Research Article

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Study on the Evaluation of Some Economic Traits of Rakhshani and Harnai Sheep Breeds of Baluchistan, Pakistan

Rameez Raja Kaleri[1,2*], Hubdar Ali Kaleri[1], Raza Ali Mangi[3], Deepesh Kumar Bhuptan[4], Sana Noor[5], Zainab Lanjar[6], Hubdar Ali Kolachi[7] Abdul Wahid Solangi[1] and Sheva Dari[1]

[1]Department of Animal Breeding and Genetics, Faculty of Animal Husbandry and Veterinary Sciences, Sindh Agriculture University, Tandojam, Pakistan; [2]Deputy Director Poultry Production, Tando Allahyar, Livestock and Fisheries Department, Government of Sindh, Sindh, Pakistan; [3]Department of Veterinary Anatomy & Histology, SBBUVAS, Sakrand, Pakistan; [4]Department of Meat Technology, SBBUVAS, Sakrand, Pakistan; [5]Department of Veterinary Parasitology, SBBUVAS, Sakrand, Pakistan; [6]Department of Veterinary Microbiology, SBBUVAS, Sakrand; [7]Department of Animal Reproduction, SBBUVAS, Sakrand, Pakistan.

Abstract | Study was conducted to analyze the economic traits of two different breeds of sheep, Rakhshani and Harnai. These sheep were being raised at two different farms, Langhove and Pirkani, located in Dera Murad, Baluchistan. The study focused on several parameters related to the weight of the sheep, including their birth weight (BW), weaning weight (WW), as well as their weight at 6 months, 9 months, and 12 months of ageData was collected over a three-year period (2018-2020) and analyzed using the standard procedure of analysis of variance. The results showed that the average birth weight of both Rakhshani and Harnai breeds was 3.17 ± 0.61 and 2.91 ± 0.51, respectively. The average weaning weight was also higher for Rakhshani than Harnai, with 15.21 ± 2.43 and 14.37 ± 1.27, respectively. The average body weight at 6 months and 12 months was also higher for the Rakhshani breed. The results showed a statistically significant influence of sex, breed, and birth type on the live body weight for all age categories (P< 0.05). Variations in twining were also observed significantly higher between the two breeds (P< 0.05). It is suggests that the economic traits of both the Rakhshani and Harnai breeds can be improved through better management, effective breeding plans, and proper selection. This could lead to better productivity, profitability, and other desirable outcomes for these breeds. By implementing these strategies, breeders may be able to selectively breed animals with desirable traits and manage their herds more efficiently, leading to overall improvements in the breed's economic performance.

Introduction

The livestock sector is fundamental assess and major source of rural livelihood in Baluchistan province with 70% of population through the share of 16,436,976 sheep and 16,880,371 goats (GOP, 2021). Sheep and goats are important small farm animals that play a significant role in rural economies and animal production across various marginal and sub-marginal land holdings. In Baluchistan, all native breeds have fat tails and are well-suited to harsh environmental conditions, primarily being raised through migratory farming systems. Kaleri et al. (2022) reported this. The study by Kaleri et al. (2018) emphasized that the breeding of sheep is crucial for sustaining people worldwide, as it provides essential products such as milk, meat, and wool. The provincial government of Baluchistan controlling the sheep production in flock farming system in various government and private farms on large and small scale Mainly all the registered sheep breed of Baluchistan raised with inbreeding method on these farms with intensive and semi-intensive management system (Becker, 1984). Rakshani and Harnai breeds are fat tailed mostly raised for meat and wool purpose in their respective areas including Loralai, Qila Saifullah, Ziarat, Pashin, Quetta and its adjoining areas. These breeds have ability to adopt wide range of harsh environment during the scarcity of food (Bugti et al., 2016). Breeding of sheep animal in term of reproduction, growth, wool and produced better selection method for genetically improved traits have been recorded for various breeds in the world. However, the information regarding climatic condition and factor mainly influencing on the live body weight at various growth period sheep is highly essential to perform effective selection program for breed and quantitative trait improvement (Fantahun et al., 2016). Keeping in the view advantage of availability data record of some productive and reproductive traits of Rakhshani and Harnai sheep breeds, this study was aimed to compare some economic traits of both breeds of Baluchistan, Pakistan.

