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Estimated breeding values for growth traits of Kashmir merino sheep in an organized farm of Kashmir

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Abstract
Data on 816 Kashmir Merino lambs sired by 30 rams, maintained at Government Sheep Breeding Farm Goabal, spanning over 4 years (2014 to 2017) were collected and used to evaluate the sire by estimating the breeding value by Best Linear Unbiased Prediction (BLUP) method of with sex and year of birth and as fixed factors. The analysis was carried out by mixed model least-squares maximum likelihood (LSMLMW) computer (PC-2) programme designed by Harvey (1990). The overall breeding values (B.V) (kg)) were 3.47±0.03, 11.07±0.14, 17.46±0.16, 20.09±0.16 and 25.18±0.18 for birth weight (BW), weaning weight (WW), six month body weight, (6MW), nine month body weight (9MW) and yearling body weight (12MW), respectively. The product moment correlations between estimated breeding values of sires among production traits were low to moderate ranging from 0.15±0.03 to 0.56±0.02. Similarly the Spearman's rank correlation among different body weight traits was moderate to high ranging from 0.25±0.03 to 0.78±0.01. Few studies on this breed of J&K have been conducted in the past by some workers [16, 17, 18]. Keeping in view the estimated breeding values and correlations among breeding values it is concluded that 6MW can serve as a good selection criterion at early age in this flock owing to favorable correlations.

Keywords: Estimated breeding values, growth traits, Kashmir merino sheep

Introduction
Kashmir Merino is a major and only synthetic breed of sheep of Jammu and Kashmir developed through cross breeding for quality apparel wool production [1]. The breed is maintained and improved at different government sheep breeding farm for up gradation and genetic improvement of farmers sheep flocks in Kashmir. However, due to the easy availability of fine and good quality synthetic fibers, wool has lost its market and there is a shift in objective of sheep farming from wool to mutton traits [1]. Due to mutton preference in the region, all sheep breeds and in particular Kashmir Merino (owing to its population and performance in temperate region of region) needs improvement for mutton traits. Any breed improvement programme is based on genetic variation and its effective utilization by selecting animals as parents of next generation on the basis of genetic worth instead of phenotype. The performance of animals depends upon its genetic worth and environment in which it is raised. The contribution of sire path is much higher than the dam path for the genetic variation of a trait [3]. The accurate estimates of breeding value of sires are prerequisites for efficient selection and effective genetic improvement program [4]. Hence, present study was under take with aim to estimate breeding values of sirs used at Government Sheep Breeding Farm Goabal during the period of study.

Material and Methods
Data on 816 Kashmir Merino lambs sired by 30 rams, maintained at Government Sheep Breeding Farm Goabal, spanning over 4 years (2014 to 2017) were collected for the present study. The farm is located at 34º16' latitude N and 53º49' longitude E, in district Ganderbal about 50 kilometers from Srinagar near tehsil Kangan. The farm has its history to pre 47 era when Mera Ben a lady, used to manage some cows, goats and sheep in it [5]. The station was later established as a sheep breeding farm by the department of Sheep Husbandry in early sixties. The sheep are stall-fed during winter for five months from fifteen November to 15th April only. The fodder is fed to animals @ 1.5 kg, 1.6 kg and 1.6 kg per day per adult ewe, ram and hogget, respectively. The concentrate ration is fed @ 600gms/day/adult male and @ 500gms /day/ewe and @ 300gms /sheep having age under one year.

The sheep are fed pelleted feed, maize, wheat bran, oil cakes, jaggery and mineral mixture. Sheep are not provided any feed and fodder from 15th April to 15th November except during draught periods. However, the common salt @ 10gms/head/week is given to these animals. The data were collected for five growth traits viz; birth weight (BW), weaning weight (WW), six month body weight 6MW), nine month body weight (9MW) and yearling body weight (12MW) to estimate breeding value of sires used. Breeding values of sires having 5 or more progeny were estimated by Best Linear Unbiased Prediction (BLUP) procedure described by Henderson (1973) [6] with sex and year of birth and as fixed factors. The analysis was carried out by mixed model least-squares maximum likelihood (LSMLMW) computer (PC-2) programme designed by Harvey (1990) [7]. The sires were ranked based on their genetic merit obtained from previous analysis and Product moment correlations and Spearman rank correlations were calculated (Spearman, 1904) [8]. The standard error of correlations was obtained according to formula given by Panse and Sukhatme (1961) [9]: The statistical significance of correlations was tested by comparing t value (obtained by dividing correlation with standard error) with table given by Snedecor and Cochran (1967) [10].

