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Qysheed Hussain Want
Division of Livestock Production and Management Faculty of Veterinary Sciences and Animal Husbandry, Shuhama, Srinagar, SKUAST-Kashmir, Jammu, Jammu and Kashmir, India

MT Banday
Division of Livestock Production and Management Faculty of Veterinary Sciences and Animal Husbandry, Shuhama, Srinagar, SKUAST-Kashmir, Jammu, Jammu and Kashmir, India

S Adil
Division of Livestock Production and Management Faculty of Veterinary Sciences and Animal Husbandry, Shuhama, Srinagar, SKUAST-Kashmir, Jammu, Jammu and Kashmir, India

HM Khan
Division of Livestock Production and Management Faculty of Veterinary Sciences and Animal Husbandry, Shuhama, Srinagar, SKUAST-Kashmir, Jammu, Jammu and Kashmir, India

MI Hussain
Division of Veterinary Microbiology and Immunology Faculty of Veterinary Sciences and Animal Husbandry, Shuhama, Srinagar, SKUAST-Kashmir, Jammu, Jammu and Kashmir, India

Corresponding Author:
Qysheed Hussain Want
Division of Livestock Production and Management Faculty of Veterinary Sciences and Animal Husbandry, Shuhama, Srinagar, SKUAST-Kashmir, Jammu, Jammu and Kashmir, India

A survey on evaluation of reproductive performance of Kashmir Merino sheep under field conditions

Qysheed Hussain Want, MT Banday, S Adil, HM Khan and MI Hussain

Abstract
Kashmir Merino sheep are used by the rural farmers as a source of food and cash and are believed to have adapted to harsh conditions of Kashmir region. There is scanty literature available regarding reproductive performance of Kashmir Merino sheep under field conditions, therefore, the present study was undertaken. The information regarding prolificacy and fine wool yield was obtained through a pre-structured questionnaire from 94 sheep farmers. Majority of the respondents reported autumn season as the main breeding season. Majority reported no oestrous activity during spring and winter season with little oestrous activity during summer season. Majority reported age at sexual maturity between 16-23 months, weight at sexual maturity 28-37 Kg, age at first lambing 20-29 months and weight at first lambing 30-39 Kg. Majority reported 11-12 months lambing interval, age at 2nd lambing as 35-44 months and 80-100% lambing percentage. Majority kept their rams continuously with the flock throughout the year with source of their breeding rams reported from their own flock.

Keywords: Kashmir Merino, oestrous, lambing, ram, breeding season

Introduction
Livestock sector acts a backbone in shaping the economy of India with livestock sector contributing nearly 4.11% during 2012-13 to the total GDP at current prices Further, in J&K 9.2 million livestock excluding poultry is available with small ruminants 5.4 million representing about 59% sheep alone (3.389 million), which constitutes approximately 37% of total livestock population [1]. The J&K has economy which is agriculture dependent with 73% population living in rural areas and associated with agriculture and allied sectors having livestock as one of the components [2].
The J&K is preferably ideal for sheep rearing owing to its favourable agro-climatic conditions with ample alpine pastures and other natural endowments. Sheep rearing is the core activity of rural masses in this region, playing a substantial role in upliftment of weaker sections of society. Sheep is an excellent animal for utilization of wasteland as well as low and high pastures and converting them into high quality proteins (meat and wool). Sheep are less prone to extremes of environmental conditions like harsh winters in this region, so they are considered as important component of temperate ecosystem of the J&K. This region has a ctrossbred native sheep called Kashmir Merino, developed by crossing local sheep of this region with 50 to 75% exotic inheritance of Merino sheep and Rambouillet [3].
The performance of Kashmir Merino sheep has slumped over the years and must be tackled by devising by effective breeding policies. Because of this reason and scanty literature available, a study on reproductive parameters of Kashmir Merino under field conditions was undertaken.

