



Phenotypic traits and performance of Kajali sheep: a lesser known ovine genetic resource of Punjab, India

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ABSTRACT

Kajali, a lesser known sheep of Punjab (India), is primarily reared for mutton production. It has two types / colour variants distinguished primarily on the basis of body coat colour namely Black (Kali) Kajali and White (Chitti) Kajali. The animals are large in size with well-built body having Roman nose, long and pendulous ears and long tail touching to ground. The average flock size was 56.45. Both the sexes are polled; however, in some males horn were also noticed. Adult body weight of males and females varied from 30 to 76 kg in males and 26 to 67 kg in females. The overall body length, height at withers, chest girth, ear length and tail length were 73.97 ± 0.28 , 73.36 ± 0.20 , 84.23 ± 0.27 , 21.33 ± 0.08 and 55.83 ± 0.37 cm, respectively. The females showed sexual maturity at about 12 to 15 months. The results indicated that the Kajali sheep is phenotypically different from other sheep breeds of the region and is contributing significantly to the livelihood security of sheep farmers of Punjab. It is well adapted to the geographical area of Punjab (India). Since Kajali have distinct phenotypic characters, it may be registered as a new sheep breed of India.

Key words: Biometry, Characterization, Kajali sheep, Management, Performance

The sheep is the most appropriate livestock species due to its sustenance and multifaceted utility for meat, wool, manure, skin and milk. The sheep biodiversity in India is characterized by high degree of endemism and variations in agro-climatic conditions of the different regions (Choudary *et al.* 2014). As per livestock census (2007), sizable population (about 49%) of sheep in India is non-descript. There are some populations in India, which deserve registration as breed but owing to lack of systematic study, they are classified as non-descript, and Kajali sheep is one of them. Scanty information is available on phenotypic characters and management of Kajali sheep of Punjab (India), hence, there is a need to characterize and document this valuable ovine germplasm. Keeping this in view, the present research work was conducted to study the phenotypic characters, performance traits and management practices followed, of this sheep population in its breeding tract.

MATERIALS AND METHODS

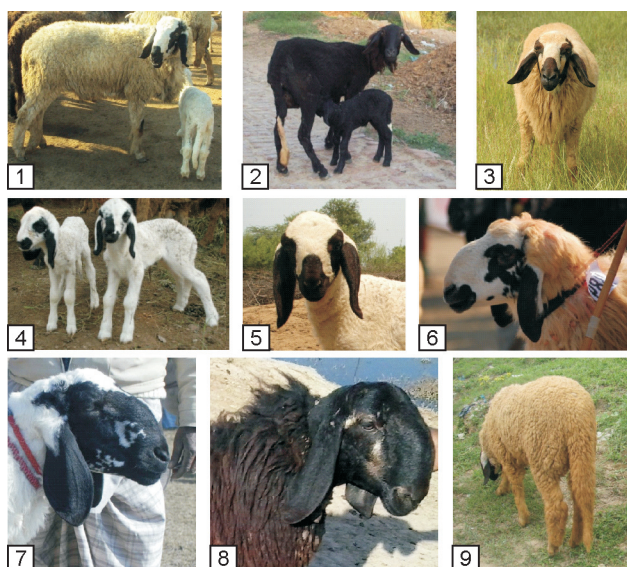
The present study was conducted in 47 villages of Sangrur, Barnala, Ludhiana, Moga, Bhatinda and Ferozpur districts of Punjab. Sheep flocks (67) having a population

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of about 2,500 animals were surveyed. The body biometric traits, viz. body length (BL), height at wither (H), chest girth (CG), paunch girth (PG), ear length (EL), face length (FL), face width (FW), tail length (TL) and body weight (BW) were recorded from 491 adult animals (87 male and 394 females). Body weights of 221 lambs belonging to different age groups from birth to 12 months were recorded. The body weight and biometric traits were recorded according to standard procedure. The data on physical traits, viz. head profile, ear orientation, colour pattern, production performance, reproduction traits etc. and management practices were collected by personnel observations and interviewing sheep farmers using a predesigned questionnaire developed for this purpose.

RESULTS AND DISCUSSION

Phenotypic characteristics: Kajali is a mutton type sheep, distributed in Sangrur, Barnala, Ludhiana, Moga and adjoining districts of Punjab. Kajali sheep has 2 colour variants distinguishable based on the coat colour of animals. The 2 colour variants are black (Kali) Kajali, and white (Chitti) Kajali. Kali Kajali animals are with complete black or black-brown body coat, but about 41.67% of tail length is covered with white coat. White/Chitti Kajali animals are with complete white coat and with black or dark brown face and ears. The black/dark brown pattern is varying in degree even covering up to 95% face and ear (Figs 1– 9). The proportions of animals belonging to both the colour variants are almost equal. Out of the total animals surveyed,



Figs 1–9. 1. White (Chitti) Kajali ewes. 2. Black (Kali) Kajali ewes. 3. White Kajali male. 4 to 9. Physical traits of Kajali sheep.

