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Non-Genetic Factors Affecting Birth Weight in Thalli Sheep

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Abstract

A study was undertaken on Thalli sheep to evaluate the non-genetic factors affected on animal's birth weight in Southern Punjab, Pakistan. Non-genetic factors along with genetic factors are important influential factors in determining the performance of animals. Data on 239 lambing records were analyzed using Statistix 8.1 software. The average birth weights calculated were 3.40 ± 3.34 kg. Significant effects of birth weight were observed by environmental factors like birth type, flock, sex of lamb, and year of birth. Non-significant i.e. ($P > 0.06$) values were observed throughout the study for the season of birth. Males were heavier than females according to their birth weights. Similarly, single-born lambs have more bodyweight than of twins.

Keywords: Flocks, Lamb, Sex, Twins

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Khan et al. 2023

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Introduction

Mostly sheep are raised for meat and wool production with flocking instinct (Iqbal *et al.*, 2019). Estimated sheep population is 31.9 million heads (GOP, 2021-22). According to Hasnain (1985), there are twenty-five breeds of sheep found in Pakistan. It provides animal proteins with high biological values and valuable byproducts like hair, wool, hides, skins and bones (Jehan *et al.*, 2021, 2022). Rise of the population of sheep is rather slow than the other livestock species; thus, need to improve the production of indigenous sheep (Faraz *et al.*, 2021). The improvement is in two distinct ways; genetic and non-genetic (Faraz *et al.*, 2022). Genetic improvement can be attained by selection while environment is a source of variation thus plays an important role on the growth of the animal (Akbar *et al.*, 2022). While selecting genetically potent breeds of sheep, it is always affected by environmental variances like a season of the year, birth and weaning weights, sex of lamb, type, and year of birth. For this reason, there is always obscurity in evaluating the differences in reproduction values of individuals being selected, therefore recognition and their correction variances will help in evaluation of genetic considerations. The non-genetic variances have great impact on live body weight of the animals at different ages. Early life trait which could be noted first time in the life of the animals, the birth weight, has more impact for growth of sheep. Usually, it is noted that single lamb's daily weight gain and birth weight is more than twins or triplet.

Additionally, growth traits of lamb are also affected by sex of lamb in sheep because mostly males have more weight gain than that of females. An important aspect which could be noted is birth year as it depends upon the temperature, rate of rainfall and humidity. The factors of the year improve the quantity and quality of grazing land forage which affect the growth rate and live body weight of sheep. Animal growth in sheep would be increased positively if land has the quality of good forage.

Therefore, the theme of the current study was to evaluate the outcomes of non-genetic variances on the animal's birth weight in Thalli sheep breed in Pakistan.

Material and Methods

There are 239 animals of Thalli sheep that were analyzed and the effects of non-genetic variants on animal's birth weight were studied. Animals were grouped into four flocks and sixty sheep included in each group except first group having fifty-nine members. Two types of variables were studied: growth variable which were dependent variable and independent variables. Birth weight of sheep was taken as growth variable. The independent variables included type of birth (TOB), flock, lamb' sex, the season of birth (SOB), and year of birth (YOB). Statistix (8.1) software was used to estimate the impact of non-genetic variants on the birth weight of Thalli sheep. Linear model and prediction equation ($y=a+bx$) were used and analysis of variance (ANOVA) technique was used to evaluate the impact of environmental factors on the animal's birth weight of Thalli sheep. Model for statistical calculations was used as follows.

$$Y_{ijklmnp} = \mu + F_i + YOB_i + SOB_j + SEX_k + TOB_l + (SOB * YOB)_{ji} + (SEX * SOB)_{kj} + (TOB * SOB)_{lj} + (TOB * SEX)_{lk} + e_{ijklmnp}$$

