



Morphometric and production characteristics of karakul-purgi cross bred sheep of Kargil (Ladakh)

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ABSTRACT

Sheep rearing is a dominant activity among the farmers in cold desert of Ladakh that not only serves as a source of income but also a source of protein during harsh winter. Government has been trying to improve the sheep from time to time and Karakul sheep introduction in 1985-86 to upgrade local purgi breed is one such example. Since available literature about the karakul and purgi cross is scant, hence the present study was conducted to assess the morphometric and production characteristics at field level. The study findings revealed Karakul-purgi cross are mostly (47.50%) black in colour followed by Sur (23.50%). More than 80% of this cross bred sheep had drooping type of ears and female are hornless while most of the males have horn buds. Ear, head, tail and body lengths noticed were 4.91 ± 0.16 , 9.31 ± 1.50 , 9.87 ± 0.24 and 24.66 ± 0.45 cm respectively at more than 2 years of age. Body weight in male animals was found higher than their female counter part. Contrary to this, adults males were found heavier than females $\{(41.44 \pm 2.06 \text{ kg}) \text{ vs } (33.17 \pm 1.16 \text{ kg})\}$. Adult animal's milk and wool production recorded was 177.20 ± 3.53 ml and 744.21 ± 10.83 g respectively and comparatively better than other breed available in the region, indicative of breed improvement. The breed showed good performance, thrives best in existing agro-geo-climatic conditions and demonstrates good scientific interventions for making sheep farming a profitable venture in Kargil Ladakh.

Key words: Karakul-purgi cross, Kargil, morphometry, production performance

Globally there are more than 800 different sheep breeds, with a wide range of sizes, forms, sorts, and colours. In India, there are 40 different sheep breeds and total population of 74.26 million (Kumar and Misra, 2021). The Jammu and Kashmir ranks sixth in terms of sheep population 3.25 million in the country and is second in terms of wool production (Anonymous, 2019). Breeds like Poonchi, Bhakarwal, Gaddi, Gurez, Karnah, Changthangi, Malluk, and Purgi are well-known (Rather *et al.*, 2019). There are 1,13,538 sheep in Kargil district, indigenous breeds being predominant in kargil district of UT Ladakh. Sheep are crucial in hilly and other inhospitable places where it is difficult for other animals to survive. Sheep raising has traditionally been done by nomadic people and members of the lesser social classes. Under the transhumance and semi-migratory production system of management, they serve as the only physical assets during times of scarcity, create jobs, and aid in raising socioeconomic status. Because of the significant snowfall on the Zojilla Pass, this region is cold with dry harsh winters. Sheep are a good source of meat in Kargil, particularly during the harsh winter.

In 1976, Karakul sheep were trial-introduced to the Kargil region of Ladakh from Bikaner, Rajasthan. Better quality breed from Australia was imported later around 1985–1986, (Anonymous. 2018). The breed has a good tolerance for the area's dry, cold climate. The native sheep in the area are smaller and lighter than the karakul sheep.

Because of its diminutive stature, the local breed Purgi (Fig.1.A) was crossed with the Karakul sheep breed (Fig.1.B) in the Suru Valley of Kargil for weight gain. This cross has not received much scientific attention; a

deeper comprehension of this cross would greatly aid in its conservation which can be further propagated for elite selections.



Fig. 1: Karakul, Purgi and its Cross

MATERIALS AND METHODS

The study was carried out in 10 villages of Suru valley of Kargil, Ladakh UT. Karakul-Purgi Cross sheep (Fig.1.C.) of all age groups (N=198) excluding less than one year age reared under semi intensive system i.e. grazing during summer months (May to October) in the upper region of Kargil and stall-feeding during winter months (Nov to April) were included in the study. All the animals were identified with ear tags. Colour, ear orientation, horn type, ear length and width, head length, nose length, body length, tail (width & length), chest girth, Punch girth, height at wither and milk and wool production were studied and recorded.

Following the descriptive analysis of data, both parametric (independent sample t-test) and non-parametric (chi-square test) tests were applied based on the measurement scale as per below mentioned table used in collection of data to draw appropriate inferences.