54.99% (1,444) and 45.01% (1,182) were of Kali and Chitti Kajali type, respectively. Scanty reports are available on Kajali sheep of Punjab (India); however, reports are available on Kajali sheep of Pakistan (Nawaz *et al.* 1999, Qureshi 2007, Qureshi *et al.* 2010). A black circle around the eyes is typical character of Kajali sheep of Pakistan from which breed's name was derived. Geerling (2001) reported Kajali sheep of Rajasthan, which is reared for its meat producing qualities, has a white, sometimes reddish face with a black patch around its eyes. Kajali sheep of Punjab are large in size with well-built body having Roman



Figs 10 and 11. Type of sheep housing.

nose, long and pendulous ears and long tail touching to ground. Out of total animals studied, 64.57% had Roman nose and rest had slightly convex type. The average flock size was 56.45 (range: 5–150). The flocks consisted of 50.94 Kajali and 5.51 other sheep. Kajali sheep flocks comprised 1.97 male, 36.06 female and 12.91 lambs. The udder is medium size and having medium teats. Both sexes are polled; however, in some males horn were noticed.

Biometry and body weight: The average body weight and biometry of adult Kajali sheep and average body weight of lambs are given in Tables 1, 2. The body weight of adult males and females were 56.98 ± 1.02 and 43.23 ± 0.36 kg, respectively, which varies from 30 to 76 kg in males and 26 to 67 kg in females. Yadav *et al.* (2011) characterized Munjal sheep and reported average body weight of males and females as 60.05 and 43.95 kg, respectively. There was significant difference between sexes for all the biometric traits under study except for ear length. The body biometry of Kajali was comparable with finding of Yadav *et al.* (2011). The lamb's body weight showed increasing trend with advancement of age. The 3 to 6 months body weight of male lambs is very important for marketing. The body weight of Kajali lambs were higher than the body weight

Table 1. Body weight (kg) and biometry (cm) of adult Kajali sheep

Trait	Body weight	Body length	Height	Chest girth	Paunch girth	Ear length	Face length	Face width	Tail length
Overall	45.69±0.42 (486)	73.97±0.28 (491)	73.36±0.20 (491)	84.23 ±0.27 (491)	85.81±0.35 (491)	21.33±0.08 (488)	22.05±0.07 (491)	10.90±0.07 (491)	55.83±0.37 (490)
Sex	**	**	**	**	**	NS	**	**	**
Male	56.98±1.02 (87)	79.92±0.71 (87)	78.84±0.51 (87)	89.89 ±0.58 (87)	91.34±0.75 (87)	21.47±0.20 (87)	23.77±0.16 (87)	(12.07±0.16 (87)	60.71±1.02 (87)
Female	43.23±0.36 (399)	72.69±0.71 (404)	72.18±0.17 (404)	83.02±0.27 (404)	84.62±0.75 (404)	21.30±0.09 (401)	21.68±0.07 (404)	10.65±0.07 (404)	54.78±0.37 (403)
Range M	30–76	66–98	69–90	76–103	76–112	17–26	19–27	9–16	35–79
F	26–67	58–86	62–88	68–103	58–107	15–27	12–29	8–14	31–80

**Significant at $P \leq 0.01$; figures within parentheses are number of observations.

Table 2. Body weight of Kajali lambs (kg)

Age	Birth wt	0–1 Months	1–3 Months	3–6 Months	6–12 Months
Overall	3.92±0.43 (9)	9.52±0.48 (62)	18.12±0.49 (73)	23.93±0.61 (65)	32.04±1.19 (12)
Sex	NS	NS	NS	**	NS
Male	4.30±0.74(4)	9.37±0.57 (36)	19.60±0.99 (20)	26.47±1.56 (18)	33.58±1.80 (6)
Female	3.62±0.52 (5)	9.72±0.83 (26)	17.56±0.54 (53)	22.96±0.54 (47)	30.50±1.44 (6)

**Significant at $P \leq 0.01$; figures within parentheses are number of observations.

of Munjal lambs reported by Yadav *et al.* (2011). The study also revealed that 72% adult males weighed more than 50 kg and 51.38% adult females weighed from 40 to 50 kg. The body biometry and adult body weight observed in Kajali sheep under the present study reflects that this sheep is quite large in size and also one of the heaviest sheep of the country.

