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Research Article

STAPLE LENGTH UNDER THE INFLUENCE OF GENETIC AND NON GENETIC FACTORS IN INDIGENOUS AND CROSSBRED SHEEP

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ABSTRACT
A study was conducted to determine the effect of breed group, age, period of birth, season of shearing and sex on staple length. Wool samples were collected from Bannur (n=68) and UAS-improved strain (n=120) maintained at UAS campus, Bangalore. Wool samples(n =608) were also collected from Bannur(n=69), Rambouillet X Deccani (n=56), Corriedale X Bannur(n=76), Corriedale X Deccani (n= 122) and Deccani(n=97) before shearing at the left side region at Large Scale Sheep Breeding and Training Centre, Kudapura, Chellakere of Chiradurga district of Karnataka. The Least squares analysis of variance technique was adapted to detect the significant sources of non-genetic variation.
The overall least square mean of staple length was 3.97 ± 0.05 c.m. The comparison of means among genetic groups revealed that the longest staple length was recorded in Corriedale X Deccani (4.87 ± 0.03c.m.) followed by Deccani (4.72 ± 0.20c.m.), UAS- Improved strain (4.14 ± 0.04c.m.), Rambouillet X Deccani (3.77 ± 0.10c.m.), Bannur (3.17 ± 0.06c.m.) and Corriedale X Bannur (2.87 ± 0.06c.m.). Significant differences in staple length were noticed with respect to breed, age, period of birth, season of shearing and sex

Key Words*: Staple length, Genetic and Non Genetic Factors, Least SquareAnalysis, Deccani, Bannur, Corriedale and Rambouillet*

INTRODUCTION
Breeding and development of superior breeds of sheep for wool and mutton would play a significant role in enhancing the rural economy of developing countries like India. Wool production in India is inadequate. To meet the increasing demand of apparel type, the country is importing 18 to 20 million kg of wool every year. This warrants an increase in the production of fine wool as well as carpet wool from the indigenous sheep. Crossbreeding of native sheep with selected exotic breeds of sheep superior in body weight, growth rate, wool yield and multiple births seems to be the quickest way of improving native breeds and their production potentials. Staple length is an important trait determining wool quality in sheep. This trait is affected, both by genetic and non- genetic factors with varying degree. Hence, an attempt was made to determine the effect of breed group, age, period of birth, season of shearing and sex on staple length.

MATERIALS AND METHODS
Wool samples were collected from Bannur (n=68) and UAS-improved strain (n=120) maintained at UAS campus, Bangalore. Wool samples(n =608) were also collected from Bannur(n=69), Rambouillet X Deccani (n=56), Corriedale X Bannur(n=76), Corriedale X Deccani (n= 122) and Deccani(n=97) before shearing at the left side region at Large Scale Sheep Breeding and Training Centre, Kudapura, Chellakere of Chiradurga district of Karnataka. Samples were collected from one square inch area in left mid side region using curved scissors . The samples collected were packed in labeled plastic bags.Staple length of each animal was recorded immediately after shearing to the nearest fraction of 0.1c.m.The staple length of unscoured wool samples was measured by placing staple unstretched on a black velvet board using forceps. The measurement was taken from the base of the staple of fibres to the tip, where the majority of the fibres end. An average of 10 random staples represented the mean staple length.

The Least squares analysis of variance technique was adapted to detect the significant sources of non-genetic variation if any (Harvey, 1987).The following mathematical model was adapted.

$Y_{ijklmn} = \mu + G_i + A_j + Y_k + S_l + X_m + e_{ijklmn}$

Where, Y_{ijklmn} is the record of the n^{th} individual belonging to i^{th} genetic group, j^{th} age group, k^{th} period of birth, shorn at l^{th} season belonging to m^{th} sex.

μ is the population mean

G_i is the fixed effect of i^{th} genetic group (i=1,2,3 … 6)

A_j is the fixed effect of j^{th} age group (j=1,2,3 … 7)

Y_k is the fixed effect of k^{th} period of birth (k=1,2)

S_l is the fixed effect of l^{th} season of shearing (l=1,2)

X_m is the fixed effect of m^{th} sex group (m=1,2)

e_{ijklmn} is the random error associated with Y_{ijklmn} and assumed to be identically, independently and normally distributed with mean zero and unit variance and interaction between various effects was assumed to be zero.

The Least Square means of different groups within each of the factors were compared by computing the Least Significant Difference (LSD) (Snedecor and Cochran, 1968).