Material and Methods
Study area and animals
The proposed work was undertaken in the four community development (CD) blocks of district Srinagar. Srinagar city is located at an average elevation of 1600 meters above mean sea level and it is spread over in the heart of the oval shaped Valley of Kashmir. It is situated between 740-56' and 750-79' East Longitude and 330-18' and 340-45' North Latitude. Srinagar has a humid subtropical climate, much cooler than what is found in much of the rest of India, due to its moderately high elevation and northerly position. The valley is surrounded by the Himalayas on all sides. Winters are cool, with daytime a January average of 2.5°C (36.5°F), and temperatures below freezing at night. Moderate to heavy snowfall occurs in winter and the only road that connects Srinagar with the rest of India may get blocked for a few days due to Avalanches.

Summers are warm with a July daytime average of 24.1°C (75.4°F). The average annual rainfall is around 710 millimetres (28 in). Spring is the wettest season while autumn is the driest. The highest temperature reliably recorded is 38.3°C (100.9°F) and the lowest is -20.0°C (-4.0°F) [4].

Experimental site

The investigation was undertaken, in collaboration with the extension wing of Sheep Husbandry Department, in four community development (CD) blocks of district Srinagar viz. Srinagar North, Srinagar South, Khanmoh and Harwan block. A total of 94 respondents involving 29, 27, 16 and 22 farmers from Srinagar North, Srinagar South, Khanmoh and Harwan were selected, respectively. This was because of uneven distribution of sheep populations in the study areas. The visited sites in each CD block were selected on the basis of having a higher concentration of livestock. At each study site, the farmers were randomly selected from a list of breeders available with Sheep Extension Centres. Each flock owner was interviewed face to face at their homesteads using pre-structured questionnaire to get information regarding reproductive performance of their flock.

Data analysis

The response to the questionnaires were entered into a computer spread-sheet, Microsoft Excel (Microsoft Corporation, USA) followed by Analysis using standard statistical tools of the said programme.

Results and Discussion

Seasonal Oestrous Distribution

The percent distribution of oestrous in Kashmir Merino sheep during different seasons has been given in Table 1. In India there are three mating seasons viz. March-April or summer, June-July or autumn, September to October or post monsoon. Generally seasonality of oestrous is controlled by the hours of light to which the ewe is exposed. In temperate areas of the world, ewes tend to enter a non-reproductive state during the spring and summer, and start cycling in the fall as the day length decreases. Sheep are short-day breeders and are also known as fall breeders. However, certain breeds of sheep are less affected by the season and can have longer breeding seasons or practically breed round the year. In the mid and high latitudes of temperate regions, breeding begins during autumn season when the day light becomes shorter [5]. Majority of the respondents (59.57%) reported autumn season as the main breeding season followed by summer season (25.53%) and winter season (11.7%). These results are in agreement with earlier reports in Gurez and Changthangi sheep respectively [6, 7]. In the present study majority of respondents (73.4%) reported no oestrous activity during spring season whereas the rest 26.5% reported this activity. During summer season 25.5% reported this season as major breeding season for their sheep even winter season was reported to be the main breeding season by 11.7% of the respondents. Generally breeds developed in tropical areas (Merino, Rambouillet) or breeds selected for out-of-season breeding are less governed by the seasons even when moved to temperate areas. Lot of variation from major to very few (<10%) breeding activity was observed throughout the year during all the four seasons. This variation in breeding activity can be used for out-of-season breeding programmes which are becoming more popular as producers move to accelerated-lambing programs to increase the supply of product to the market place on a year-round basis. These finding are supported by the earlier reports [8] who reported that seasonal breeding pattern commonly observed in sheep bred in temperate climates was a major constraint in increasing the sheep production over greater period of a year.

