waist) and urea and molasses treated wheat straw. The data were analysed by least-squares technique (Harvey 1990) adapting linear model after adjusting the fixed effects of period and season of birth, sex of the lamb and parity, since these being considered as the potential sources of variation. The period of birth has been divided into five years and the season of birth was classified as season 1 (October to March) spring lambing and season 2 (April to September) autumn lambing. The parity has been grouped as 1^{st}, 2^{nd}, 3^{rd}, 4^{th} and 5^{th} and above. The data were subjected to standard statistical analysis as per Snedecor and Cochran (1986). The fixed effects model used for the analysis estimating the least-squares means to find out the non-genetic factors affecting birth weight in the Mengali sheep was as follows:

$$Y_{ijlklm} = m + P_i + S_j + T_k + O_l + e_{ijklm,}$$

Where

m = overall mean when equal subclass frequencies exist,
P_i =effect of i^{th} period ($_i$= 1to 5),
S_j =effect of j^{th} season ($_j$ =1 to 2),
T_k =effect of k^{th} sex of lamb ($_k$= 1 and 2),
O_l =Effect of l^{th} parity ($_l$ = 1 to 5)
Q_n =Effect of n^{th} flock (1-4) and

E_{ijklmn} =Residual error.

The heritability for birth weight was estimated by paternal half-sib method by including the sires in the model after adjusting the data for significant non-genetic factors.

RESULTS AND DISCUSSION

Sex Ratio

Among the total lambs born, the male to female sex ratio was 49.43: 50.57 respectively. The chi-square test (of goodness of fit) revealed no significant difference between two sexes. The result of sex ratio for the present study was in agreement with many researchers (Maria, 1972; Nawaz, 1983; Kakar, 1993; Akhtar, 1996; Memon, 1998; Sharif, 2001; Hussain, 2006). Maria (1972) reported that the sex ratio lambs (Male: Female) in Ossimi was 46.92:53.08, respectively. Nawaz (1985) reported sex ratio in Awassi, Kachhi and Awassi x Kacchi was 49.26; 48.88 and 50.87 in male and 50.74; 51.12 and 49.13 in female, respectively. Kale and Raman (1994) reported a sex ratio of 52.93% males for Madras Red and 50% for Mandya sheep. Akhtar (1996) reported that sex ratio values in Hissardale sheep flock was found 52.5: 47.5 males and females, respectively. Memon (1998) obtained that secondary sex ratio values were (47:50:52.50); (55.30:44.70) and (52.20:47.80) in Kacchi; Kooka and Dumbi sheep (Male: Female) respectively. Secondary sex ratio for Balochi, Rakhshani, Bibrik and Harnai sheep were (39:61); (37:62); (43:57) and (43:57) respectively (Kakar, 1993). Sharif (2001) determined the sex ratio of Balochi and Bibrik sheep breed of Balochistan were 44:56 and 42:58 (Male: Female) respectively. Hussain (2006) also estimated sex ratio 47.4:52.6 in Hissardale flock, respectively. There were many investigators mentioned that sex ratios showed much variation due to breed differences.

Lambing Pattern

The lambing pattern revealed that the lambing occurred in spring (February and March) and 85% and autumn (September and October) 15%. It is in accordance with the information of Akhtar (1996) for Hissardale sheep, Memon (1998) for Kacchi; Kooka and Dumbi sheep Pattanayak et al. (2003) for Ganjam sheep and Hussain (2006) for Hissardale sheep and Thiruvenkadan et al., (2008) for Mecheri sheep. However, Patro et al. (2006) reported that indigenous sheep of Kendraprada district of Orissa were bred throughout the year and they further noted that majority of the ewes (67 per cent) came to heat in April to June months.

Effect of Non-Genetic Factors

The least-squares means of genetic traits of birth weight (kg) of Mengali lamb are presented in Table 1.

Period of Birth

It was observed from the results that the period of birth had significant ($P<0.05$) effect on birth weight (Table 1). Further it has been noted that the lambs born in period 4 and 5 (2008-2009 and 2009-2010) had higher birth weight (3.58±0.38 and 3.56±0.40 kg, respectively). While lambs born during the period 1 (2005-2006) had lowest birth weight (3.46±0.29 kg). The present findings of significant effect of period are in agreement with the observations made by Bobhate et al. (2003), Nehra and Singh (2006), Jadav et al. (2007) and Thiruvenkadan et al., (2008). The significant differences in birth weight among lambs born in different period may be attributed to difference in management, selection of rams and environmental conditions.

