

GENETIC POTENTIALS OF AWASSI AND HISSARDALE SHEEP BREEDS MAINTAINED ON A GOVERNMENT FARM, PAKISTAN

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The present study was conducted on sheep flocks (n=295) belonging to different breeds (Hissardale, Awassi) at Experimental Research Station Jahangirabad. The genetic potential of these flocks were determined through birth weight, weaning weight, adult body weight, reproductive performance and wool production. The mean birth weight of Hissardale male and female lamb was 4.72 ± 0.80 kg and 4.46 ± 0.84 kg; similarly the birth weight of in Awassi male and female lambs was 4.89 ± 0.16 and 4.30 ± 0.14 kg respectively. The weaning weight was recorded as 19.23 ± 0.55 kg in Hissardale male and 17.0 ± 0.68 kg in Hissardale female. The weaning weight in Awassi was recorded as 16.44 ± 0.58 kg in male and 17.1 ± 0.31 kg in female. The adult body weight of Hissardale male and females was 66.4 ± 0.70 and 41.94 ± 0.42 kg respectively. Similarly the adult body weight of Awassi was 67.89 ± 0.71 kg in male and 45.34 ± 0.33 kg in female. Female fertility rate was 96%, twice a year lambing was zero and twin birth were 17.60% and triplet were 0.40% of live birth in these stocks. The 1.5 lambs were produced per female per year. Wool production was 4.19 ± 0.22 kg/year and quality; it was superior in Hissardale and medium in Awassi. The blood glucose level were 109.4 ± 5.89 mg/100ml, Hemoglobin was $7.45 \pm 0.32\%$, RBC counts 3.05 ± 0.03 million/mm³ WBC count 8.13 ± 0.35 thousand/mm³ and ESR was 1.35 ± 0.12 mm in this stock. These breeds of sheep showed higher genetic potential than the stock maintained on natural grazing.

Key word: Awassi, Hissardale, adult body weight, birth weight, wool production, haematology.

Sheep and goats play a major role for strengthening the back bone of rural economy; especially sheep are integral to the cultural, social and economic livelihood of rural farmer^[1]. The profitability of sheep production systems is determined by both fertility and production trait^[2]. Sheep are the big source of income for thousands of rural inhabitants of Pakistan^[3,4]. There are 28 sheep breeds in the country, mostly kept by smallholders. Hissardale is a fine wool breed developed at Hissar, India during 1930 by crossing Merino with local carpet wool sheep known as Bikeneri^[5]. It is a fact that an increase in the profitability of the sheep production depends upon the reducing input cost and increasing production output. All breed improvement programs are based on effective utilization of genetic variation among the animals. It is therefore, necessary to estimate genetic parameters for predicting response to selection^[6,7].

The potential for genetic progress is largely dependent on the genetic difference in traits and its connection with other economic character. When heritability of a trait is little, non additive gene action such as over-dominance, dominance and epistasis may be important^[8].

The genetic potential of various breeds of sheep have been reported in various parts of world and Pakistan^[9-11] but very less information was available on the genetic characteristic of reproductive performance of Awassi and Hissardale sheep in Pakistan.

Hence, the objectives of present study were to evaluate the genetic potential of sheep flocks at Livestock Experimental Station Jahangirabad (Khanewal, Punjab) to determine the growth and reproductive performance the mean wool production and hematological parameters.

MATERIALS AND METHODS

Study Area

The data was collected from the Awassi and Hissardale sheep flocks maintained at Livestock Experimental Station Jahangirabad Khanewal during July 2012 to June 2013. The adult females (n=134) were weighed on monthly basis. Each of the animals was weighed on approximately the same date during different calendar months of the year under study. Monthly mean weight was subsequently calculated for different categories of the animal flocks adopting the general statistical techniques, for the purpose of analysis of different factors.

Growth Studies

Different numbers (n=40) of the newborn lambs of sheep were selected. The average weights for each month for animals were calculated from the pooled data available for different months of age using normal statistical techniques ^[12] the first weight recorded being regarded as first month of age. The increase in the body weight on per day per animal per unit body weight was exploited as suitable option to the direct studies on turnover rate.

Breeding Performance

The breeding efficiency (n=295) of these stocks maintained in this farm was worked out through a comparison of the total potentially reproductively active females with the total number of female lambing with in the year under study duration. The record was also maintained on the selected females regarding the number of the

offspring's produced by each female at each parturition. The data thus yielded used for calculation of the proportion of the single/twin/triplet/quard/pentalet births through a direct comparison with the total number of the parturitions examined under the total study of the stock.