Age at Sexual Maturity

Majority of the respondents (41.48%) reported age at sexual maturity ranged between 16-23 months followed by 24-30 months and 8-15 months by 38.29% and 20.21% of the respondents respectively (Table 2). These results are in accordance with earlier findings [9] who observed that majority (62.70%) of the respondents reported the age at first mating in females as 16-18 months. However, in the present study 20.21% reported age at sexual maturity to be 8-15 months. This is in agreement with earlier reports [10] who reported that age at sexual maturity in Mangali sheep of Pakistan is 12-16 months for both males and female. Lower estimate for age at sexual maturity is desirable as it increases the lifetime production of the individuals. Breed and nutritional status of the animal might be the reason for the differences in age at sexual maturity in ewes.

Weight at Sexual Maturity

A large body is the evidence which suggests that the puberty usually occurs when a threshold amount of body weight has been achieved [11]. Majority of the respondents (53.19%) reported weight at sexual maturity to be 28-37 Kg followed by 38-47 Kg and 18-27 Kg by 34.04% and 12.76% of the respondents. Patro *et al*. (2005) also reported weight at sexual maturity of indigenous sheep of Kendrapada area to be 18.07±0.09 Kg. which is in agreement with the reports recorded by 12.76% respondents. Ewes need to attain a minimum body weight of about 28-37 Kg to reach sexual maturity and generally at this weight have a conception rate of about 80%. Nutritional levels modulate age at puberty because of its impact on body weight [12]. Animals that are fed a higher plane of nutrition generally have a faster growth rate and reach puberty earlier than animals that are underfed. However, underfed animals eventually attain puberty, albeit at an older age, provided the malnourishment previously suffered was not severe [13].

Age at First Lambing

Majority of the respondents (62.76%) reported the age at first lambing as 20-29 months. The present findings are in corroboration with others [10] who recorded the age at first lambing for Mengali sheep (19-25 months). However, these reports differ with others [14] who reported mean age at first lambing in Kashmir Merino to be 19.7 months which is in line with the present report (10-19 months) as recorded by 15.75% of respondents. Gbangboche *et al*. (2006) reported highest parameters for Djallonke gimmers at 20.7 months.

Weight at First Lambing

Majority of the respondents (53.29%) recorded weight at first lambing to be 30-39 Kg. This is in contrary to the reports of others [15] who reported that the mean value of weight at first lambing in indigenous sheep of Kendrapada area to be 23.44±0.90 Kg. However these reports are in line with the reports from 11.70% respondents who recorded the weight at first lambing to be 20-29 Kg. in the present study higher weight (40-49 Kg) at first lambing of Kashmir Merino ewes was reported by 35.10% of respondents.

Service Period

Majority of the respondents (87.23%) kept their rams continuously with the flock throughout the year to increase the lambing rate and because they could not manage different flocks separately. According to earlier reports [17] controlled mating management system in sheep farms accounted for the higher age at first parturition whereas rams let loose with the females all-year-round provided ample opportunity for them to service young females at the earliest opportunity. The mean value for service period has been reported to be 63.13±0.25 days [15]. Similar observations were made earlier [16] who observed that introduction of ram into the flock, resulted in an average age at first parturition of 15.3 months.

Lambing Interval

Majority of the respondents (74.46%) reported lambing interval of 11-12 months which is in agreement with earlier reports [10] who also reported average lambing interval of 12 months in Mengali sheep breed of Balochistan whereas 25.53% of respondents (except North block) in the present study reported 7-8 months of lambing interval i.e., two lambing in 14 months which depicted that there was a potential of accelerated lamb crop production. These results are in line with previous reports [15] who reported that mean value of lambing interval in indigenous sheep of Kendrapada area to be 7 months. The average lambing interval of around 10 months has been reported by others [16].

Age at 2nd Lambing

Majority of the respondents (60.63%) reported age at 2nd lambing was 35-44 months followed by 25-34 months (mostly from North block) & 45-54 months by 24.46% and 14.39% of the respondents respectively. These reports are in contrary to the findings of others [15] who reported the mean value of age at 2nd lambing in indigenous sheep of Kendrapada area was 24.4 months. It is evident from the study that sheep with lambing interval of 1 year had higher age at 2nd lambing.