Materials and Methods

Data
This study aimed to evaluate certain economic traits of Rakhshani and Harnai sheep breeds that are reared in Langhove and Pirkani sheep farms located in Dera Murad Jamali, Baluchistan. Data pertaining to economic traits of 1,300 lambs (640 Rakhshani and 531 Harnai) descended from 480 ewes and 36 rams were collected and recorded for duration of three years from 2018 to 2020.

Breeding and management
The flock was raised under range management system with inbreeding method were applied. Animal were allowed to breed from 15 September to 15 November once a year. The data was recorded from identified animal with individuals' identity by ear tags sire, dam, birth date, lambing date, sex, date of service and type of birth.

Performance traits
The data regarding economic traits including lamb's (birth weight), (weaning weight), (6 month weight), (9 month weight), and (12 month weight) were recorded in this study.

Reproductive traits
Reproductive traits including service period, age at 1st lambing, twining %, lambing interval, fertility rate and lambing % was collected for study.

Vaccination
Proper vaccination and deworming were routinely performed with proper scheduled.

Statistical analysis
The collected data was subjected to analysis through standard procedure of variance and significant difference was determined by the formula as suggested by (Becker, 1984).

Results and Discussion

The findings for least standard mean and standard error for body weight varied with birth weight, weaning weight, lamb's (birth weight), (weaning weight), (6 months weight), (9 months weight), and (12 months weight) for Rakhshani and Harnai breed are listed in Table 1. The variation among body weight varied with birth weight, weaning weight, lamb's (birth weight), (weaning weight), (6 months weight), (9 months weight), and (12 months weight) due to birth year, birth type, sex, breed observed significantly differed (P<0.05). However, the results for influence of birth type at 9 months weight were observed non-significant (P>0.05). The statistical analysis for reproductive traits is displayed in Table 1.

Table 1: *The least mean standard error values for some reproductive parameters in days.*

Breed	Age at 1st service	Age at 1st lambing	Service period	Lambing interval	Twining (%)	Lambing (%)	Fertility rate
Rakhshani	543±2.75(324)	693±2.21(314)	197±1.93(284)	347±3.73(294)	2±.02(294)	73±1.93(304)	61±2.46(290)
Harnai	513±1.19(280)	623±1.43(268)	178±3.17(284)	319±3.71(284)	1±0.2(284)	57±2.31(284)	51±2.81(284)

The findings showed that effect of breed found non-significantly difference non-significantly differed (P > 0.05) among all reproductive traits. However, the significantly differed (P < 0.05) was recorded for birth type.

Birth weight
The findings of our study showed significant difference in present study for year of birth, birth type, sex and birth weight of lambs with findings of various researchers Babar *et al.* (2004); Rafiq *et al.* (2009) and Akhtar *et al.* (2001), reported about the data of Kajli and Lohi lambs that birth weight was observed higher of single born lamb as compared with twins with (18%) and (3%) for male and female respectively. It has also been reported that male single born lambs with male were observed have heavier birth weight as compared with twin and female born lambs ranged from 3.9 to 2.78 for male and female lambs.