Result and Discussion

The overall breeding values (B.V)(kg)) were 3.47±0.03, 11.07±0.14, 17.46±0.16, 20.09±0.16 and 25.18±0.18 for birth weight (BW), weaning weight (WW), six month body weight, (6MW),-nine month body weight (9MW) and yearling body weight (12MW) (Table 1). More or less similar estimates of breeding values for different body weight traits ware reported by [11, 12] in Marwari sheep. Jeichitra et al. (2015) [13] estimated the breeding value of Mecheri ram for body weight by BLUP method and reported that EBVs ranged from -0.199 to 0.228 for birth weight, -1.195 to 1.133 for WW, -1.079 to 0.902 for SMW and -1.682 to 1.459 for YW. Mallick et al. (2016) [14] estimated the breeding value of Bharat merino rams and reported the deviation of breeding value from population mean as 0.067 for BW, 0.008 for WW and 0.036 for SMW. However, in Munjal sheep breeding values (kg)) of 4.15, 15.57, 21.00 and 26.54 for BW, WW, 6MW and 12MW, respectively were reported [4]. It was observed that out of 30 sires B.V of 11 (36.67), 11 (36.67), 16 (53.33), 15(50.00) and 19 (63.33) sires was above average for BW, WW, 9MW and 12MW, respectively. Similarly, out of 30 sires B.V of 19(63.33), 9(63.33), 14 (46.67), 15 (50.00) and 11 (36.67) for BW, WW, 9MW and 12MW, respectively was below average. The genetic worth of top ranking sire was 14.41 %, 24.57%, 9.62%, 16.48% and 6.31% above the average B.V for BW, WW, 9MW and 12MW, respectively. Similarly, the genetic worth of bottom ranking sire was 14.41 %, 16.98%, 12.03, 11.70 and 11.52 for BW, WW, 9MW and 12MW, respectively below average B.V.

Table 1: Average breeding value (B.V) of Kashmir Merino sire's for different growth traits

Traits	No of sires	Average BV	Minimum B.V (% below average)	Maximum B.V (% above average)	No. of sires with above average B.V (%of sires)	No. of sires with below average B.V (% of sires)
BW (kg)	30	3.47±0.03	2.97 (14.41)	4.53 (14.41)	11 (36.67)	19(63.33)
WW (kg)	30	11.07±0.14	9.19 (16.98)	13.79 (24.57)	11 (36.67)	19(63.33)
6MW (kg)	30	17.46±0.16	15.36 (12.03)	19.14 (9.62)	16(53.33)	14(46.67)
9MW (kg)	30	20.09±0.16	17.74 (11.70)	23.40 (16.48)	15(50.00)	15(50.00)
12MW (kg)	30	25.18±0.18	22.28 (11.52)	26.77 (6.31)	19(63.33)	11(36.67)

BW- Birth weight, WW- Weaning weight, 6MW- Six month body weight, 9MW-nine month body weight 12MW- yearling body weight.

The genetic worth (estimated breeding values) and ranks of sires for different body weight traits are presented in Table 2. Sire numbers 17 and 24 ranked first for BW and WW, respectively. Sire number 16 ranked first for 6MW and 9MW whereas sire number 19 ranked first for 12MW. Similar finding were reported by [4].

Table 2: Estimated breeding values (EBVs) and sire's rank for different body weight traits

Sire 32	N	Traits (kg)				
		BW±SE (Rank)	WW±SE (Rank)	6MW±SE (Rank)	9MW±SE (Rank)	TMW±SE (Rank)
1	35	4.01±0.15(5)	13.50±0.65 (2)	18.30±0.78 (9)	21.21±0.78 (4)	26.63±0.84 (2)
2	69	3.34±0.11 (16)	13.34±0.49(4)	18.90±0.59 (2)	20.92±0.59 (7)	23.97±0.63 (25)
3	64	3.49±0.12 (10)	11.05±0.52 (12)	18.50±0.62 (5)	20.83±0.62 (8)	25.50±0.67 (13)
4	5	3.46±0.16 (9)	11.05±0.68 (20)	18.31±0.81(6)	19.79±0.81 (15)	25.39±0.87(26)
5	12	3.52±0.11 (12)	10.55±0.46 (13)	18.38±0.55 (8)	20.20±0.55(17)	23.96±0.60(16)
6	10	3.48±0.26 (11)	9.34±1.15 (29)	17.47±1.37 (16)	21.14±1.37(15)	25.15±1.48 (20)
7	6	3.68±0.16 (7)	10.83±0.69 (15)	17.50±0.83 (15)	19.34±0.83 (23)	25.73±0.89 (8)
8	14	3.17±0.13 (27)	11.25±0.58 (11)	18.62±0.69 (3)	20.66±0.69 (10)	25.62±0.75 (11)
9	8	3.19±0.19 (25)	9.84±0.85 (28)	16.03±1.01 (27)	17.47±1.01 (30)	23.91±1.09 (27)
10	16	3.10±0.07 (28)	10.77±0.32 (16)	17.25±0.38(19)	19.72±0.38 (19)	24.99±0.41 (22)
11	21	3.03±0.08 (29)	11.01±0.36 (14)	17.56±0.43 (14)	20.41±0.43 (13)	25.23±0.4 (18)
12	31	3.22±0.27 (23)	10.14±1.16 (24)	17.70±1.39 (12)	19.68±1.39 (20)	26.06±1.49 (5)
13	27	3.17±0.18 (26)	10.32±0.78 (22)	17.83±0.92 (11)	19.74±±0.93 (18)	25.40±1.00 (14)
14	33	3.22±0.19 (22)	9.19±0.85 (30)	17.00±1.01 (22)	18.54±1.01 (28)	23.29±1.09 (29)
15	46	3.21±0.25 (24)	10.50±1.07 (21)	17.21±1.28 (20)	18.58±1.28 (27)	25.74±1.38(7)
16	33	2.97±0.19 (30)	10.12±0.83 (25)	15.36±0.99 (30)	18.39±0.99 (29)	22.28±1.07(30)
17	32	4.53±0.23 (1)	11.48±1.02 (9)	16.84±1.21 (24)	20.53±1.21 (12)	25.91±1.31 (6)
18	70	4.13±0.18 (2)	11.69±0.80 (7)	17.64±0.95 (13)	20.79±0.95 (9)	26.44±1.03 (4)
19	32	4.09±0.17 (4)	13.42±0.72 (3)	17.26±0.86 (18)	21.08±0.86 (6)	26.77±0.93 (1)
20	17	3.37±0.13 (15)	10.01±0.57 (26)	15.75±0.68 (29)	19.50±0.68 (22)	25.70±0.73 (10)

