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## Carcass traits in Deccani sheep

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#### Abstract

In this study, 6 male and 6 female Deccani lambs aged one year were studied for their carcass traits at Livestock Research Station, Mahabubnagar, Telangana State. The overall mean pre-slaughter weight, empty body weight and hot carcass weight was  $21.35 \pm 0.43$ ,  $17.95 \pm 0.23$  and  $10.03 \pm 0.17$  kg, respectively. The overall mean weight of primal cuts i.e., leg, loin, rack, neck and shoulder, breast and fore shank were  $3.31 \pm 0.05$ ,  $1.07 \pm 0.02$ ,  $1.44 \pm 0.06$ ,  $2.43 \pm 0.06$  and  $1.79 \pm 0.02$  kg, respectively. Sex had a significant influence on all the traits studied except on weight of rack.

**Keywords:** Carcass, Deccani, Sheep, Primal cuts

#### Introduction

Sheep rearing is an important income generating activity in India. Deccani breed of sheep breed is a dual purpose, drought resistant, hardy breed of Deccan peninsula reared mainly for meat production. Meat yield determines the profitability of sheep rearing. Hence the present study was conducted to investigate the carcass traits in Deccani sheep.

#### Material and Methods

The experimental animals were weaned at 3 months of age and were provided with 8 hours of grazing and supplemented with 3 kg of green fodder and 300 gm of concentrate mixture with 18% CP per head.

Twelve sheep (6 of each sex) were slaughtered at the age of one year as per standard procedure by "Halal" method after being fasted overnight. Carcass and non-carcass components were separated and weighed. Non-carcass components included head, skin, feet, digestive tract, liver, spleen, pancreas, lungs plus trachea which were weighed separately. Carcass was split along the middle between the 12<sup>th</sup> and 13<sup>th</sup> ribs and the left half was cut into rack, shoulder, breast and the right half was divided into the loin and the leg as per ISI (1963) specifications. Loin eye area was recorded on the cut surface of *Longissimus dorsi* muscle at the interface of 12<sup>th</sup> and 13<sup>th</sup> ribs on both the sides of the carcass after tracing on tracing paper. Traced area was measured using compensating Planimeter with optical tracer and reported in cm<sup>2</sup>. The primal cuts i.e., shoulder, rack, breast, loin and leg were individually weighed to the accuracy of 1 gram. The five primal cuts were deboned individually and meat and bone were weighed separately. Fat was weighed separately. The data on carcass characters were subjected to independent samples t-test to find out any difference among the sexes.

#### Results and Discussion

In the present study, pre-slaughter weight (PSW), empty body weight (EBW) and hot carcass weight (HCW) were significantly different between the sexes, as revealed by t-test. Silvester *et al.* (2003) [22] also reported significant differences between sexes for dressing percentage in improved Jezersko-solcava lambs. On the contrary, non-significant differences among sexes were reported by Shaik *et al.* (2007) [20] and Ana *et al.* (2015) [1] in Bharat Merino and Lika Pramenka sheep.

The overall mean pre-slaughter weight, empty body weight and hot carcass weight observed in the present study were  $21.35 \pm 0.43$ ,  $17.95 \pm 0.23$  and  $10.03 \pm 0.17$  kg, respectively while the corresponding values on Indian breeds ranged from 18.20 to 41.10, 16.40 to 20.90 and 9.00 to 11.10 kg (Karim *et al.*, 2002; Karim *et al.*, 2006; Karim *et al.*, 2007; Gopal, 2008 and Gadekar *et al.*, 2012) [9, 10, 11, 7, 5]. Rajkumar and Agnihotri (2005) [17] commented that the average slaughter weight of Indian sheep varied from 22-25 kg. Present findings are in agreement with the published literature.

The overall mean dressing percentage based on PSW and EBW was  $46.97 \pm 0.41$  and  $55.80 \pm 0.53$ . Previous reports on Indian breeds of sheep revealed a range of 43.60 to 50.60 and 43.70 to 59.10 for DP on live weight and empty body weight basis, respectively (Karim *et al.*, 2002; Karim *et al.*, 2006; Karim *et al.*, 2007; Das *et al.*, 2008; Kumar *et al.*, 2008 and Ganai *et al.*, 2009) [9, 10, 11, 13].

### Edible Organs

The overall mean weight of edible organs recorded in the present study was  $0.84 \pm 0.02$  kg with differences among males ( $0.95 \pm 0.01$  kg) and females ( $0.72 \pm 0.05$  kg) being significant, as revealed by t-test (Table 1). Similar significant findings were reported by Silvester *et al.* (2003) [22] and Shaik *et al.* (2007) [20] in improved Jezerko-solcava lambs with Romanov (JSR) and Bharat merino sheep. In general, edible organs weighed more in males than in females while Ana *et al.* (2015) [1] reported otherwise in Lika Pramenka sheep.