Management: Kajali sheep are primarily maintained on grazing; however, 8.12% of farmers provided concentrate feed to sheep especially during breeding season to pregnant ewes and lambs. The farmers also provided fodder (67.12%) to sheep during lean season. The animals were allowed for grazing (56.25%) for about 8–10 h in a day (10 or 11 AM to 6 PM), the distance covered by majority of sheep farmers (53.45%) to graze their animals were ranged from 5 to 10 km in a day (Table 3). In Punjab, the farmers follow an intensive agriculture with multiple cropping in a year resulting in non-availability of local or community grazing

Table 3. Management practices adopted by Kajali sheep farmers

Particulars	Items	% of sheep farmers
<i>Housing pattern</i>		
Housing	Pucca	46.77% (29)
	Kutchra	53.23% (33)
	Separate	57.89% (33)
	Part of owners house	42.11% (24)
Grazing : Distance travelled	≤ 5 km	6.90% (4)
	5 to 10 km	53.45% (31)
	>10 km	39.66% (23)
Grazing hours	≤ 8 h	31.03% (18)
	8 to 10 h	65.52% (38)
	>10 h	3.45% (2)
<i>Breeding practices</i>		
Age at first breeding: Males	<12 months	16.95% (10)
	12–15 months	66.10% (39)
	>15 months	16.95% (10)
Females	<12 months	29.09% (16)
	12–18 months	69.09% (38)
	>18 months	1.8% (1)
Tupping %	<80 %	0.00%
	80–90%	57.78% (26)
	>90 %	42.22% (19)
Age at first lambing	< 17 months	36.00% (18)
	17–20 months	58.00% (29)
	>20 months	6.00% (3)
Age at puberty	< 10 months	24.49% (12)
	10–12 months	61.22% (30)
	>12 months	14.29% (7)
Breeding life	<7 years	17.65% (9)
	7–8 years	62.75% (32)
	>8 (up to 12 years)	19.61% (10)
	12 years)	
Marketing age	3–4 months	60% (33)
	4–6 months	38.18% (21)
	>6 months	1.81% (1)
	>12 lambs	12.27% (6)

Within parentheses are number of respondents.

land, which is main reason for the sheep farmers to walk long distance in search of grazing area for their sheep. The present findings were in agreement with earlier reports of Singh *et al.* (2007), Yadav *et al.* (2010) and Choudary *et al.* (2014). Majority of sheep farmers provide housing (Figs. 10, 11) particularly during night time; about 46.77% of sheep farmers have *pucca* housing and 53.23% provide *kutchra* housing to their sheep. About 57.89% farmers constructed separate houses with *katcha* and *pucca* type roofs. Out of total surveyed flocks, 2.98% farmers provided water to animals at house. The waterers were either *pucca* type or metal type. The sheep were generally shorn twice a year (February-March and August– September). About 64.44% of farmers reported an average greasy wool production ranging from 800 to 1,000 g/shearing. The cost of black wool was ₹ 15 to 20 and white wool ₹ 20 to 40/kg by 82.14% farmers; however, 16.07% farmers sold white wool even more than ₹ 40/kg. The marketing age of male lambs was reported to be 3 to 6 months by 60% sheep rearers and the cost of surplus lambs was reported as ₹ 2,500 to 4,000 by 75% farmers. The cost of adult/old aged rams and ewes varied from ₹ 2,000 to 3,000 as reported by 52.18% farmers.

Reproduction performance: It was observed that the ewes are bred through natural service, the rams/flock were 1.88 with a ram-ewe ratio of 1:30.02. The result was concurrence with report of Choudary *et al.* (2014). In all the studied flocks (100%), only Kajali ram was being used for breeding purpose. The farmers kept breeding rams in flock all times. The rams were either selected from their own flock or exchanged with the other breeders; the farmers select their rams based on body conformation traits specific to Kajali sheep and also based on body weight and growth rate of ram lambs. The age at first mating in rams was about 12–15 months as reported by 66.10% sheep breeders, 69.09% of farmers reported about 12–18 months as age at first breeding in females. The main lambing season is January to March and minor is from August to October with an average of 80 to 90% of annual lambing. The breeding life of ewes was reported to be 7 to 8 years by 62.75% sheep farmers (Table 3). The findings were comparable with Kushwaha *et al.* (1999) and Yadav *et al.* (2010). The litter size was single but 38.71% farmers reported that twinning varied from 5 to 10% in their flock.

The study revealed that Kajali sheep is phenotypically distinct from the other sheep breeds of the area and farmers preferred it because of its heavy size and better growth rate. The Kajali sheep population need to be improved and propagated by using elite breeding rams.

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