Esenbuga *et al.* (2002a), Mokhtari and Rashidi (2010) and Tariq *et al.* (2010) conducted a study to analyze the influence of the environment on some growth traits of Red Karman Lambs and Awassi breeds. They reported that birth type, birth year, and sex significantly influenced birth weight. Another investigation performed by Babar *et al.* (2004) on Lohi sheep breeds suggested that the weight of birth was significantly influenced by the birth year and birth type of the newborn lamb. It is also reported that dam age is a key factor that affects the birth weight of the lamb, as young lambs produced lower weight ewes compared to old age ewes. Kaleri *et al.* (2022) and Hussain (2006) suggested that birth season has a higher influence on birth weight because Thali and Harnai lambs born during the spring season have a heavier birth weight than the lambs born in the summer and autumn season. They also reported that lambs born single had a higher birth weight than those born as twins and triplets. The variation in birth weight might be due to the method of data analysis, type of breed, climatic conditions, production system, and agro-ecological areas where sheep were maintained. The high range difference among birth weight indicates that mass selection should be practiced to get maximum birth weight,

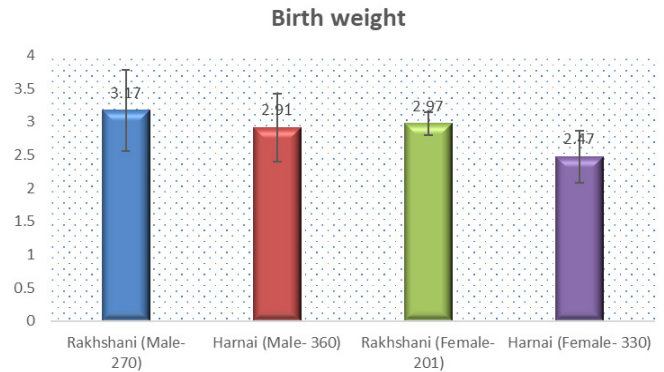which can improve growth and production rates and decrease lamb mortality rates.

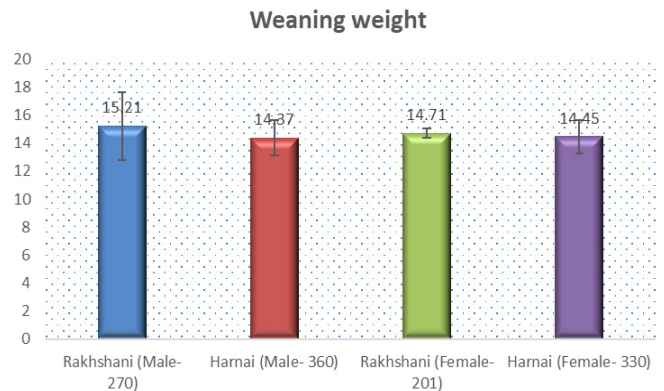**Figure 1:** *Birth weight of male and female for Rakhshani and Harnai breeds.*

Figure 2: *Weaning weight of male and female for Rakhshani and Harnai breeds.*

Weaning weight
The findings of present investigation showed that weaning weight significantly (P ≤ 0.05) affected by year of birth, type of birth and sex. The results of our investigation are similar with result of Kaleri *et al.* (2023), Mokhtari and Rashidi (2010), Esenbuga *et al.* (2002a) and Babar *et al.* (2004), they analyzed that performance record of Kachhi, Lohi and Awassi and its crosses. Their findings depicted that weaning weight observed significantly difference for birth year, sex and birth type because male lamb born were observe 14 percent heavier in birth weight as compared with female born lambs. In another investigation conducted by Hussain (2006); Kaleri *et al.* (2018); Akhtar *et al.* (2001), who revealed that effect of environment on growth, production and reproduction of Hissardale breed in Pakistan with the help of MMLS and maximum likelihood computer

software. Author suggested that weaning weight was recorded significantly affected birth season, year and sex, these mention variations are in the support of our study. Difference among findings may be due to breed difference, birth type, sex and year of birth, environmental conditions with production system in which lambs were raised.