Wool Production and Analysis

Some studies have also directed on wool production. The fleece was weighed accurately by simple weighing scale. The data were collected on the fleece weight of individual sheared on biannual basis.

Haematological Studies

Twenty blood samples were collected from jugular vein in the sterilized test tubes and was added EDTA as anticoagulant for different type of analysis. The glucose contents were analyzed through simpler colorimetric techniques using spectronic 20. The Sahli's method was adopted for the determination of haemoglobin (Hb). The RBC and WBC were determined using the haemocytometer. The erythrocyte sedimentation rate (ESR) was worked out with Westergren's method. The data collected for various parameters was analyzed by statistical methods. Standard descriptive statistics were used for the calculation of Mean \pm SEM using Minitab version 13.

RESULTS AND DISCUSSION

Adult weight

The results of the adult body weight in Hissardale and Awasi illustrated the average body weight in adult ewes and rams as 41.92 \pm 0.42, 66.4 \pm 0.70kg in Hissardale and 45.34 \pm 0.33, 67.89 \pm 0.71kg in Awassi respectively (Table 1). The data suggests that with regard to the adult body weight of the individuals of more than two years of age the males are significantly heavier than the females, confirming many of the previous reports coming from both within

Table 1. Mean \pm SEM adult body weight of Awassi and Hissardale sheep maintained at Experimental Station Jahangirabad (Khanewal) during 2012-2013

Stock	Weight (kg) \pm SEM	
	Male	Female
Awassi	67.89 \pm 0.71	45.34 \pm 0.33
Hissardale	66.4 \pm 0.70	41.92 \pm 0.42

Table 2. Mean \pm SEM Birth weight lambs of Awassi and Hissardale sheep maintained at Experimental Station Jahangirabad (Khanewal) during 2012-2013.

Stock	Weight (kg) \pm SEM			
	Single		Twin	
	Male	Female	Male	Female
Awassi	4.89 \pm 0.16	4.30 \pm 0.14	4.65 \pm 0.092	4.15 \pm 0.08
Hissardale	4.72 \pm 0.080	4.46 \pm 0.84	4.57 \pm 0.092	4.06 \pm 0.075

Table 3. Mean \pm SEM growth rate of Awassi and Hissardale sheep maintained at Experimental Station Jahangirabad (Khanewal) during 2012-2013.

Age/Month	Weight (kg) \pm SEM			
	Awassi		Hissardale	
	Male	Female	Male	Female
1	9.66 \pm 0.44	7.7 \pm 0.23	9.2 \pm 0.19	8.4 \pm 0.27
2	12.44 \pm 0.66	11.55 \pm 0.27	13.2 \pm 0.29	11.0 \pm 0.45
3	14.44 \pm 0.66	14.35 \pm 0.41	16.35 \pm 0.43	14.4 \pm 0.56
4	16.44 \pm 0.58	17.1 \pm 0.31	19.23 \pm 0.55	17.0 \pm 0.68
5	18.22 \pm 0.32	19.05 \pm 0.39	22.95 \pm 0.73	20.1 \pm 0.66
6	20.66 \pm 0.44	20.75 \pm 0.46	24.36 \pm 1.04	22.25 \pm 0.57
7	22.77 \pm 0.77	21.85 \pm 0.52	25.7 \pm 1.09	23.25 \pm 0.54
8	22.33 \pm 1.02	23 \pm 0.61	26.86 \pm 0.83	24.05 \pm 0.52
9	25 \pm 1.61	24.2 \pm 0.60	28.25 \pm 1.05	25.85 \pm 0.50
10	25.77 \pm 1.91	25.45 \pm 0.63	28.75 \pm 1.14	26.2 \pm 0.56
11	28.55 \pm 2.08	26.8 \pm 0.61	30.2 \pm 1.39	28.4 \pm 0.52
12	30.88 \pm 2.48	27.9 \pm 0.64	33.05 \pm 1.44	30.30 \pm 0.61

and outside the country. The weight of the female of our stock fluctuates around 39.20-44.82kg-in Hissardale and 43.90-48.5kg in Awassi sheep. The results indicate that the adult body weight of our flocks is greater than stocks maintained around Quetta^[4,9]. Present results when compared with others recorded breed's show that present stock or sheep have a higher body weight than Salt range, Kajli, Lohi^[8] and resemble body weight with Afghan breed^[13]. However, present stocks have maintained in controlled conditions of the government sponsored farms, clearly indicating the ideal feeding management and disease control facilities attain better weight.

