Effect of Pre-Slaughter Age on Carcass Traits and Chemical Composition of Mutton in Deccani Sheep

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ABSTRACT

The aim of the present study was to study the effect of pre-slaughter age on carcass traits and chemical composition of mutton in Deccani sheep maintained at Network project on Sheep Improvement (Farm Based Unit), MPKV (Maharashtra) during the period of April, 2014 to June, 2015. Six Deccani lambs of 4, 5 and 6 months of age groups (two each) were selected randomly and slaughtered according to the common procedure under the federal inspection. The present study indicated that the empty weight, the dressing percentage on empty weight basis and loin eye area of lambs increased gradually with increase in age. The Chemical composition (protein, fat, and Cholesterol) of mutton of Deccani sheep was found to significantly (p<0.05) increased with advancement in the age from 4 to 6 months. Among the different primal parts, the loin part was found to have higher protein and fat (%). However, cholesterol content was lower in leg region of lamb. Therefore it may be concluded that the slaughtering of lambs at 6 months age may be preferred over 4 and 5 months.

Keywords : *Deccani, Sheep, Mutton, Chemical composition, Protein*

Sheep rearing is supplementary occupation to nomadic communities' in agricultural farming system. India possesses 65.07 million sheep and hold third rank in the world regarding the sheep population (DADF 2014). The importance of this species of livestock is not only in number but also in total production of meat, wool, skin and other byproducts. Besides that it has the scope for creation of employment opportunities in rural areas. Nearly 70 percent income of shepherds is derived from the sale of sheep mostly for mutton purpose, nearly 12-13 per cent from sale of wool, 1-3 per cent sheep folding and 5-6 per cent from sheep manure (Ghule 1992). The sheep with its multi-utility value play an important role in Indian economy especially in semi-arid region. These animals utilize spare vegetation, tree- tops and most weeds efficiently. Because of this ability of sheep, the sheep farming becomes an important farming system as compared to other species.

The sheep are one among the main meat producing animals in India, whose mutton is one of the highly preferred meats and has huge demand. India has exported 23, 611.55 MT of sheep and goat meat to the world for worth of Rs. 828.11 crores during 2014-15 (APEDA 2015). The quality and quantity of mutton production drives sheep industry in India. The important components of efficient and economical meat productions are slaughter weight, dressing percentage, proportion of different cuts and composition of meat. The quality of mutton depends upon its chemical components; viz. moisture content, protein, fat, and ash.

The pre-slaughter age of animal has importance in respect of nutritive value of meat. The pre-slaughter age also influences the quality and quantity of mutton (Mule 2007). Furthermore pre-slaughter age influences tenderness, flavour and juiciness of mutton. Keeping these points under consideration, the present study was undertaken to study the effect of pre-slaughter age on the carcass traits and chemical composition of mutton in Deccani sheep.

The present research work was undertaken at Network Project on Sheep Improvement (Deccani Farm Based Unit), Mahatma Phule Krishi Vidyapeeth, Rahuri (Maharashtra) during the period of April, 2014 to June, 2015.

Feeding and Management: The feeding and management practices followed at the project were more or less uniform throughout the year. All the adult animals were let loose for grazing daily in pasture, harvested fields and surrounding hillocks of the project. Apart from grazing they were fed with green and dry fodder in the evening as per the availability. In addition to this definite quantity of concentrates were also fed to animals in the evening before feeding of green and dry fodder.

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Selection of animals: The experimental animals were classified as per their age group viz. 4 months, 5 months and 6 months. Total 6 male lambs were randomly selected i.e. two male lambs from each category of age. Three replications were taken from each animal for chemical composition to minimize the error in estimation of components.

Traits under study: In this study, quantitative traits such as empty weight, hot carcass weight, dressing percentage, loin eye area and composition of primal cuts were studied. Under the composition of primal cuts, five cuts viz. Leg, Loin, Rack, Neck & Shoulder and Breast & Fore shank were studied.

Slaughter and dressing procedure: The lambs ready for slaughter were taken to laboratory and slaughtered according to common procedure under federal inspection. Fasting of animal was done for 18 hrs before slaughtering. These lambs were slaughtered in the morning hours by cutting the throat transversely close to the head and severing carotid arteries and jugular veins on both sides. The pelt was removed properly with knife and hand pressure technique, while hanging the animal on crate. The gastro-intestinal tract was removed from the carcass. The offal's like liver, testicle, spleen, caul fat and non-edibles like lungs were taken out separately from carcass and weighed. Only kidney and kidney fat were accounted for weight along with carcass.