Table 1. Least-squares (± S.E) means of non genetic traits of birth weight (kg) of Mengali lamb

Effect	**Number of observations**	**Mean ± S.E**
Overall	**2377**	**3.54±0.36**
Period		*
P_1 (2005-2006)	279	3.46 ± 0.29^{a}
P_2 (2006-2007)	331	3.51 ± 0.34^{b}
P_3 (2007-2008)	450	3.55 ± 0.37^{c}
P_4 (2008-2009)	584	3.58 ± 0.38^{c}
P_5 (2009-2010)	733	3.56 ± 0.40^{d}
Season		*
Season 1 (October-March)	2026	3.68 ± 0.35^{b}
Season 2 (April –September)	351	3.49 ± 0.33^{a}
Sex of the lamb		*
Male	1174	3.61 ± 0.36^{b}
Female	1203	3.48 ± 0.39^{a}
Parity		*
First	714	3.40 ± 0.35^{a}
Second	568	3.49 ± 0.42^{b}
Third	520	3.54 ± 0.38^{bc}
Fourth	364	3.58 ± 0.33^{cd}
Fifth and above	211	3.61 ± 0.39^{d}
Flock at different location		
ESU Quetta	307	3.62 ± 0.33^{c}
Killi Hassni, Quetta	631	3.53 ± 0.38^{b}
Khadkucha, Mastung	763	3.59 ± 0.35^{c}
Peer wala (Mal) Nushki	676	3.47 ± 0.39^{a}
* significant , Means bearing different superscript indicate significant difference (P<0.05).		

Season of Birth

The lambs born during spring were heavier (3.68±0.35 kg) than the lambs born during autumn season (3.49±0.33 kg). Similarly, single born lambs were (3.72±0.29 kg) heavier than twin born lambs (3.45±0.34 kg). The season had significant (P<0.05) effect on birth weight of lambs. It is in accordance with the reports of Akhtar et al. (2001) who analyzed performance data on Hissardale lambs and stated that, the lambs born during spring were heavier (3.8±0.01 kg) than the lambs born during autumn season (3.6±0.02 kg). Similarly, single born lambs were heavier than twin born lambs (3.9±0.14 vs. 3.5±0.03 kg). Male lambs were also heavier (3.9±0.02 kg) than the female lambs (3.5±0.02 kg). Sivakumar et al. (2006) also reported that lambs born during September to February were having higher birth weight than those born during March to August. Thiruvenkadan et al., (2008) reported that lambing

occurred throughout the year, however majority of the Mecheri sheep (76.2 per cent) lambed between September and February months.

The ewes those conceived during September to October months had lambing during February and March, favourable environmental conditions with good availability of the fodder during the gestation period, which might have been contributed to higher body weight at birth.

Parity

Parity has significant effect ($P<0.05$) on birth weight of the lambs. The birth weight of the lambs was lowest in the first parity and it increased as the parity advanced with maximum in the fifth and above parity. It is in accordance with the report of Karunanithi et al. (1994) for the same breed, Mandal et al. (2003) for Muzaffarnagari sheep and Thiruvenkadan et al. (2008) for Mecheri sheep.

Sex of the Lamb

The average birth weight of different sexes revealed that the male lambs had higher birth weight than females. The sex of the lambs had significant ($P<0.05$) effect on birth weight. High birth weight of ram lambs and significant effect of sex was also reported by several authors (Karunanithi et al., 1994, Sivakumar et al., 2006; Ravimurugan et al., 2007 and Thiruvenkadan et al., 2008). Higher growth in prenatal stage under the influence of male sex hormones with anabolic effect (Hafez 1962) might be the reason for higher birth weight of male lambs.

Flock at Different Locations

The flocks kept at different locations had significant ($P<0.05$) effect on birth weight of lambs. Flock kept at ESC, Quetta and Khadkucha, Mastung location performed significantly better in all traits compared to other flocks. This difference might be due to better management and regular supplementation of ration to this flock. Refiq et al. (2009) reported that flocks raised at different location had significant effect on birth weight of lambs; that result was found similar to the present study under report.

