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EFFECT OF SEX AND BODY REGION ON WOOL CHARACTERISTICS OF CORREIDALE SHEEP (*Ovis aris*)

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ABSTRACT

The end use suitability of wool is influenced by its characteristics, varying between species, individuals and sex. Wool characteristics of Correidale sheep was studied to evaluate its suitability for developing region-wise grading system for better marketability. Twelve Corriedale sheep (>1 year), six each from both sexes were taken for the study. About 40 g wool sample was collected by shearing from five body regions *viz*; back, neck, shoulder, flank and thorax. Fibre diameter, medullation, staple length, crimp frequency, fibre length, scouring yield, grease, burr, suint and bundle strength was evaluated. Significant differences were observed in the number of crimps and staple length between sexes while diameter, medullation, fibre length, scouring yield, burr, grease, suint and bundle strength showed no significant variation. In general, the average quality in terms of diameter was better at shoulder followed by neck, thorax, flank and back. It was concluded that region-wise grading of wool at harvesting may provide better marketability.

Key words: Correidale, fleece, marketability, sheep, woolcharacteristics

INTRODUCTION

India possesses 65.06 million sheep, producing 48.5 m kg wool. Out of the total raw wool produced, only 5% is of apparel grade while 85 and 10% is of carpet and course-grade, respectively (Karim, 2009). The Jammu and Kashmir has 3.389 million sheep and the demarcated under wool belt has 8 well established sheep breeds. Besides its indigenous breeds, J&K has adapted exotic breeds like Correidale, having its origin in New Zealand and Australia. It is a dual purpose breed which thrives well in temperate climatic conditions of Kashmir valley (Afzal *et al*., 2009). It is known for its outstanding efficiency to produce more mutton and wool kg^{-1} body weight as compared to other range breeds. The market demand of animal fibres and their products is determined by its quality in terms of its physical characteristics (Swan, 2010), processing performance, durability (Swan *et al.,* 2008) and textile attributes (Wood, 2003). The end use of all the animal fibres including wool is influenced by their fleece characteristics, varying between the species, individuals, body regions and staples. The Correidale sheep thrived well in temperate conditions of J&K, but the region- and sex-wise wool characteristics have not been determined. In view of higher heritability of fleece characteristics and expected differences *viz-a-viz* sex and body region, it is conceived these parameters may provide a basis for wool classing/grading. Since, Correidale is a major contributor of fine cross bred wool in Kashmir, hence the present study was

undertaken to ascertain the region and sex effects on wool metrology of Correidale sheep so that suitable region-wise grading system is developed for better marketability.

MATERIALS AND METHODS

The present study was conducted in the year 2014 at the Faculty of Veterinary Sciences & Animal Husbandry, SKUAST, Shuhama, Kashmir. Twelve Correidale sheep of 1-2 years age, six each from both the sexes, were taken for the present study. About 40 g wool sample was collected from each animal in the month of March by shearing their five body regions *viz*; back, neck, shoulder, flank and thorax. The samples from each region were analyzed for diameter, medullation, staple length, crimp (number per staple), length, scouring yield, grease, burr, suint and bundle strength as per the methods specified by Bureau of Indian Standards (Anonymous,1989). The data was analyzed by the analysis of variance using SPSS version 20 package.

RESULTS AND DISCUSSION

The physical characteristics of Correidale wool revealed that in males the fibre diameter of wool from neck and thorax differed significantly ($p<0.05$) from shoulder and flank region whereas back differed significantly ($p<0.05$) from flank region only (Table 1). However, in case of females, non-significant difference was found among different body regions. Between the sexes, significant difference was observed only at neck region where males had significantly ($p<0.05$) higher fibre diameter than females (29.80±0.55 v/s 26.67±0.67). Kasim and Hamad (2006) reported the fiber diameter of wool from back region of Hamdani sheep as 26.4 µ which is more or less in agreement with our results. However, our results contradict with those of Kasim and Hamad (2006), Tariq *et al.* (2013) and Thiagarajan (2013) who reported the fiber diameter of >30µ in Garol, Hamdani, Mengali, Decani and Bannur sheep breeds. This could be because of breed difference as Corriedale is a fine wool breed whereas the other breeds are dual purpose (meat and wool) breeds. Medullation percentage did not differ significantly at different body regions in males whereas females had significantly lower medullation percentage at back (4.57±0.24) than other regions. Males showed significantly ($p<0.05$) different medullation percentage than females at neck, thorax and back only. The results are more or less in agreement with Ahmad *et al.* (2006) in male (5.5) and female (6.9) Kari sheep; and in disagreement with Mehta *et al.* (2004) in case of Magra sheep (33.66). The variation observed in medullation percentage could be attributed to both genetic and non-genetic factors including sex (Thiagarajan, 2013). The staple length of wool harvested from thorax region of male sheep was significantly higher than neck, shoulder and back. However, in females significantly lower value was obtained at back than thorax region only. Females had significantly lower staple length than males at neck (3.90±0.23 v/s 4.68±0.19), shoulder (4.17±0.18 v/s 5.02±0.17), thorax (4.28±0.19 v/s 5.63±0.27) and back (3.50±0.33 v/s 4.95±0.21) region. The difference could be attributed to a number of factors like genetic (Singh *et al.*, 2008); sex (Tabba *et al.*, 2001; Thiagarajan, 2013); nutrition (Ryder, 1965) and combination of genetic, nutritional and environmental factors (Botkin *et al.*, 1998). Fiber crimp influences the spinnability of yarn and quality of product, gives cohesiveness and improves the spinning performance by imparting twist in the fiber assembly (Parthasarthy, 2009). Non-significant variation was observed in both males and females for crimps per staple at neck, shoulder, thorax, flank and back showing average values as 11.20±0.87 & 10.08±0.57; 12.56±0.50 & 10.33±0.6; 13.49±0.90 & 10.55±0.67; 11.43±1.32 & 9.57±1.35 and 12.03±0.90 & 10.37±0.74, respectively. Between sexes, significantly lower values