Parameters	Groups	Scales of measurement	Unit of measurement	Analytical tools used
- Body colour - Ear orientation - Horn type	General traits	Nominal scale (non-parametric)	--	- Frequency, percent - Chi-square test
- Ear length & width, - Head length, - Nose length - Body length, - Tail width & length, - Chest girth - Punch girth, - Height at wither	Morphological	Ratio scale (parametric)	In inches	- Mean and standard error - Independent sample t-test between sex at > three years of age.
- Milk yield, - Wool production	Production (ratio scale, measured in)	Ratio scale (Parametric)	- Milk: ml / day/ animal - Wool: gms / animal (after shearing)	Mean and standard error, One-way ANOVA

RESULTS AND DISCUSSION

All the morphometric characteristics were grouped as per the scale of data measured viz. nominal and ratio scale separate tables prepared for better presentation, understanding interpretation and accordingly presented under separate heading.

General traits of Karakul-Purgi Cross sheep: A variety of body colours were observed. Predominant colour observed was either black (47.50%) (Fig.2.a) or uniform Sur (Fig.2.b) (23.50%) unlike pure Purgi breed sheep

which are mostly white in color (Baba *et al.* 2018.) Karakul are mostly black and grey in Afghanistan (Musavi *et al.*, 2022).

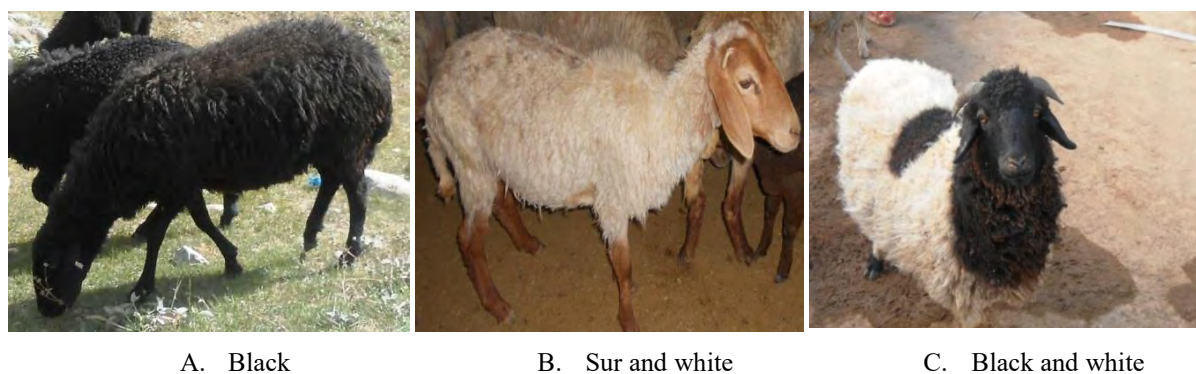


Fig. 2 : Body colour of Karakul-purgi cross

With respect to Ear orientation, only two varieties were observed mainly Drooping downward type (83.50%) (Fig.3.A) followed by tubular type (16.50%) (Fig.3.B), Karakul pure animals have pendulous ears (Fanica *et al.*, 2010; Musavi *et al.* 2022). Although, all the Ewes of karakul-purgi cross sheep were polled (Fig.3.a) irrespective of their age, almost 50% among the male had buds (Fig.3.B) followed by 25% each having backward (Fig.3.C) and outward types of horn orientation with varied length. Similar finding were also reported among the Karakul sheep in Kazakhstan by Dyusegaliyev *et al.*, (2021) who noticed well-developed horns in males compared to hornless females.