Genetic Parameter

The estimate of heritability for birth weight observed in this study was 0.39±0.06. Heritability estimates for BW were similar to the estimates reported by many researchers; Pollott et al. (1998) in Turkish Awassi lambs (0.44 ± 0.09), Al-Shorepy (2001) in crossbred lambs (0.32) and Ali (2008) in Karakul (0.30). The estimates of the present study were lower than those obtained by many researchers; Mahmoud (2000) in Barki (0.81), Rahmani (0.66) and Ebangi et al. (2001) (0.61) in Fulbe sheep. The estimates were higher than those reported by Yazdi et al. (1997) in Baluchi (0.14), Hussain (2006) in Thalli (0.07 ± 0.02), Thiruvenkadan et al. (2008) for Mecheri lamb 0.061 ± 0.071, Jadhav et al. (2007) for crossbred sheep 0.14 ± 0.02, Refik et al. (2009) in Turkish Merino (0.14 ± 0.02), and Borg (2009) in Targhee (0.19). The relatively moderate estimate of heritability indicated that a greater portion of variation in growth traits was due to non-genetic factors.

These differences in birth weights may be due to breed, size of the data set or method of estimation used in different studies, production system, climatic conditions and ecological zones, where sheep farms were practiced. This wide variation in birth weight indicated that

mass selection for higher birth weight could be made in order to improve the birth weight of lambs so that early lamb mortality may be reduced.

CONCLUSIONS

The study revealed that the birth weight of Mengali lambs was influenced by various non-genetic factors viz., period of birth, season of birth, sex of the lamb, parity and locations of flock. Efforts should be made for better management of pregnant ewes when the climatic conditions are not conducive to them. Since the birth weight is the first observational trait on which growth, production, selection and reproduction traits are dependent; efforts have to be made for improvement of the same through better nutrition and management.

REFERENCES

Akhtar P. 1996. Genetic and phenotypic parameters of some performance traits of Hissardale sheep in Pakistan. Ph D Dissertation. Department of Animal Breeding and Genetics, Univ. Agric. Faisalabad, Pakistan.

Akhtar P, Ali S, Hussain A, Mirza MA, Mustafa MI, Sultan JI. 2008. Heritability estimates of post-weaning performance traits in Hissardale sheep in Pakistan. Turk. J. Vet. Sci., 32(4): 275-279.

Ali M.2008. Effect of genetic and environment factors on performance traits of Karakul sheep. M Sc. Thesis. Department of Livestock Management, Sindh Agriculture University, Tandojam.

Al-Shorepy SA 2001. Genetic parameters for growth traits of a local breed of sheep in the United Arab Emirates. J. Agric. Sci., 137(3): 365-371.

Bobhate S D, Barbind RP Hanmante AA. 2003. Factors causing variation in birth weight of goats. Indian Journal of Small Ruminants 9:173-175.

Borg RC, Notter DR, Kott RW.2009. Phenotypic and genetic associations between lamb growth traits and adult ewe body weights in western range sheep. J. Anim. Sci., 87: 3506-3514.

Ebangi AL, Njoya A, Ngo-Tama AC, Awa DN, Mbah DA. 2001. Genetic and phenotypic parameters of birth weight traits in Fulbe sheep in Cameroon. Revue. d'Elevage et de Medecine Veterinaire des Pays Tropicaux, 54(2): 147-151.

Hafez E S E 1962 Reproduction In Farm Animals. (2^{nd} edition). Lea and Febizer, Philadelphia.

Harvey WR 1990. User's Guide for LSMLMW and MIXMDL PC-2 Version. Mixed model least-squares and maximum likelihood computer program. Ohio State University, Columbus, Ohio, U.S.A.

Hussain A (2006). Genetic evaluation of Thalli sheep in Pakistan. Ph D Dissertation. Department of Animal Breeding and Genetics, Univ. Agric. Faisalabad, Pakistan.

Jadhav S, Qureshi MI, Singh A, Nanavati S. 2007. Study of birth weight in crossbred sheep. Indian Journal of Field Veterinarians 2:71-72.Kale D G and Raman K S 1994 Sex ratio, twinning, still births and abortions in Madras Red and Mandya breeds of sheep. Indian Veterinary Journal 71: 1195-1197.

Kakar MA, Ahmed M.2004. An over-view of livestock in Balochistan. Livestock and

Dairy Development Department Balochistan, Quetta

Kakar AH. 1993. Performance analysis of Balochi, Bibrik, Rakhshani and Harnai sheep managed under farm flock system in Balochistan. M.Sc. Thesis. Department of Livestock Management, Sindh Agriculture University, Tandojam.