Table 1: Effect of sex and body regions on the physical characteristics of wool

Parameters		Body regions					
		Neck	Shoulder	Thorax	Flank	Back	Total
Fibre diameter (µ)	Male	29.80±0.55^{cA}	27.66±0.37^{ab}	29.70±0.69^{c}	26.99±1.43^{a}	29.09±0.31^{bc}	28.90±0.32
	Female	26.67±0.67^{B}	28.32±1.05	28.33±1.69	28.89±0.84	28.92±1.59	28.22±0.54
	Overall	28.06±0.70	27.99±0.53	28.95±0.96	28.41±0.74	29.02±1.92	28.53±0.33
Medullation (%)	Male	7.10±0.74^{A}	8.44±2.26	7.99±0.79^{A}	10.21±1.84	9.56±0.76^{A}	8.66±0.63
	Female	9.26±0.43^{bcB}	8.14±0.50^{b}	11.30±0.85^{dE}	10.76±0.78^{cd}	4.57±0.24^{aB}	8.81±0.51
	Overall	8.18±0.52	8.31±1.10	9.64±0.74	10.48±0.96	7.06±0.84	8.73±0.40
Staple length (cm)	Male	4.68±0.19^{aA}	5.02±0.17^{aA}	5.63±0.27^{bA}	5.27±0.12^{ab}	4.95±0.21^{aA}	5.11±0.10^{A}
	Female	3.90±0.23^{abB}	4.17±0.18^{abB}	4.28±0.19^{bB}	4.13±0.16^{ab}	3.50±0.33^{aB}	3.99±0.11^{B}
	Overall	4.29±0.18	4.59±0.17	4.96±2.60	4.70±0.19	4.23±0.29	4.55±0.10
Crimp staple^{-1} (No.)	Male	11.20±0.87	12.56±0.50^{A}	13.49±0.90^{A}	11.43±1.32	12.03±0.90	12.14±0.42^{A}
	Female	10.08±0.57	10.33±0.62^{B}	10.55±0.67^{B}	9.57±1.35	10.37±0.74	10.18±0.36^{B}
	Overall	10.64±0.52	11.44±0.50	12.01±0.69	10.50±0.94	11.20±0.61	11.16±0.30
Fibre length (mm)	Male	49.42±2.56	54.91±5.25	54.04±3.61	49.24±1.56	57.30±7.32	52.98±1.98
	Female	50.42±3.83	49.41±1.67	49.45±1.43	51.09±2.42	47.13±2.69	49.50±1.09
	Overall	49.92±2.20	52.16±2.75	51.74±1.98	50.17±1.40	52.21±4.02	51.24±1.14

Means across the columns in a same row with different lower case superscript differ significantly.
Means between sexes with different upper case superscript differ significantly.
P level 0.05; No. of observations (n = 6 each)

were found in females at shoulder and thorax than males. The results were in agreement with Singh *et al.* (2008) in Correidales wherein they reported almost similar results. The variation in the number of crimp per staples observed may be attributed to the sex (Thiagarajan, 2013) besides genetic factors. Non-significant difference in fibre length was observed in both male and females between neck, shoulder, thorax, flank and back. Non-significant variation was also found between male and females having overall mean (mm) as 49.92±2.20, 52.16 ±2.75, 51.74±1.98, 50.17±1.40 and 52.21±4.02 for neck, shoulder, thorax, flank and back regions, respectively. The results are in agreement with Pan *et al.* (2004) in Garol sheep and in disagreement with Kasim and Hamad (2006) in Hamdani sheep and Ganai *et al.* (2009) in Karnah sheep. The difference in fibre length between the breeds may be attributed to genetic, environmental, nutritional and managemental factors (Poppi and McLennan, 2010).