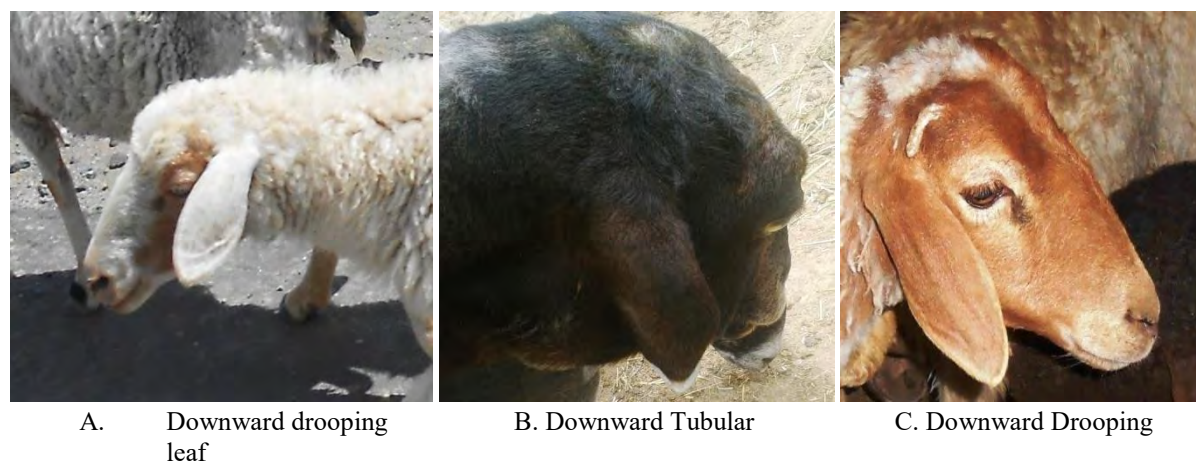


Fig. 3: Ear Orientation of Karakul-Purgi cross

Morphometric measurements of Karakul-purgi cross sheep: 10 parameters were considered under this category (Table 2). The result revealed none of the parameters varied significantly between the sexes across the different age groups. Ear and head length of cross bred sheep were found to be 4.91 ± 0.16 and 9.31 ± 1.50 respectively, quite longer than Karakul sheep at same age i.e. at > two years of age similar findings were reported by Musavi *et al.* (2022). Who noticed corresponding figures of 5.51 ± 0.11 and 6.57 ± 0.09 respectively.

Body length and height at wither of Karakul-Purgi cross sheep at the age of more than 2 years measured were 24.66 ± 0.40 and 24.99 ± 0.34 respectively. The present body length was much higher than the earlier findings of Purgi in the same region as reported by Baba *et al.* (2018) in either sex who recorded around 21 inches body length. Contrary to the present body height, a higher value was recorded in Karakul (26.37cm) by Musavi *et al.* (2022). Other major characteristics such as tail length, chest girth and punch girth at the age of more than 2 years notice were 9.87 ± 0.24 , 29.19 ± 0.34 and 32.18 ± 0.40 cm respectively.

Although all the parameters varied across the different age group, there was no significant difference between the sexes. Some of the results were towards better side compared to earlier finding for either breed viz. Karakul or Purgi, indicative of better weather adoptability.