Mean weights of liver, heart, testes, kidneys and spleen recorded were  $0.43 \pm 0.01$ ,  $0.10 \pm 0.01$ ,  $0.23 \pm 0.18$ ,  $0.09 \pm 0.01$  and  $0.08 \pm 0.01$  kg, respectively while the corresponding values ranged from 354 to 1900, 330 to 460, 600, 75 to 330 and 175 to 220 g as per the findings of Karim *et al.* (2007) [11], Gopal (2008) [7] and Seethalakshmi *et al.* (2008) [19] in Malpura, Pugal and Madras Red sheep. In exotic sheep, Faruk *et al.* (2007) [4] and Mamdouh (2014) [14] reported a range of 652 to 907, 148.5 to 388, 236 to 410, 98 to 136 and 47.5 to 130g for liver, heart, testes, kidneys and spleen in Karayaka and Barki sheep. Significant difference in total edible organs weight among sexes and non-significant difference among sexes for weights of individual edible organs could be explained by the fact that in males, testes is included as edible organ while female gonads are not included.

### Inedible Organs

Overall mean weight of inedible organs was  $4.89 \pm 0.07$  kg and it ranged from  $4.64 \pm 0.11$  kg in females to  $5.14 \pm 0.10$  kg in males, with the differences between sexes being significant (Table 1). The t-test revealed significant differences among sexes with the weight of head being significantly more in males ( $1.72 \pm 0.05$  kg) than in females ( $1.37 \pm 0.01$  kg). The differences in other inedible organs were not significant between the sexes. Silvester *et al.* (2003) [22] reported that males had higher percentage of head in improved Jezerko-solcava lambs with Romanov (JSR) lambs while Ana *et al.* (2015) [1] reported that the influence of gender was not significant in Lika Pramenka sheep.

In the present study, the overall mean weight of head, forelegs, hind legs, skin, blood, lungs including trachea and diaphragm and stomach with intestines was  $1.55 \pm 0.02$ ,  $0.28 \pm 0.01$ ,  $0.23 \pm 0.01$ ,  $2.18 \pm 0.09$ ,  $0.75 \pm 0.04$ ,  $0.32 \pm 0.01$  and  $1.74 \pm 0.03$  kg, respectively. Published literature revealed a range of 1.44 to 6.78 kg for head, 2.60 to 2.83 kg for legs, 3.30 to 9.19 kg for skin, 2.93 to 4.60 kg for blood, 1.69 to 2.20 kg for lungs including trachea and diaphragm and 1.67 to 8.97 kg for stomach with intestines as per the findings of Karim *et al.* (2007) [11], Gopal (2008) [7] and Seethalakshmi *et al.* (2008) [19] in Malpura, Pugal and Madras Red sheep. The differences may be attributed to the size of the animals, breed and the nutritional status of the animals at the time of slaughter.

### Primal Cuts

Sex had a significant influence on weight of leg, loin, neck and shoulder, breast and fore shank, as revealed by t test.

Silvester *et al.* (2003) [22] reported that males had higher proportion of neck and shoulder and lower proportion of loin in improved Jezerko-solcava lambs with Romanov (JSR). Shaik *et al.* (2007) [20] reported that cut proportion of standard cuts was similar in the both sexes in Bharat Merino. Ana *et al.* (2015) [1] reported that male lambs had higher proportion of shoulder, leg, breast and fore shank, and lower proportion of rack in Lika Pramenka lambs.

Mean weights of leg, loin, rack, neck and shoulder, breast and fore shank were  $3.31 \pm 0.05$ ,  $1.07 \pm 0.02$ ,  $1.49 \pm 0.06$ ,  $2.43 \pm 0.06$  and  $1.79 \pm 0.02$  kg, respectively forming 32.33, 11.08, 14.59, 24.05 and 17.93 per cent of hot carcass weight (Table 1). The published results on corresponding proportion of each primal cut ranged from 32.16 to 34.40, 12.42 to 13.2, 12.42 to 13.38, 23.4 to 25.33, 15.69 to 17.20 percent in Malpura sheep and Avikalin finisher lambs (Karim *et al.*, 2002; Karim *et al.*, 2006, Karim *et al.*, 2007 and Suresh *et al.*, 2010) [9, 10, 11, 23]. Mule *et al.* (2013) [16] reported the corresponding proportions as 27.48, 13.25, 15.39, 18.21 and 23.85 percent in Deccani sheep. The definition of the cuts, slaughter procedure etc. might have caused the differences in the per cent weight of primal cuts.