Source of Breeding Ram

The source of breeding rams has been presented in Figure 1. In the present study the primary reason for keeping rams was for breeding as well as socio-cultural and religious purposes. Rams for breeding were selected by farmers based on size and confirmation. The breeding method used by most smallholder farmers in the district was uncontrolled natural mating. In this regard smallholder farmers allowed their ewes to mate randomly with rams from other herds in the same area or nearby areas during grazing time throughout the year except winter season. The consequence of rams and ewes to run together throughout the year in uncontrolled breeding include the lambing to occur even in unfavourable seasons. Uncontrolled breeding was also reported earlier by other workers [17]. In the present study majority of the sheep farmers (57.45%) replaced breeding rams from their own flock (farm bred) whereas 36.17% respondents obtained their breeding rams from Sheep Husbandry Department (SHD) free of cost and only 6.38% respondents purchased breeding rams from different sources as a replacement stock. In the field there was a trend to replace their breeding rams within 2-3 years, after attaining considerable body weight which were preferred for sacrifice during the religious festival such as Eid. This indicated that sheep farmers were not aware of inbreeding effects in the flock. This could be due to lack of availability of superior breeding rams from the department of sheep husbandry, lack of awareness about inbreeding effects, unwillingness of breeders to pay hefty sums on elite breeding rams from other sources. These results indicated that more than 50% respondents could not be benefitted by the ongoing government schemes. These results are in conformity with findings of others [18] in the breeding tract of Mecheri sheep.

Table 1: Percent distribution of oestrous in Kashmir Merino sheep during different seasons

Block						
Oestrous Distribution	**Season**	**North n=29**	**South n=27**	**Khanmoh n=16**	**Harwan n=22**	**Overall n=94**
Majority	Spring	0.00	0.00	0.00	0.00	0.00
Fifty %		0.00	0.00	0.00	0.00	0.00
Few(10-20%		0.00	14.81	0.00	4.55	5.31
Very few (<10%)		13.79	11.11	6.25	54.55	21.27
Nil		86.21	74.97	93.75	40.91	73.40
Majority	Summer	3.45	44.44	32.25	27.27	25.63
Fifty %		6.90	0.00	6.25	9.09	5.31
Few(10-20%		20.69	14.81	0.00	18.18	14.89
Very few (<10%)		34.48	25.93	31.25	36.36	31.21
Nil		34.48	14.81	31.25	9.09	22.34
Majority	Autumn	51.72	55.56	62.50	72.73	59.57
Fifty %		0.00	0.00	6.25	4.55	2.12
Few(10-20%		31.03	11.11	31.25	18.18	19.14
Very few (<10%)		6.90	25.93	0.00	4.55	13.82
Nil		10.34	7.41	0.00	0.00	5.31
Majority	Winter	37.93	0.00	0.00	0.00	11.70
Fifty %		6.90	0.00	6.25	0.00	3.19
Few(10-20%		0.00	51.85	18.75	4.55	19.14
Very few (<10%)		27.59	11.11	62.50	36.36	30.85
Nil		27.59	37.04	12.50	59.09	35.10

Table 2: Reproductive parameters of Ka Kashmir Merino sheep under field conditions (%)