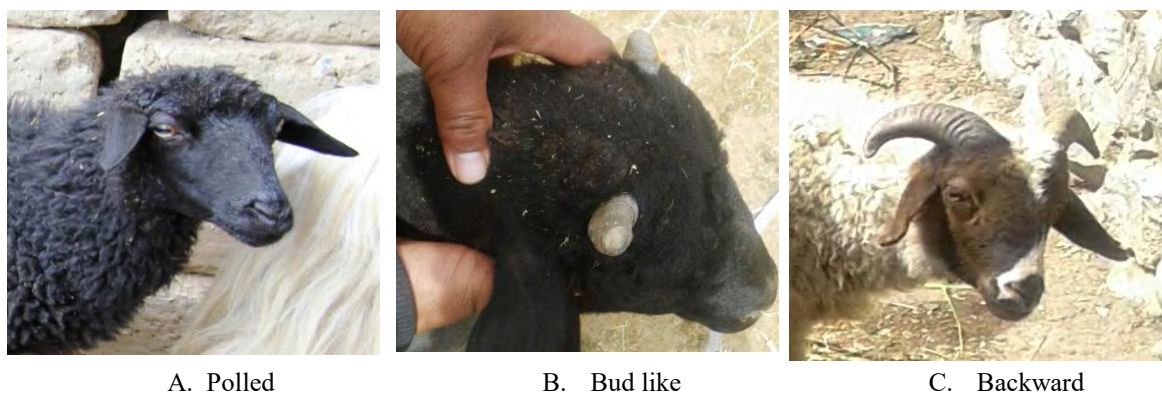


Fig. 4: Horn type and Orientation of Karakul-Purgi cross

Table1: General Traits of Karakul-Purgi cross sheep

Parameter	Female		Male		Total	
	Number	Per cent	Number	Percent	Number	Percent
Body Colour						
Black & Gray	0	0.00	2	1.00	2	1.00
Black & White	6	3.00	6	3.00	12	6.00
Black	50	25.00	45	22.50	95	47.50
Black White and Sur	0	0.00	4	2.00	4	2.00
Gray	11	5.50	10	5.00	21	10.50
Gray White and Sur	2	1.00	0	0.00	2	1.00
White & Sur	0	0.00	3	1.50	3	1.50
Sur and Black	2	1.00	2	1.00	4	2.00
Sur	27	13.50	20	10.00	47	23.50
White	6	3.00	4	2.00	10	5.00
Total	104	52.00	96	48.00	200	100.00
Ear orientation						
Drooping	85	42.50	82	41.00	167	83.50
Tubular	19	9.50	14	7.00	33	16.50
Total	104	52.00	96	48.00	200	100.00
Horn Orientation						
Backward	0	0.00	19	9.50	19	9.50
Bud	0	0.00	47	23.50	47	23.50
Forward	0	0.00	4	2.00	4	2.00
Polled	104	52.00	0	0.00	104	52.00
Outward	0	0.00	24	12.00	24	12.00
Pointed	0	0.00	2	1.00	2	1.00
Total	104	52.00	96	48.00	200	100.00

Production parameters of Karakul-purgi cross sheep: Body weight of Karakul-Purgi cross sheep at the age of more than 2 years observed was 36.23 ± 23 kg, higher than Purgi local breed of either sex. Males and females attained body weight of 17.64 kg and 18.52 kg at 2-tooth; 20.67 and 21.87 kg at 4-tooth; 23.51 kg and 24.81 kg at 6-tooth, and 25.81 kg and 26.69 kg at full mouth, respectively (Baba *et al*, 2018).

Both Karakul and Purgi are multipurpose breed, milk production of their cross bred animal was not found to be comparable with other milk producing sheep breed, (Haenlein, 2007; Bobokulovich and Kasimovna, 2021). However, Wool production of this cross bred sheep was comparable to several other breeds (Dixit *et al.* 2006).

Table 2: Morphological and Production characteristics of Karakul-purgi cross Sheep (all measures are in inches)