The weight of such carcass was recorded as hot carcass weight. Then the carcass was cut into leg, loin, rack, neck and shoulder and breast and fore shank cuts as per specification of ISI (1963). Dressing percentage was calculated from the hot carcass weight and live weight before slaughter and weight after removal of ingesta using the formula given below:

$$\text{Dressing percentage (Live weight Basis)} = \frac{\text{Hot carcass weight}}{\text{Live weight}} \times 10$$

$$\text{Dressing percentage (Empty weight Basis)} = \frac{\text{Hot carcass weight}}{\text{Empty weight}} \times 10$$

Collection and preparation of samples: The representative of 100 g samples were collected from all five cuts of all animals slaughtered in the experiment for analysis of mutton. The samples were packed in polythene bags and kept in deep freezer with proper labeling at -15°C temperature. The muscle samples were trimmed to exclude exterior fat and minced rapidly by passing three times through a meat mincer. The minced samples were then kept in containers with lids. At all stages, care was taken to prevent loss of moisture from samples. All the meat samples were preserved in deep freezer at -15°C temperature until the analysis. The analysis for chemical composition of mutton sample was carried out by using AOAC (2000) method. The moisture content was determined by oven drying at 104°C, ash content by igniting a test sample in a muffle furnace at 550°C. The crude protein content was calculated by converting the nitrogen content, determined by Kjeldahl method. Fat content was determined by the acid hydrolysis Soxhlet system. The cholesterol content was estimated by Gas Chromatography with FID detector. The loin area was marked on butter paper and measured by planimeter with standard procedure.

Statistical analysis: The statistical analysis was carried out by using Analysis of Variance to test the significance of different mutton character as per the Snedecor and Cochran (1994).

The average live body weights (kg), average empty weights (kg), hot carcass weight (kg), dressing percentage and loin eye area (cm²) of Deccani lambs at 4, 5 and 6 months of age is presented in Table 1. The average live body weights of Deccani lambs at 4, 5 and 6 months of age were 14.32, 15.65 and 16.25 kg, respectively.

Table1: Various carcass traits of Deccani sheep at different age groups

Age (Months)	Live weight (kg)	Empty weight (kg)	Hot carcass weight (kg)	Dressing	Percentage	Loin eye area (cm²)
				Live weight	Empty weight	
4	14.32	12.17	6.51	45.53	53.57	12.19
5	15.65	13.05	7.15	45.68	54.78	13.17
6	16.25	14.12	7.74	47.63	54.81	13.96

The average empty weights (kg) of lambs was highest at 6 months (14.12) followed by 5 months (13.05) and lowest at 4 months age (12.17). The average empty weight of lambs observed in present study was more or less similar as reported by Mule (2007) in Deccani sheep. The average hot carcass weight (kg) of lambs at 4, 5 and 6 months of age were 6.51, 7.15, and 7.74 respectively. Comparatively higher values of hot carcass weights were recorded by Hameed *et al.*(1985) in Arabi

lambs, Khan *et al.* (1981) in Muzaffanagari lambs and Latif and Owen (1980) in Suffolk and Taxel lambs, Mule (2007) in Deccani lambs.

The dressing percentage of lambs on live weight basis at 4, 5 and 6 months averaged 45.53, 45.68 and 47.63 per cent, respectively. Similar findings were reported by Mule (2007) in Deccani lambs. However, Hameed *et al.* (1985) recorded comparatively higher dressing percentage at 4, 5 and 6 months age in Arabi lambs. The average dressing percentage of lambs on empty weight basis at 4, 5, and 6 months of age were 53.57, 54.78, and 54.81 per cent, respectively. Similar results were reported by Khan *et al.*(1981) in Bannur lambs, Mule (2007) in Deccani lambs.

The average loin eye area (cm²) at 4, 5, and 6 months of age were 12.19, 13.17, and 13.96, respectively. Similar observations were recorded by Sents *et al.*(1983) in crossbred lambs. The results indicated that the loin eye area of lambs increased gradually with increase in age.

***Effect of pre-slaughter age and primal cuts on chemical composition of mutton*:** The effect of pre-slaughter age and different primal cuts on chemical composition of mutton of Deccani sheepis given in Table 2.

Table 2: Effect of pre-slaughter age and primal cuts on chemical composition of mutton of Deccani sheep

Factor	Moisture (%)	Protein (%)	Fat (%)	Cholesterol (%)	Ash (%)
Age					
4 months	75.54	19.83[b]	20.48[b]	19.89[c]	0.93
5 months	75.42	19.88[b]	20.63[a]	20.66[b]	0.95
6 months	75.39	20.10[a]	20.66[a]	21.97[a]	0.98
	0.10	0.02	0.04	0.03	0.02
Primal cuts					
Leg	75.50[b]	19.42[c]	21.19[b]	18.83[e]	0.95
Loin	74.75[c]	20.83[a]	21.93[a]	21.35[b]	1.00
Rack	75.98[a]	20.34[b]	18.80[e]	19.07[d]	0.96
Neck and shoulder	75.59[b]	19.26[d]	20.98[c]	24.74[a]	0.94
Breast and foreshank	75.45[b]	19.82[c]	20.06[d]	20.21[c]	0.93
	0.13	0.02	0.05	0.04	0.03

Means bearing different superscripts differ significantly (p<0.05) in same column.