Chemical and mechanical characteristics of Correidale wool revealed non-significant variation in scouring yield between different body regions of both male and females with mean as 83.82±1.67 & 89.03±3.76 (neck); 84.15±1.89 & 84.63±4.25 (shoulder); 84.0±4.07 & 84.6±3.57 (thorax); 80.99±3.20 & 82.45±2.66 (flank) and 84.41±3.47 & 81.36±4.55 (back), respectively (Table 2). It may be inferred that the wool obtained from different body regions was of Grade I type, except that from flank of male where it was of Grade II type. The results of Singh *et al*. (2008) in Corriedale (79.01), Poll Dorset (78.34) and South Down (73.82) were not in agreement with our results which could be attributed to the managemental practices adapted besides age, sex and season of shearing (Thiagarajan, 2013). Non-significant difference was also found in burr content between different body regions of both male and females. Between sexes, statistically comparable results were observed at different body regions. The results revealed that wool harvested from different regions was of heavy burr type except thorax of both male and female (low burr) and back of female (medium burr). The poor quality of wool could be attributed to presence of heavy burry or thorny bushes available in the highland pastures where animals are put to grazing during summer. The grease content in males showed non-significant difference between neck and thorax as well as between neck, shoulder, flank and back. However, thorax revealed significant ($p<0.05$) difference with shoulder, flank and back. In females, non-significant difference was found between neck, shoulder, thorax, flank and back. The suint content (%) at different body regions in both male and females differed non-significantly with average as 12.81±4.00 & 12.99±3.94; 7.92±1.34 & 8.82±1.48; 10.28±2.27 & 13.15±5.60; 5.81±1.24 & 8.02±1.25 and 10.78±2.51 & 9.62±4.55 from

Table 2: Effect of sex and body regions on the chemical and mechanical characteristics of wool

Parameters		Body regions					
		Neck	Shoulder	Thorax	Flank	Back	Total
Scouring yield (%)	Male	83.82±1.67	84.15±1.89	84.00±4.07	80.99±3.20	84.41±3.47	83.59±1.27
	Female	89.03±3.76	84.63±4.25	84.60±3.57	82.45±2.66	81.36±4.55	84.41±1.66
	Overall	86.42±2.11	84.39±2.21	84.60±2.58	81.72±2.00	82.89±2.77	84.00±1.03
Burr (%)	Male	4.29±1.73	5.07±2.32	2.88±1.36	7.36±3.95	7.23±1.93	5.37±1.06
	Female	8.82±2.82	13.87±7.31	2.44±0.60	2.98±1.26	3.95±0.88	6.40±1.70
	Overall	6.55±1.72	9.47±3.90	2.66±0.71	5.16±2.08	5.59±1.12	5.88±0.99
Grease (%)	Male	$7.79±0.92^{ab}$	$8.93±1.00^{b}$	$5.23±0.61^{a}$	$9.41±1.14^{b}$	$8.72±0.75^{b}$	8.11±0.44
	Female	8.38±0.99	6.41±1.13	6.17±0.97	8.08±0.92	8.49±0.76	7.55±0.43
	Overall	8.09±0.67	7.67±0.78	5.70±0.56	8.75±0.73	8.61±0.53	7.84±0.31
Suint (%)	Male	12.81±4.00	7.92±1.34	10.28±2.27	5.81±1.24	10.78±2.51	9.57±1.12
	Female	12.99±3.94	8.82±1.48	13.15±5.60	8.02±1.25	9.62±4.55	10.27±1.48
	Overall	12.81±2.73	8.35±0.76	11.26±2.44	6.07±0.80	10.05±2.42	9.89±0.91
Bundle strength (g/tex)	Male	18.87±0.21	17.21±0.15	16.37±0.99	18.87±0.17	25.18±7.04	19.30±1.48
	Female	17.19±1.20	16.06±1.28	16.35±0.28	20.00±3.99	17.29±1.50	17.38±0.83
	Overall	18.03±0.69	16.64±0.62	16.38±0.42	19.44±1.66	21.24±3.7	18.34±0.86

Means across the columns in a same row with different lower case superscript differ significantly;
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P level 0.05; No. of observations (n=6 each)

neck, shoulder, thorax, flank and back regions, respectively. The variation in the suint content between the sexes of both breeds could be attributed to the genetic, nutritional and environmental factors including geographical and climatic factors under which the animal has been grown (Poppi and McLennan, 2010). Non-significant difference was also observed in bundle strength in both the sexes between different regions with mean values as 18.87±0.21 & 17.19±1.20 (neck); 17.21±0.15 & 16.06±1.28 (shoulder); 16.37± 0.99 & 16.35±0.28 (thorax); 18.87±0.17 & 20.0±3.99 (flank); and 25.18±7.04 & 17.29±1.50 (back), with over all mean of 18.03±0.69, 16.64±0.62, 16.38±0.42, 19.44±1.66 and 21.24±3.7, respectively. It is opined that body region-wise classification of wool at harvest will provide better price in the market.

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