Weight at 6 months
Result of present investigation was in the support of the results of Hussain (2006); Rafiq *et al.* (2009), Akhtar (1996) and Babar *et al.* (2004) for 6 months weight. Who suggested that effect of year of birth, sex and birth year has significant effect on age of 6 months. These findings were in agreement of present result. Studied conducted by Hussain (2006); Rafiq *et al.* (2009) on Hissardale sheep, they reported birth type and birth season had non-significant effect on age of 6 month as mentioned in our study. They reported that lambs were born during spring season have heavier birth weight as compared those were born during autumn and summer season had produced more weight at the age of six month 23.45. 24.37 and 22.01, respectively. Similar statement given that single born lambs were heavier as compared those twins and triplet born. All these findings were supported by findings of present study. Rafiq *et al.* (2009), conducted study to analyze the data record of Turkish lamb. Their findings showed birth type, year of birth, season of birth including sex showed significant effect on age of 6 months.
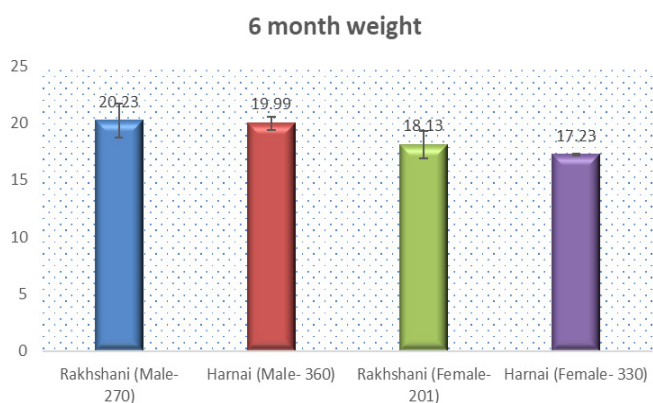

Figure 3: *Weight of 6 month for male and female for Rakhshani and Harnai breeds.*

Weight of 9 months
The findings of our study at the age of 9 month were partially supported by the result of Rafiq *et al.* (2009), analyze the record of 9080 lamb of Hissardale sheep breed for 29 years of period. Their result depicted that sex birth type, sex of lamb has non-significant influence on the 9 months weight of Hissardale

breed. They reported that effect of birth season and birth year were observed significantly ($P<0.05$) higher on the age of 9 months weight as were recorded in present investigation. Researcher suggested that those lambs were born during the autumn season had little bit lower body weight during the age of 9 month 26.72 as compared with spring born lambs 25.91 kilo grams. They also depicted that lambs born single and male had higher than twins and triplet born female 28 to 24 kilo gram respectively, as were recorded in our study. The result for weight at the age of 9 month were analyzed same as suggested by Akhtar *et al.* (2001), who assess record of Hissardale lamb, suggested that effect of year of season and year of birth had highly significant effect on live body weight during the 9 months weight. They had reported the lamb were born during the spring season their body weight during 9 month of age was recorded slightly heavier as compared those were born during autumn and summer. Similar type of statement has been given by researcher that male lambs and single born were also heavier than female and twins and triplets. Above all mentioned statements are in agreement with our study that similar results were observed.
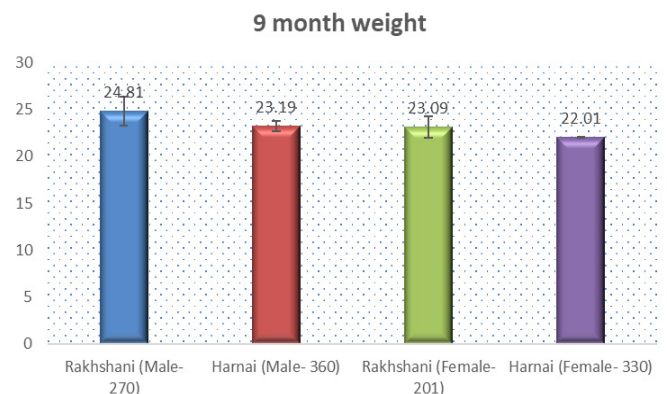

Figure 4: *Weight of 9 month for male and female for Rakhshani and Harnai breeds.*