Characteristics	Sex	Age of Sheep (Years)			Total	Independent sample t test between sex at > 3 years (2 – tailed)
		1 year	1-2 years	> 2 years	Total	
Sample Size	Male	38	42	16	96	NS
	Female	18	51	35	104	
Ear Length	Male	3.98 ± 0.11	4.46 ± 0.12	4.61 ± 0.36	4.29 ± 0.09	NS
	Female	4.14 ± 0.13	4.55 ± 0.17	5.05 ± 0.15	4.66 ± 0.10	
	Total	4.03 ± 0.08	4.51 ± 0.11	4.91 ± 0.16	4.49 ± 0.07	
Ear Width	Male	2.21 ± 0.04	2.56 ± 0.07	2.47 ± 0.15	2.41 ± 0.05	NS
	Female	2.23 ± 0.08	2.39 ± 0.07	2.66 ± 0.07	2.46 ± 0.05	
	Total	2.21 ± 0.04	2.47 ± 0.05	2.60 ± 0.07	2.43 ± 0.03	
Head Length	Male	7.98 ± 0.11	7.85 ± 0.12	8.11 ± 0.18	7.94 ± 0.07	NS
	Female	8.28 ± 0.17	7.90 ± 0.10	9.89 ± 2.23	8.59 ± 0.71	
	Total	8.08 ± 0.09	7.88 ± 0.08	9.31 ± 1.50	8.28 ± 0.37	
Nose Length	Male	5.64 ± 0.18	5.55 ± 0.12	5.86 ± 0.21	5.64 ± 0.09	NS
	Female	5.76 ± 0.11	5.67 ± 0.07	5.40 ± 0.11	5.60 ± 0.05	
	Total	5.68 ± 0.13	5.62 ± 0.06	5.55 ± 0.10	5.62 ± 0.05	
Tail Length	Male	7.48 ± 0.27	8.87 ± 0.28	9.91 ± 0.19	8.49 ± 0.19	NS
	Female	7.79 ± 0.49	8.82 ± 0.29	9.86 ± 0.34	8.96 ± 0.21	
	Total	7.58 ± 0.24	8.85 ± 0.20	9.87 ± 0.24	8.73 ± 0.14	
Tail Width	Male	2.98 ± 0.17	4.19 ± 0.26	5.65 ± 0.41	3.96 ± 0.18	NS
	Female	2.68 ± 0.21	4.40 ± 0.53	4.03 ± 0.22	3.94 ± 0.28	
	Total	2.89 ± 0.13	4.31 ± 0.31	4.56 ± 0.22	3.95 ± 0.17	
Height at wither	Male	17.90 ± 0.38	23.93 ± 0.38	26.23 ± 0.70	21.93 ± 0.42	NS
	Female	17.98 ± 0.46	22.56 ± 0.26	24.39 ± 0.34	22.38 ± 0.28	
	Total	17.93 ± 0.30	23.18 ± 0.23	24.99 ± 0.34	22.16 ± 0.25	
Chest girth	Male	21.08 ± 0.49	28.17 ± 0.47	29.33 ± 0.81	25.56 ± 0.49	NS
	Female	23.01 ± 0.79	27.28 ± 0.28	29.13 ± 0.31	27.14 ± 0.30	
	Total	21.70 ± 0.43	27.68 ± 0.26	29.19 ± 0.34	26.38 ± 0.28	
Body Length	Male	17.02 ± 0.48	23.06 ± 0.28	26.53 ± 0.97	21.25 ± 0.46	NS
	Female	17.70 ± 0.52	22.31 ± 0.29	23.75 ± 0.40	22.00 ± 0.29	
	Total	17.24 ± 0.37	22.65 ± 0.21	24.66 ± 0.45	21.64 ± 0.27	
Punch Girth	Male	23.48 ± 0.56	30.12 ± 0.56	33.39 ± 0.85	28.04 ± 0.53	NS
	Female	23.34 ± 0.87	29.19 ± 0.37	31.59 ± 0.40	29.01 ± 0.38	
	Total	23.44 ± 0.47	29.61 ± 0.33	32.18 ± 0.40	28.55 ± 0.33	

Table 3: Production characteristics of Karaku- purgi cross Sheep:

Parameters		Up to 1 year	1-2 years	> 2 years
Body Weight (kg)	Male	9.83 ± 0.86	31.37 ± 1.15	41.44 ± 2.06
	Female	10.49 ± 1.50	27.30 ± 1.08	33.71 ± 1.16
	Total	10.04 ± 0.75	29.14 ± 0.81	36.23 ± 1.14
Milk production (ml)	N=104		177.20 ± 3.53	
Wool Production (gm)	Male (n=59)		787.29 ± 16.91	
	Female (N=86)		714.65 ± 13.26	
	Total (N=145)		744.21 ± 10.83	

CONCLUSION

Since this karakul-purgi cross bred is particularly significant and suitable for the region's hard climate throughout the year, it is necessary to preserve it so that its genetic potential can be utilized for the benefit of the area's underprivileged farmers. The documenting of this cross bred is absolutely necessary since it will serve as a reference for future efforts to preserve it. The preservation of the gene pool is a requirement.

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