### Meat and Bone Content

In the present study, significant differences in the meat and bone content among sexes were revealed by t test. Mean meat content in leg, loin, rack, neck and shoulder, breast and fore shank was  $2.27 \pm 0.05$ ,  $0.74 \pm 0.02$ ,  $0.79 \pm 0.06$ ,  $1.54 \pm 0.06$  and  $1.16 \pm 0.02$  kg in males and  $2.01 \pm 0.05$ ,  $0.59 \pm 0.02$ ,  $0.63 \pm 0.05$ ,  $1.33 \pm 0.05$  and  $0.97 \pm 0.02$  kg in females, respectively whereas the corresponding bone content was  $1.23 \pm 0.04$ ,  $0.45 \pm 0.03$ ,  $0.78 \pm 0.04$ ,  $1.06 \pm 0.04$  and  $0.78 \pm 0.03$  kg in males and  $1.10 \pm 0.03$ ,  $0.34 \pm 0.02$ ,  $0.61 \pm 0.05$ ,  $0.92 \pm 0.04$  and  $0.68 \pm 0.03$  kg in females, respectively (Table 2). Silvester *et al.* (2003) [22] and Ana *et al.* (2015) [1] reported significant influence of sex on meat and bone content in Lika Pramenka lambs and in improved Jezerko-solcava lambs with Romanov (JSR). Shaik *et al.* (2007) [20] reported higher bone contents in females in Bharat Merino sheep.

Leg had highest meat content of 64.68 per cent. Sen and Karim (2010) [18], also reported that higher meat content in leg in Garole, Malpura and their crosses. Rack had highest bone content of 48.43 per cent in the present study while Sen and Karim (2010) [18] observed that neck had highest bone content. Proportion of meat and bone in the primal cuts of leg, loin, rack, neck and shoulder, breast and fore shank was 64.68, 62.68, 49.38, 59.17 and 59.25 percent and 35.31, 37.31, 48.43, 40.74 and 40.74 percent, respectively (Table 2). Previous workers reported that leg, loin, rack, neck and shoulder, breast and fore shank had meat content ranging from 61.4 to 71.8, 41.9 to 61.5, 47.1 to 57.3, 52.9 to 65.8, 44.7 to 58.1 percent and bone content ranging from 16.3 to 23.3, 11.3 to 18.8, 17.3 to 29.6, 16.4 to 24.5 and 14.6 to 31.5 percent, respectively (Karim *et al.*, 2002; Karim *et al.*, 2007 and Suresh *et al.*, 2010) [9, 11, 23] in Malpura and Rajasthan local sheep.

The overall mean loin eye area was  $7.53 \pm 0.19$  cm<sup>2</sup> in the present study. In Indian sheep breeds like Madras Red and Malpura, loin eye area ranged from 7.90 to 13.00 cm<sup>2</sup> (Karim *et al.*, 2002; Karim *et al.*, 2007; Seethalakshmi *et al.*, 2008 and Shinde *et al.*, 2008) [9, 11, 19, 21]. In exotic sheep such as Karayaka, Morada Nova, Moghani, Makui and Barki sheep, the loin eye area ranged from 10.0-14.5cm<sup>2</sup> (Kiyanzad, 2004; Faruk *et al.*, 2007; Mamdouh, 2014 and Michelle Santos *et al.*, 2015) [12, 4, 14, 15].