RESULTS

The least square mean and standard error computed for staple length(c.m) are presented in Table-1

Table 1: The Least Square Mean and Standard Error for Staple Length

Genetic and Non-genetic factors	Number of samples	Mean	Standard Error	Coefficient of Variation
Overall	608	3.97	0.05	30.23
Genetic Groups				
Bannur	137	3.17[a]	0.06	22.40
R X D	56	3.77[b]	0.10	20.42
C X B	76	2.87[a]	0.06	18.81
C X D	122	4.87[d]	0.03	7.39
Deccani	97	4.72[d]	0.20	41.31
UAS	120	4.14c	0.04	11.59
Age (Years)				
½ to 1 ½	52	4.43[c]	0.06	10.38
1 ½ to 2 ½	65	4.03[b]	0.09	18.14
2 ½ to 3 ½	64	3.74[a]	0.13	27.27
3 ½ to 4 ½	106	3.62[a]	0.09	25.14
4 ½ to 5 ½	114	3.93[ab]	0.13	36.39
5 ½ to 6 ½	83	4.17[bc]	0.16	35.97
6 ½ to 7 ½	124	4.07[b]	0.12	33.42
Period of birth				
1987 -90	384	4.02[a]	0.07	33.33
1991 - 94	224	3.88[b]	0.06	23.20
Season of shearing				
Dec - Jan	292	4.14[a]	0.07	28.02
Jul - Aug	316	3.81[b]	0.07	31.76
Sex				
Male	85	4.20[a]	0.13	27.62
Female	523	3.93[b]	0.05	30.53

R X D : Rambouillet X Deccani C X B : Corriedale X Bannur C X D : Corriedale X Daeccani
UAS : UAS improved strain ;
Column-wise means with atleast one common superscript do not differ significantly.

DISCUSSIONS

The overall least square mean of staple length was 3.97 ± 0.05 c.m. The comparison of means among genetic groups revealed that the longest staple length was recorded in Corriedale X Deccani (4.87 ± 0.03c.m.) followed by Deccani (4.72 ± 0.20c.m.), UAS- Improved strain (4.14 ± 0.04c.m.), Rambouillet X Deccani (3.77 ± 0.10c.m.), Bannur (3.17 ± 0.06c.m.) and Corriedale X Bannur (2.87 ± 0.06c.m.).

The staple length in Bannur and corriedale X Bannur crossbreds did not differ significantly from each other. The mean values for staple length were similar in Deccani and Corriedale X Deccani which were significantly higher than the values recorded in Rambouillet X Deccani , UAS- Improved strain, Bannur and Corriedale X Bannur crosses.UAS-Improved strain had significantly longer staple length than Bannur and Rambouillet X Deccani crossbreds. The staple of Corriedale X Bannur (2.87 ± 0.06c.m.) was comparatively shorter than that of pure bred Bannur(3.17 ± 0.06c.m.)

Differences in staple length due to genetic groups have been reported by Umrikar et al.(1992),Malik and Singh(2006) and Singh et al.(2008) in different native and crossbred sheep.

The staple length of young sheep ½ -1 ½ years was significantly higher (4.43 ±0.06 c.m.) than that of other age groups. Sheep aged three-and-a-half to four-and-a-half years had the least staple length (3.62 ± 0.09 c.m) and was not significantly different from those of two-and-a-half to three-and-a-half and four-and-a-half to five-and-a-half year groups.

Sheep belonging to age group of half to one-and-a-half and five-and-a-half to six-and-a-half years had longer staple length and the values did not differ significantly. The staple length of above age groups were significantly higher than age groups above one-and-a-half to two-and-a-half and six-and-a-half to seven-and-a-half.

Significant difference ($P \leq 0.01$) in staple length due to age was reported by Krishnappa(1979) in Corriedale X Deccani and by Garcia and Alvarez (1992) in German Mutton Merinos.

The lambs born in period I had significantly longer staple length (4.02 ± 0.07 c.m) than those born in period II (3.88 ± 0.06 c.m). This significant difference was ($P \leq 0.01$) probably due to environmental and physiological conditions provided by ewes.

The sheep shorn in the month of December and January had longer staple length (4.14 ± 0.07 c.m) than sheep shorn in the months of July and August (3.81 ± 0.07 c.m). The difference was statistically significant ($P \leq 0.01$). This observation was supported by earlier reports of Chaudhari and Malik (1972) in Chokla and Kandril (1984) in Ossimi flock of sheep. This may be due to favourable winter climatic conditions.

The staple length was longer (4.20 ± 0.05 c.m) in rams than in ewes (3.93 ± 0.05 c.m). The difference was significant ($P \leq 0.01$) which may be due to hormonal differences. This findings closely tallied with the results of Chopra and Chopra (1972) in Nali. Contrary to this, Krishnamurthy et al.(1975) in Nilagiri and its crosses and Krishnappa (1979) in Corriedale X Deccani and Deccani reported that sex had no effect on staple length.

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