Moisture content: The moisture percent of meat of lambs at 4, 5 and 6 months at age was 75.54, 75.42 and 75.39 per cent, respectively. Although moisture content decreased gradually as age increased from 4 month to 6 month, there was no statistical significance between three age groups. However, there was statistical significant (p<0.05) difference between 5 primal parts for moisture content of mutton. The moisture content was found to be highest in rack area (75.98%) and least in loin area (74.75%). Similar moisture per cent of different cuts were reported by Dani *et al.* (1985) and Mule (2007).

Protein content: Analysis revealed that the protein content was increased significantly (p<0.05) as age increased from 4 to 6 month. The protein content in mutton at 6 month (20.10%) was significantly higher than that of 5 month (19.88%) and 4 month (19.83%). It was also observed that the protein content among different primal parts was significantly different and it was higher in loin (20.83%) with least in neck & shoulder (19.26%). Almost similar protein level in different primal cut was noticed by Chougule *et al.*(1986) in Deccani sheep and Mule (2007) in Deccani lambs.

Fat content: The fat content of mutton of Deccani lambs was found to be significantly increasing as age increases (from 4 to 6 month). Similar finding was reported previously by Knight and Foote (1965). Highest fat content were recorded at 6 month of age (20.66) per cent than other ages. There was significant difference (p<0.05) for fat content for all primal parts and it was higher in loin area (21.93%) than others. The rack area was found to be having least fat content (18.80%). These results are similar to findings reported by Mule (2007) in Deccani lambs.

Ash content: The ash content of mutton did not vary significantly as slaughter age advanced. Furthermore it was not significantly different among different primal parts of carcass.

Cholesterol content: Cholesterol content was found significantly higher at 6 month of slaughter age, followed by 5 month and 4 month of slaughter age. In case of primal parts, the cholesterol content was observed significantly higher in neck and shoulder as compared to other body cuts of Deccani lambs. The cholesterol content was found to be lowest in leg as compared to other primal cuts.

It can be concluded from the present study that the chemical composition (protein, fat and cholesterol) of mutton of Deccani sheep increases with advancement in the age from 4 to 6 months. In case of primal parts, the loin part was found to have higher protein and fat (%). However, cholesterol content was lower in leg region of lamb. Further, it was concluded that the slaughter at 6 months age can be preferred than 4 and 5 months.

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REFERENCES

DADF (2014) Basic Animal Husbandry and Fishery Statistics, Department of Animal Husbandry, Dairying and Fisheries. Govt. of India

APEDA (2015) Agricultural and Processed Food Products Export Development Authority. www.apeda.gov.in

AOAC (2000) Meat and meat products. In: Official Methods of Analysis. Association of Official Analytical Chemists Inc. Gaithersburg, U.S.A

Chougule BA, Salunkhe DK, Deshmukh AP (1986) Effect of slaughter weight on mutton from sheep. Indian J Anim Sci 56(3): 377-381

Dani NP, Rajalakshmi D, Indira CB, Dhanaraj S, Rao DN, Mahendrakar NS (1985) Meat quality in Bannur ram lambs. Indian J Anim Sci 55(12): 1094-1099

Ghule MS (1992) Genetic and non-genetic factors affecting pre and post weaning in Deccani and its halfbreeds with Dorset. M.Sc. (Agri.) Thesis submitted to M.P.K.V., Rahuri

Hameed MA, Amin AL, Radim T (1985) Carcass characteristics of Arabi ram's slaughtered at different age. Indian J Anim Sci 55(12): 1099-1103

ISI (1963) Indian standard specification for mutton and goat flesh: Fresh chilled and frozen, IS-2536. Indian Standard Institution, New Delhi

Khan BU, Bhat PN, Bisht GS (1981) Carcass traits in Muzaffarnagari sheep and its corriedale half Breeds. Indian J Anim Sci 51(11): 1062-1066

Knight AD, Foote WC (1965) Influence of breed type, feed level and sex on carcass characteristics. J Anim Sci 24: 786-789

Latif MGA, Owen E (1980) A note on the growth, performance and carcass composition of Texel and Suffolk sired-lambs in an intensive feeding system. Anim Prod 30: 311-314

Mule AD (2007) Effect of slaughter age on quality and quantity of mutton in Deccani sheep. M.Sc. Thesis on Deccani sheep submitted to Mahatma Phule Krishi Vidyapeeth, Rahuri.

Sents AE, Walteris LE, Whiteman JV (1983) Performance and carcass characteristics of ram lambs slaughtered at different weights. J Anim Sci 57: 1360-1369

SnedecorGW, Cochran WG (1994) Statistical methods, IOWA University, Ames, IWOA, USA