Parameter	Variable	Block				
		North n=29	South n=27	Khanmoh n=16	Harwan n=22	Overall n=94
Age at Sexual Maturity (months)	8-15	(10)*34.48	(1)3.70	(6)37.50	(2)9.09	(19)20.21
	16-23	(13)44.83	(16)59.26	(2)12.50	(8)36.36	(39)41.48
	24-30	(6)20.69	(10)37.04	(8)50.00	(12)54.55	(36)38.29
Weight at Sexual Maturity (Kg)	18-27	(2)6.90	(2)7.41	(4)25.00	(4)18.18	(12)12.76
	28-37	(15)51.72	(15)55.56	(6)37.50	(14)63.64	(50)53.19
	38-47	(12)41.38	(10)37.04	(6)37.50	(4)18.18	(32)34.04
Age at First Lambing (months)	10-19	(6)20.69	(2)7.41	(6)37.50	(1)4.55	(15)15.95
	20-29	(23)79.31	(21)77.78	(5)31.25	(10)45.45	(59)62.76
	30-40	(0)0.00	(4)14.81	(5)31.25	(11)50.00	(20)22.27
Weight at First Lambing (Kg)	20-29	(5)17.24	(0)0.00	(4)25.00	(2)9.09	(11)11.70
	30-39	(16)55.17	(16)59.26	(2)12.50	(16)72.73	(50)53.19
	40-49	(8)27.59	(11)40.74	(10)62.50	(4)18.18	(33)35.10
Service Period						
Days	<15	(0)0.00	(0)0.00	(0)0.00	(5)22.73	(5)5.31
Days	30	(0)0.00	(0)0.00	(0)0.00	(1)4.55	(1)1.06
Months	6	(0)0.00	(4)14.81	(0)0.00	(2)9.09	(6)6.38
Throughout year	-	(29)100.0	(23)85.19	(16)100.00	(14)63.64	(82)87.23
Lambing Interval (months)	7-8	(0)0.00	(2)7.41	(10)62.50	(12)54.55	(24)25.53
	11-12	(29)100.0	(25)92.59	(6)37.50	(10)45.45	(70)74.46
Age at 2nd Lambing (months)	25-34	(14)48.28	(2)7.41	(3)18.75	(4)18.18	(23)24.46
	35-44	(15)51.72	(16)59.26	(9)56.25	(17)77.27	(57)60.63
	45-54	(0)0.00	(9)33.33	(4)25.00	(1)4.55	(14)14.89
Lambing Percentage	50-70%	(0)0.00	(0)0.00	(0)0.00	(8)36.36	(8)8.51
	80-100%	(29)100.0	(27) 100.0	(16)100.00	(14)63.64	(86)91.48

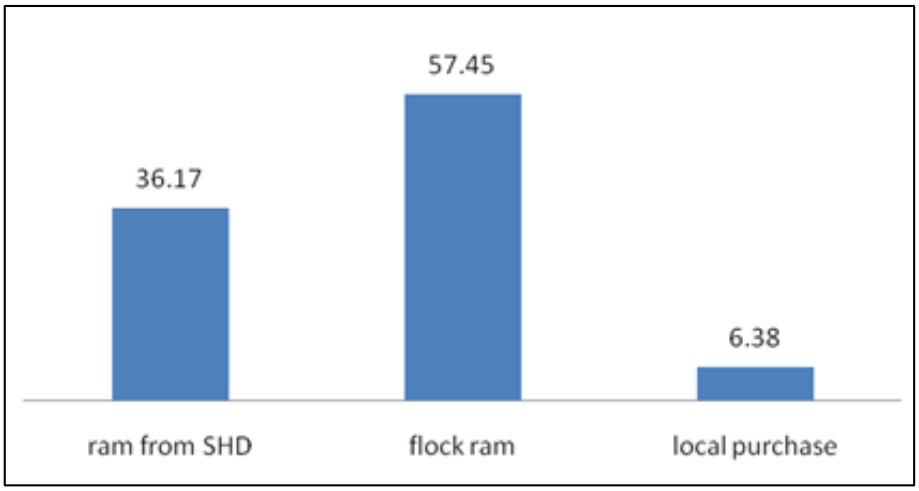

Fig 1: Source of Breeding Ram

Conclusion

The presence of lot of seasonal variation in estrous activity throughout the year with high lambing percentage are the positive attributes in Kashmir Merino sheep, however, twining percentage and ability to lamb thrice in two years is less. Molecular studies on Kashmir Merino sheep may be undertaken for characterization of twining and genes related to breeding and cyclicity.

Conflict of Interest: All authors declare no conflicts of interest

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