Birth Weight

The birth weights recorded for male lambs of Hissardale and Awassi breed being generally maintained in the farm was 4.72 \pm 0.080 and 4.89 \pm 0.16 kg respectively (Table 2). It was 4.46 \pm 0.84 and 4.30 \pm 0.14kg for ewe lambs of respectively. It was found that the sex of the new born was a significant factor in birth weight as the males were significantly ($P < 0.05$) heavier

than female. The studies of Ahmad and Saleem^[14] on Lohi, Kacchi and Awassi breeds have sufficiently indicated that the selection of ram is liable of producing the progeny with higher birth weight. The birth weights are similar as compared with Afghan sheep^[13].

The weaning weights, as recorded at the age of 120 days, suggested the average weaning weight of present stock was 19.23 \pm 0.55kg (male), 17.0 \pm 0.68kg (females). On comparison, the weaning weight of present stock is higher than the flocks at Quetta as recorded by Mian and Khan^[9] (1991). The weaning weight of Lohi sheep is higher than present study as reported by Lashari and Tasawar^[8]. It is suggested that certain growth conditions have significant effect on the weaning weight, and the studies of Akhtar et al^[15] provides support to the fact, suggesting that there is a significant decrease in the weaning weight, if the flock is being maintained in the pastures with carrying capacity lower than required for the total grazing animals.

Growth rate

The results of the present study suggested that lambs keep growing till the age of 12 months (Table 3). An initial relatively rapid increase in the live weight occurred during the first four months of the age of new born. Live weight was increased in male from 9.2 ± 0.19 to 19.23 ± 0.55 kg and female from 8.4 ± 0.27 to 17.0 ± 0.68 kg at the age of four month in Hissardale breed. Whereas in Awassi the average body weight was increased from 9.66 ± 0.44 in male and 17.1 ± 0.31 kg in female at the age of 4th month.

A moderate degree of increase in live weight from 22.95 ± 0.73 kg to 28.25 ± 1.05 kg in male and 20.1 ± 0.66 to 25.85 ± 0.50 kg in female in Hissardale breed. Whereas in Awassi breed the body weight increased from 18.22 ± 0.32 to 25 ± 1.61 kg in male and 19.05 ± 0.39 to 24.2 ± 0.60 kg in females.

In the third phase slow increase in the weight of lamb from 28.25 ± 1.05 kg to 33.05 ± 1.44 kg in male and from 25.8 ± 0.50 kg to 30.30 ± 0.61 kg in female in Hissardale breed. Whereas in Awassi breed the body weight was increased from 25 ± 1.61 kg to 30.88 ± 2.48 kg in male and 24.2 ± 0.60 kg to 27.9 ± 0.64 kg in female. It was supported by report of earlier worker indicating that the live weight keep increasing till the age of two years^[16]. This study exhibits a higher growth rate than reported by Mian and Khan^[9]. These variations could also be attributable to the rearing conditions available under different regimes, including the availability of pasture, additional rationing provided and the expertise of the breeders, to provide suitable conditions better pasture conditions on the general weight of the individuals have proved by our study suggesting that in the favorable pasture condition

Breeding performance

The different parameters relating to reproductive efficiency has been presented in Table 4. The percentage of the reproductively active adult females conceiving/reproducing 96.0% and 70% fertility in Hissardale and Awassi breed respectively. It was 96.1% according to Qureshi^[17] while fertility was 85.7%^[13]. Mian and Khan^[9] reported the fertility rate

of different breeds around Quetta as 90% (Urk), 75% (Karakuli), 69% (Balali) and 64% (Randozai).

Table 4. Breeding performance of sheep maintained at Experimental Station Jahangirabad (Khanewal) during 2012-2013.

Fertility Performance (%)	96.00
Pregnancy (%)	80.60
Lambing pattern	
Once /year	100.0
Twice /year	0.00
Twining pattern	
Single	81040
Twins	17.60
Triple	0.40
Quard	0.3
Pantalets	0.3
No. of lambs	
Born/year/ewe	1.5
Birth rate	114.00
Mortality rate	17.63
Abort rate	0.68
Breeding Season	
Summer	50.0
Winter	50.0