**Table 1: Mean weights of carcass components**

Components of carcass	Overall n=12		Sex				t
			Male n=6		Female n=6		
	Mean	S.E	Mean	S.E	Mean	S.E	
Pre-slaughter weight (kg)	21.35	0.43	22.88 <sup>a</sup>	0.65	19.83 <sup>b</sup>	0.59	3.47**
Empty body weight (kg)	17.95	0.23	19.13 <sup>a</sup>	0.38	16.77 <sup>b</sup>	0.28	5.00**
Hot carcass weight (kg)	10.03	0.17	10.83 <sup>a</sup>	0.20	9.22 <sup>b</sup>	0.29	4.51**
Dressing per cent on PSW	46.97	0.41	47.41	0.62	46.53	0.55	1.55
Dressing per cent on EBW	55.80	0.53	56.63	0.50	54.96	0.96	1.07
Weights of edible organs (kg)							
Liver	0.43	0.01	0.46	0.01	0.41	0.02	2.02
Heart	0.10	0.01	0.09	0.01	0.12	0.01	1.83
Testes	0.23	0.18	0.23	0.02	-	-	-
Kidneys	0.09	0.01	0.09	0.01	0.10	0.01	1.19
Spleen	0.08	0.01	0.07	0.01	0.08	0.01	0.89
Total edible organs	0.84	0.02	0.95 <sup>a</sup>	0.01	0.72 <sup>b</sup>	0.05	4.54**
Edible organs as % of PSW	3.94	0.16	4.19	0.13	3.70	0.31	1.45
Edible organs as % of EBW	4.67	0.16	5.00	0.10	4.34	0.32	1.98
Weights of inedible organs (kg)							
Head	1.55	0.02	1.72 <sup>a</sup>	0.05	1.37 <sup>b</sup>	0.01	6.82**
Fore legs (Metacarpal & hooves)	0.28	0.01	0.28	0.02	0.28	0.01	0.15
Hind legs (Metatarsal & hooves)	0.23	0.01	0.23	0.01	0.23	0.01	0.46
Skin	2.18	0.09	2.20	0.15	2.17	0.12	0.16
Blood	0.75	0.04	0.80	0.06	0.71	0.06	1.08
Lungs, trachea and diaphragm	0.32	0.01	0.33	0.02	0.31	0.01	0.91
Stomach & Intestines	1.74	0.03	1.76	0.05	1.72	0.06	0.50
Total inedible organs	4.89	0.07	5.14 <sup>a</sup>	0.10	4.64 <sup>b</sup>	0.11	3.40**
Inedible organs as % of PSW	23.00	0.45	22.51	0.52	23.49	0.73	1.09
Inedible organs as % of EBW	27.28	0.35	26.87	0.38	27.70	0.59	1.19
Fat (kg)	0.68	0.01	0.68	0.01	0.68	0.02	0.20
Leg (kg)	3.31	0.05	3.50 <sup>a</sup>	0.08	3.12 <sup>b</sup>	0.07	3.61**
Loin (kg)	1.07	0.02	1.20 <sup>a</sup>	0.04	0.94 <sup>b</sup>	0.04	4.57**
Rack (kg)	1.44	0.06	1.58	0.09	1.31	0.10	1.94
Neck & Shoulder (kg)	2.43	0.06	2.60 <sup>a</sup>	0.09	2.25 <sup>b</sup>	0.08	2.89*
Breast & Fore Shank (kg)	1.79	0.02	1.94 <sup>a</sup>	0.03	1.65 <sup>b</sup>	0.05	5.03**
Loin eye area (cm <sup>2</sup> )	7.53	0.19	7.53	0.27	7.54	0.27	0.35

\*\* Significant ( $P \leq 0.01$ ); \* Significant ( $P \leq 0.05$ )

**Table 2: Mean and per cent meat and bone content in primal cuts of Deccani sheep**

Primal cut	Meat							Bone						
	Overall n=12		Male n=6		Female n=6		t	Overall n=12		Male n=6		Female n=6		t
	Mean	SE	Mean	SE	Mean	SE		Mean	SE	Mean	SE	Mean	SE	
Mean weight (kg)														
Leg	2.14	0.03	2.27 <sup>a</sup>	0.05	2.01 <sup>b</sup>	0.05	3.62**	1.17	0.02	1.23 <sup>a</sup>	0.04	1.10 <sup>b</sup>	0.03	2.83*
Loin	0.67	0.01	0.74 <sup>a</sup>	0.02	0.59 <sup>b</sup>	0.02	4.50**	0.40	0.01	0.45 <sup>a</sup>	0.03	0.34 <sup>b</sup>	0.02	3.32**
Rack	0.71	0.03	0.79	0.06	0.63	0.05	2.11	0.70	0.03	0.78 <sup>a</sup>	0.04	0.61 <sup>b</sup>	0.05	2.77*
Neck & Shoulder	1.43	0.03	1.54 <sup>a</sup>	0.06	1.33 <sup>b</sup>	0.05	2.78*	0.99	0.03	1.06 <sup>a</sup>	0.04	0.92 <sup>b</sup>	0.04	2.30*
Breast & Fore Shank	1.06	0.01	1.16 <sup>a</sup>	0.02	0.97 <sup>b</sup>	0.02	6.23**	0.73	0.02	0.78 <sup>a</sup>	0.03	0.68 <sup>b</sup>	0.03	2.28*
Proportion (%)														
Leg	64.68	0.33	64.81	0.52	64.56	0.43	0.36	35.31	0.33	35.19	0.52	35.44	0.43	0.36
Loin	62.68	0.81	62.18	1.38	63.18	0.87	0.61	37.31	0.81	37.81	1.38	36.81	0.87	0.61
Rack	49.38	1.23	50.05	0.90	48.71	2.30	0.54	48.43	1.25	49.85	0.90	47.00	2.35	1.13
Neck and Shoulder	59.17	0.63	59.26	0.96	59.07	0.84	0.14	40.74	0.75	40.73	0.96	40.92	0.84	0.14
Breast & Fore shank	59.25	0.75	59.77	1.08	58.73	1.07	0.68	40.74	0.75	40.22	1.08	41.26	1.07	0.68

Means followed by different superscript in a row differ significantly.

**Conclusion**

Deccani sheep with a carcass yield of 10.03 kg. at one year of age indicates its potential as a meat producing animal under low input situations and its production performance can be improved by genetic selection and improved management.

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