Weight at the age of 12 month
The result for 12 months of age were in agreement with the studies conducted by various authors Akhtar *et al.* (2001); Cloete *et al.* (1988a), Abegaz *et al.* (2012), Talebi and Edriss (1988a), Mokhtari and Rashidi (2010), Rafiq *et al.* (2009), revealed that sex and birth type had significant effect on 12 months of age. Abegaz *et al.* (2012), analyzed the data of indigenous Ethiopian Horro sheep and suggested that there are different factors affecting on the growth and survival ability of animal. Author depicted that birth type and sex had also significant effect on the body weight during 12 months. Kaleri *et al.* (2018), work out on the data of Dhone Merino sheep and reported that

male lambs were heavier at the age of 12 month as compared with female lambs as were observed in present study. Another study was conducted by Hussain (2006), on 7061 lambs of Thalli sheep. They suggested that variation was observed in the body weight during the age of 12 month that might be due to type of birth, birth year and sex weaning weight co variable. They suggested that interaction among birth season, sex and birth type was observed significant with sex. However, the interaction among season has non-significant influence live body weight during the age of 12 month. Results of present investigation are in agreement with all mentioned studies. Result of Eyduran et al. (2009), Matika et al. (2003), Mokhtar and Rashidi (2010) and Dixit et al. (2001), reported the live body weight at the age of 12 months had significant effect of different factors including birth type, birth season and sex. They reported that weight at the age of 12 months highly influenced by sex, birth type and environmental conditions animals were raised. They depicted interaction between birth season significantly influence yearling weight of lambs. Above all mentioned statements were similar to findings of our study.
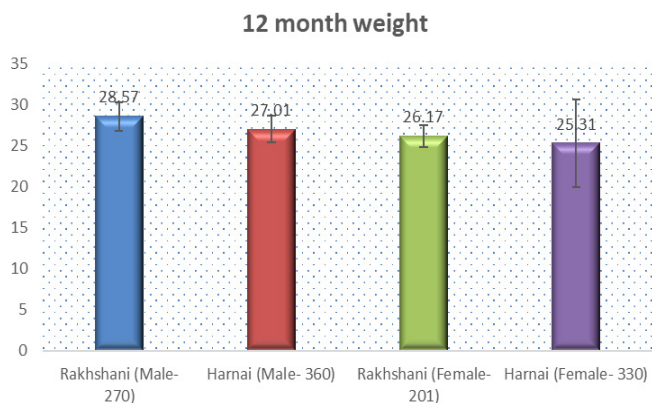

Figure 5: *Weight of 12 month for male and female for Rakhshani and Harnai breeds.*

Reproductive traits

In this study natural breeding inbreeding method were applied in flock. The values of our study were recorded low to moderate, it is essential to practice better management and breeding strategies for getting better reproductive and productive performance in future. The result of our study was supported by number of researchers including Esenbuga et al. (2002a), Kaleri et al. (2023), Babar et al. (2004) and Mokhtari and Rashidi (2010).

Conclusions and Recommendations

It is concluded that productive and reproductive traits of Rakhshani and Harnai sheep breed significantly affected by environmental factors. It was observed that Rakhshani sheep had better productive and reproductive performance as compared with Harnai that could be improve through better selection and breeding strategies.

Novelty Statement

Small ruminants contribute to the animal production and rural economy in arid and semi-arid regions of Pakistan. It is highly important to evaluate the economic traits of sheep to support the small scale farmers and economy of Pakistan.

Author's Contribution

HA Kaleri, RR Kaleri and GM Solangi: Conceived and designed the experiment.
RR Kaler: Performed experiment and wrote the manuscript.
RA Mangi, DK Bhuptani and AW Solangi: Collected the data.
S Noor, Z Lanjar, S Dhari and HA Kolachi: Analyzed the data.

Conflict of interest
The authors have declared no conflict of interest.

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