It was revealed that Lohi and Afghan breeds mainly lambd once year under normal breeding regime^[20, 11]. Mian and Khan^[11] studied the once/twice a year lambing pattern in different stocks at Quetta. The frequency of appearance of twins was 13.34% and the rate of triple birth in the animals in the present study was 0.40%. Some widely different results has been quoted for Lohi breed in the two studies conducted on the same basic stock/similar farming conditions, with twining proportion varying from 28%)^[18] to 9.3%, (1.6% triples birth,^[13]. The environmental variations are expected to affect the proportion of twin, triple births, yet it appears to have some degree of influence or genetic potentials of the stock under consideration. The computed value regarding our stock suggests that the average number of the lamb produced /year/ewe was 1.5 lambs. With regard to the breeding potentials as judged by lambs produced/ewe/year our stock runs close to the Lohi breed, though a widely different figure has been quoted in different studies,

Table 5. Mean \pm SEM of different haematological parameters of sheep maintained at Experimental Station Jahangirabad (Khanewal) during 2012-2013.

Parameters	Mean \pm SEM	Range
Glucose (mg/100ml)	109.4 \pm 5.89	70-140
Haemoglobin (%)	7.45 \pm 0.35	6-10
WBC count (1000)/mm ³	8.13 \pm 0.35	5.0-12.65
RBC count (million)/mm ³	3.05 \pm 0.036	1.13-5.15
ESR (mm)first hour	1.35 \pm 0.12	0-4

Table 6. Mean \pm SEM of wool weight in Awassi and Hissardale sheep maintained at Experimental Station Jahangirabad (Khanewal) during 2012-2013.

Shearing Season	Weight (kg)	
	Awassi	Hissardale
Spring (March)	2.20 \pm 0.06	1.99 \pm 0.02
Autumn (September)	1.90 \pm 0.02	2.20 \pm 0.2
Total	4.1 \pm 0.08	4.19 \pm 0.22

ranging from 1.89^[19], 1.04^[9], 1.07^[13]. In our stock 50% parturition occurs in summer, and other 50% lambing during winter. Few studies were in hand suggesting monthly variation in the reproductive activity in sheep to support our present findings. The survival of lamb's upto weaning age has been calculated to be around 82.37 in Hissardale breed and 96.43% in Awassi. Mian and Khan^[9] suggested 93.75% survival rate or different breeds around Quetta on comparison our results about survival rate. The variable survival rate has been suggested for general nomadic flock or Lebanon it was 91.0%^[19].

Haematological studies

The results presented in Table 5 exhibit that the glucose content or the serum fluctuate between a range of 70 -140mg/100ml with a computed average of 109.4 \pm 5.89mg/100ml. The glucose level has been suggested to show variations in Lohi (57.53%) and Afghan 64.82%. Mian and Khan^[9] reported the glucose level in different breeds farmed around Quetta and mean glucose level was 85.31 \pm 2.35mg/100ml with a range of 70-95mg/100ml. It was found that the glucose level is higher in present study. The haemoglobin contents 7.45 \pm 0.32% with a range of 6-10%. Mian and Khan^[11] found the haemoglobin contents of the breeds maintained around Quetta as 1.74 \pm 0.27% with a range of 10.2-12.6%. The haemoglobin concentration in our flocks is lower than reported by Mian and Khan^[11].

The mean value of the WBC count was 8.13 \pm 0.35 1000/rmm³. Mian and Khan^[11] reported WBC concentration was 6.48 \pm 0.17thosand/mm³. In comparison the study stocks have higher WBC count than the reported breeds. RBC count suggests an average of 3.05 \pm 0.036million/mm³. Mian and Khan [9] has been found the RBC values as 4.97 \pm 0.23-million/mm³. The erythrocyte sedimentation rate was 1.35 \pm 0.12mm alter the first hour with calculated range or 0-4mm. The comparative figure quoted by Robinson^[18] for Lohi breed was 0.77mm. Mian and Khan^[9] described the erythrocyte sedimentation rate in Quetta breed 1.69 \pm 0.41mrn.

Wool-quantity

The data presented in Table 6 suggested a mean of 4.19 \pm 0.22kg in Hissardale and in Awassi, it was 4.1 \pm 0.08kg per animal per year of wool produced on the basis of biannual shearing pattern. Hasnain^[4] has found that Balochi breed produced 1.4kg whereas in Bibrik it was 1.54kg, Harnai 1.37kg and Rakhshlmi 0.92kg/year/animal. It has been proved that wool production potential in imported breed was higher^[19]. Moreover, our stocks are superior with regards to wool production over Kajli and Salt Range breed as reported by Ahmed^[13]. The present stocks are similar to Afghan breed^[14].

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