Where F_i = flock effect

$Y_{ijklmnp}$ = observation of important traits

SEX_k = lamb's sex

μ = population overall mean

TOBi= birth type

SOBj= birth's season

YOBi= birth's year

(SEX*SOB)kj=relation between birth season and sex of the animal

(TOB*SEX)lk=relation between birth type and sex

(TOB*SOB)lj= relation between birth type and season

(SOB*YOB)ji= relation between birth year and season

eijklmnp = random error

Results

The mean value of animal birth weight for lambs is presented in Table-1 while birth weights in different categories are mentioned in Table-2. According to the study of analysis of variance, different non-hereditary variant factors like flock, lamb sex, year, and type of birth were influenced the lamb's birth weight significantly ($P<0.0000$) except season and it was ineffective for birth weight. Our study results showed that male lambs have heavy body weight than females at birth and the mean value of birth weight of Thalli sheep lamb was 3.30 ± 0.02 kg. The results of present study were in accordance with Afolayan *et al.* (2006) as they proposed the reason behind heavier body weight is the faster growth rate in males. Loos *et al.* (2001) suggested that testosterone secretions may affect the body weight in males as it is a growth hormone. Birth weight in lambs was affected normally by sex of lambs due to male hormonal growth and there are increased numbers of receptors on muscle cells in males. Similarly, another factor for increased birth weight is type of birth, either single or twins because lambs with single type of birth had greater birth weights than twins or triplets. According to results of present study, mean values of singly and twins born lambs were 3.60 kg and 2.99 kg respectively. Ratios for single and twins birth types were 170:69 respectively. So, the results presented that the type of birth had more influenced on lamb's birth weight because single lamb gets more space, better nourishment and feed in womb of mother than that of twins.

Table 1. Descriptive statistics for some performance traits in Thalli sheep and significance level of studied factors in the analysis of variance (ANOVA)

Trait	No of records	Mean	YOB	SOB	Sex of lamb	TOB	Flock
BW	239	3.30 ± 0.02	*	N.S	**	**	*

BW = Birth weight, YOB= year of birth, SOB= season of birth, TOB=type of birth, N.S= non-significant, *= significant ($p<0.05$), **= significant ($p<0.01$)

Table 2. Least square means and standard errors for birth weights

Particulars		Birth Weight
Overall mean		3.30 ± 0.02
Year		
1		3.21 ± 0.01
2		3.38 ± 0.01
TOB		
Single		3.60 ± 0.01
Twins		2.99 ± 0.03
Sex		
Male		3.38 ± 0.01
Female		3.21 ± 0.01
SOB		
Season 1		3.26 ± 0.03
Season 2		3.33 ± 0.01
Flock		
1		3.40 ± 0.02
2		3.20 ± 0.02
3		3.28 ± 0.02
4		3.35 ± 0.02

Gluckman and Hanson (2004) reported that in case of twins or triplets, there is limited space for lamb development in dam's uterus due to finite space; the birth weight would be decreased. Atkins (1980) reported that lamb birth weight is significantly influenced by the type of lamb's birth. Similar, results were reported in the studies of Donald and Russel (1970) and McDonald *et al.* (1981).

Year of birth had also affected the birth weight if the rainfall of the year would be maximum and climatic temperature would be optimum. It will support forages or pastures, so that feed would be available in adequate amount for dams and it would enhance the lamb's birth weight. Mellado *et al.* (2016) studied that year had significant effects on birth weight as they studied Dorper sheep located in Mexico. According to their findings, environmental conditions like weather, temperature, rainfall and humidity had more effects on dam during the gestation period and ultimately, it affected the birth weight of lamb significantly. Similar results were found in the studies of Nesar *et al.* (2001) and Hinojosa-Cuellar *et al.* (2013).

The results of the current study are in line with the researches of Akhtar *et al.* (2012), Hussain (2006), Refik *et al.* (2009), Baber *et al.* (2004), Akhtar *et al.* (2001), Matika *et al.* (2003), Abegaz *et al.* (2002), Mokhtari and Rashidi (2010) and their result concluded that a significant impact was observed by season, nature and year of birth and sex of lamb on birth weight of different sheep breeds. So, birth weight had significant effects on the season it was dissimilar in present study.

Jadhav *et al.* (2007), Nehra and Singh (2006), and Bobhate *et al.* (2003) reported the influence of year on the birth weight of lambs. Additionally, Eyob Marufa *et al.* (2017) studied the substantial impact of all non-hereditary factors such as sex of lamb, year, birth type, lamb born season and parity number on lamb's birth weight. All their findings are similar with the present findings except season of birth.

Conclusion

It was concluded that birth weight is affected by different environmental factors significantly and factor includes type of birth, flock, year of birth and lamb sex. Birth season is noted as non-significant factor. The results showed that males have heavy body weight than females at the time of birth. Similarly, single-born lambs have heavy body weight than twins.

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