Karunanithi K, Natarajan N, Thangaraju P. 1994. Genetic and non-genetic variation in birth, placental weight and number of cotyledons in Mecheri and its Dorset cross sheep. Cheiron 6:255-260.

Khan SA, Khan MA, Khan SA, Mehmoud S. 2007. Genetic resources and diversity in Pakistani sheep. Inter. J. Agric. Biol.6:-941-944.

Mahmoud A. 2000. Heritability, genetic and phenotypic correlations of pre-weaning growth traits of Rahmany and Barki lambs. Alexandria J. Agric. Res., 45: 1.

Mandal A, Pant K P, Nandy DK, Rout PK,Roy R. 2003 Genetic analysis of growth traits in Muzaffarnagari sheep. Tropical Animal Health and Production 35:271-284.

Maria IFM. 1972. A study of twin and triplet lambs in Ossimi fat tailed sheep. Riuistadi Agriculture Sub-tropical. Animal Breeding. Abst. 53 (10): 798.

Memon MS. 1998. Performance analysis of Kachhi, Looka and Dumbi sheep under semi-intensive management system in Sidh. MSc Thesis. Department of Livestock Management, Sindh Agriculture University, Tandojam.

Nawaz, M. Ahmad MD, Ahmad Z, Khan GR, Khan MA. 1985. Comparative performance of Awassi, Kachhi and crossbred (Kachhi x Awassi) lambs. Pakistan J. Agri. Sci. 22 (3): 181-187.

Nehra KS, Singh VK. 2006. Genetic evaluation of Marwari sheep in arid zone :Growth. Indian Journal of Small Ruminants 12:91-94.

Patro B N, Mallick CR, Rao PK, Panda P. 2006. Production performance of indigenous meat type sheep in Kendrapada Distirct of coastal Orissa. Indian Journal of Small Ruminants 12: 42-47

Pattanayak GR, Patro BN, Das SK. Nayak S. 2003. Survey and performance evaluation of Ganjam sheep. Indian Journal of Small Ruminants 9:47-49.

Pollott GE, Gursoy O, Kirk K. 1998. The Genetics of meat and milk production in Turkish Awassi sheep. Proc. 6th World Cong., Genetics Applied to Livestock, Armidale, Australia; 11-16 January, 24: 177-180.

Ravimurugan T, Thanaseelaan V, Piramanayagam S and Balachandran S. 2007 Effect of non-genetic factors on birth weight and body measurements of Vembur lambs, Indian Journal of Small Ruminants 13:100-102.

Refik A, Ceyhan A, Ozder M, Sezenler T. 2009. Genetic and Non-Genetic parameter Estimates for Growth Traits in Turkish Merino Lambs. J. Anim. Vet. Adv., 8(9): 1729-1734.

Sharif M. 2001. Performance evaluation of economic traits of Balochi and Bibrik sheep of Balochistan. M.Sc. Thesis. Department of Livestock Management, Sindh Agriculture University, Tandojam.

Sivakumar T, Soundararajan C, Palanidorai R, Ganeshkumar K, Mahendran M, Malathi G. 2006 Factors affecting birth weight in Madras Red lambs. Indian Journal of Small Ruminants 12:115-116.

Snedecor GW, Cochran WG. 1989. Statistical Methods. 8th edition. Iowa State University Press, Ames, Iowa. pp. 503.

Snowder GD, Van Vieck LD. 2003. Estimates of Genetic parameters and selection strategies to improve the economic efficiency of post weaning growth in lambs. J. Anim. Sci. 81: 2704-2713.

Tariq MM. et al. 2011. Some Morphological, Fertility and Growth Traits for Mengali Sheep of Balochistan, Pakistan Balochistan (Pakistan). .(2011 Iğdır Üni. Fen Bilimleri Enst. Der. / Iğdır Univ. J. Inst. Sci. & Tech. 1(1): 63-68.

Thiruvenkadan A K, Chinnamani K, Muralidharan J, Karunanithi K. 2008. Effect of non-genetic factors on birth weight of Mecheri sheep of India. Livestock Research for Rural Development 20 (6) 2008.

Yazdi MH, Engstrm G, Nasholm A, Johansson K, Jorjani H, Liljedahl LE. 1997. Genetic parameters for lamb weight at different ages and wool production in Baluchi sheep. J. Anim. Sci., 65: 247-255.