21	26	3.33±0.11 (18)	10.17±0.48 (23)	16.06±0.58 (26)	19.28±0.58 (24)	25.30±0.62 (17)
22	36	3.58±0.10 (8)	11.70±0.42 (6)	18.35±0.50 (7)	20.54±0.50 (11)	24.70±0.54 (2)
23	27	3.34±0.11 (17)	10.00±0.48 (27)	15.85±0.57 (28)	18.97±0.57(26)	25.18±0.61 (19)
24	41	3.31±0.12 (19)	10.65±0.52 (18)	17.17±0.62 (21)	19.63±0.63 (21)	24.73±0.67 (23)
25	15	3.28±0.08 (20)	10.59±0.37 (19)	16.97±0.44 (23)	19.25±0.44 (25)	24.99±0.47 (21)
26	35	3.44±0.11 (13)	11.47±0.48 (10)	16.83±0.57 (25)	19.95±0.57 (16)	23.81±0.62 (28)
27	5	3.27±0.16 (21)	10.74±0.68 (17)	17.43±0.81 (17)	20.21±0.81 (14)	25.56±0.87 (12)
28	16	3.75±0.12 (6)	12.04±0.53 (5)	19.14±0.64 (1)	23.40±0.64 (1)	25.30±0.69 (15)
29	24	4.10±0.15 (3)	13.79±0.65 (1)	18.07±0.77 (10)	21.62±0.77 (2)	26.57±0.83 (3)
30	10	3.44±0.10 (14)	11.48±0.46 (8)	18.52±0.55 (4)	21.44±0.55 (3)	25.70±0.59 (9)

The product moment correlations between estimated breeding values of sires among production traits were low to moderate ranging from 0.15±0.03 (between WW and 12MW) to 0.56±0.02 (between 6MW and 9 MW). Similarly the Spearman's rank correlation among different body weight traits were moderate to high ranging from 0.25±0.03 (between 6MW and 12MW) to 0.78±0.01 (between WW and 9MW). All correlations were positive and significant. Similar finding were reported by [4, 11]. The moderate to high rank correlations between different traits indicated corresponding moderate to high degree of similarity between rankings. The present findings are in close consonance results reported in literature [4, 11, 15].

Table 3: Estimates of Product Moment (above diagonal) and Spearman's rank correlation (below diagonal) between EBVs among production traits

Traits	BW	WW	6MW	9MW	12MW
BW	--	0.27±0.03**	0.24±0.03**	0.24±0.03**	0.19±0.03**
WW	0.59±0.02**	--	0.43±0.03**	0.42±0.03**	0.15±0.03**
6MW	0.29±0.03**	0.60±0.02**	--	0.56±0.02**	0.34±0.03**
9MW	0.60±0.02**	0.78±0.01**	0.73±0.02**	--	0.38±0.03**
12MW	0.45±0.03**	0.44±0.02**	0.25±0.03**	0.44±0.03**	--

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed). N. non-significant

The early body weight traits are very important for economic sheep rearing owing to their high correlation with life time production potential of sheep. The six months body weight is very important trait owing to its positive correlations with other traits. Therefore, effective selection based on breeding values at six months age aided by optimal environmental conditions in terms of management and nutrition to obtain quick and effective genetic gain will be a game changer for mutton industry in the region.

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