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Carcass characteristics and proximate composition of Mithun (*Bos frontalis*) carcass

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Abstract

In order to study the carcass characteristics, six mithun (Bos frontalis) of either sex were slaughtered and their body tissues were analysed for proximate principles in the present investigation. The physical carcass characteristics like the carcass length, weight, dressing percentage etc. were also determined. The data analysis revealed that the mean carcass length and weight were measured as 162.10±6.15 cm and 242.25±36.75 kg, respectively. The overall dressing percentage was found to be 60.65±1.68% in mithun, while the subcutaneous fat thickness was recorded to be 42.15±2.15 mm. The heaviest organ of the mithun carcass was observed to be the stomach (68.2±0.1 kg), the lightest was recorded to be the pancreas (0.45±0.10 kg). The nutrient composition of mithun meat was excellent with protein content of 18.74±1.25% and fat content of 0.48±0.03%. This study further recommended the need of a detailed study on the effect of mithun meat consumption on human health in future.

Keywords: *Mithun, carcass traits, proximate composition*

Mithun (*Bos frontalis*) is a unique bovine of the northeastern hills (NEH) region of India and adjacent areas of Bhutan, Bangladesh, China and Myanmar. Apart from its cultural attachment to the tribal society of the region, mithuns have predominantly been used for meat purpose. The multi-faceted contribution of this massive semi-domesticated bovine has a special role in the overall improvement of socio-economic condition of the mithun eating countries (Mondal and Pal, 1999). Though specific and more systematic research works have been taken for nutritional, anatomical, physiological and ethological aspect of mithun production, there are only some sporadic reports on the meat production by this species (Heli *et al.*, 1994; Pal *et al.*, 2002; Chungath and Kima, 2018). Therefore, the present study was undertaken to study the physical characteristics of the mithun carcass and to find out the proximate composition of mithun meat.

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Materials and methods

Six apparently healthy young mithuns, aged between 2 and 3 years of either sex, were slaughtered at the Medziphema Mithun Farm, National Research Centre on Mithun, Jharnapani, Nagaland, India following traditional method (Heli *et al.*, 1994). The different physical characteristics like carcass length, fresh carcass weight, mean blood volume, fat weight and thickness, loin muscle area (measured by conventional formula for beef animals as per Pinto (1988) and Osório and Osório (2005)), weights of both edible and non-edible offals were recorded immediately. The weights of various parts and organs were taken with the help of a weighing balance having an accuracy upto 0.050 kg. The four chambers of stomach were weighed with their contents as the consumers in Nagaland usually take them as edible offals after removing the content. The biometrical measurements of the organs were also done during the study with the help of ordinary plastic measuring tape having a graduation upto 0.100 cm.

To find out the proximate composition, different body tissues like muscle, liver, kidney, heart, intestine, bone, skin and blood were aseptically and hygienically collected (50 g each) from the slaughtered animals and were immediately brought to the laboratory for their further analysis for chemical composition. The samples were cut into pieces in the laboratory and then dried in hot air oven at 100.0 ± 5.0°C overnight (except blood) to determine moisture content, crude protein, ash, crude fat, and NFE as per the standard procedures (AOAC, 2016). Blood samples were collected at the rate of 100 ml per carcass and subjected to analytical procedures. Blood samples were separately dried under steam and then analysed. The data analysis was done following suitable statistical procedures (Snedecor and Cochran, 1994).

Results and discussion

The fresh carcass weight was recorded to be 242.25±36.75 kg, while the average carcass length was measured as 162.10±6.15 cm (Table 1). The overall dressing percentage in mithun carcass was found to be 60.56±1.68%, the loin muscle area being 716.50±65.50 sq. cm. The present findings corroborated with the earlier reports (Heli *et al.*, 1994). However, the average carcass weight in case of buffaloes (*Bubalus bubalis*) and cattle (*Bos taurus*) were comparatively less (Naveena and Kiran, 2014) than that of mithun (*Bos frontalis*) reported in the present study. This may be attributed to the feeds and feeding management under which mithuns were being kept as well as species difference in growth and the age of the animal at which slaughtered. The dressing percentage in conventional beef producing buffaloes (Naveena and Kiran, 2014; Lambertz *et al*., 2014; Tamburano *et al*., 2019; Kumar *et al*., 2020) was also much lower than the observed value in our study. Overall, the physical characteristics of the carcass justified its being used as a potential meat animal in its natural habitat area. The mean blood volume collected from mithun carcass was 4.23 per cent of the total carcass weight.

Various visceral and non-visceral organs of mithun were measured for their biometry and the results were presented in Table 2. It was revealed that the stomachs (4 chambers) with content constituted about 28.15 per cent of the total carcass weight. Among the edible offals of the mithun carcass, the parts of four limbs weighed the most (68.2±0.1kg) and the pancreas, the least (0.45±0.10 kg). The present findings were in line with the reported values for buffaloes (Anjaneyulu *et al.,* 1985, 2007).

The proximate composition of the body tissues of the mithun was analysed and presented in Table 3. It indicated average protein content (fresh basis) of 18.74±1.25% in this red meat having fat content of 0.48±0.02%. The highest fat in the mithun carcass was found in bone tissues (3.58±0.95%) and the highest protein content was in its skin (24.89±2.08%). Moisture percentage of 74.04 to 77.75 per cent has been reported for fresh buffalo meat (Anjaneyulu *et al.,* 1985; Naveena *et al.,* 2004). The protein content of mithun meat in the present study was higher than the previous workers who reported 17.90 per cent crude protein content on fresh basis (Anonymous, 2001). Buffalo meat showed a protein percentage of 17.33 to 23.3 per cent (Naveena *et al.,* 2004). Among all the red meats, buffalo has been

Table 1. Physical characteristics of mithun carcass

Parameters	Average values (n=6)
1. General	
Fresh carcass weight (kg)	242.25±36.75
Carcass length (cm)	162.10±6.15
Dressing percentage (%)	60.56±1.68
Weight of subcutaneous fat (g)	416.85±6.85
Blood volume (%)	4.43
Back Fat thickness (mm)	42.15±2.15
Loin muscle area (sq cm)	716.50±65.50
2. Weight of edible offal (% of fresh carcass weight)	
Heart	0.70
Kidney	0.41
Liver	1.94
Stomachs (with contents)	28.15
Intestines	11.82
Parts of limbs (include legs, head, claws etc.)	37.81
3. Weight of non-edible offal (% of fresh carcass weight)	
Lungs	1.20
Pancreas	0.19
Spleen	0.33
Horns	1.94
Hooves	1.84
Skin	16.43

reported to have lowest concentration of total lipids (1.37g/100g) and buffalo meat from 2 year old male calves showed a fat percentage of 1.0 to 3.5 (Kesava Rao and Kowale, 1991). Our present findings showed that mithun meat is much leaner than other animal species and the relatively low fat content in mithun meat is attributed to poor marbling.

The present findings were in agreement with the earlier reports on the composition of mithun carcass (Heli *et al.*, 1994). Several studies on related species like cattle and buffaloes also showed that the values reported in our study were of similar trend as far as the nutrient composition of the carcass is concerned (Lambertz *et al*., 2014; Naveena and Kiran, 2014).

Conclusion

The physical characteristics of mithun carcass and chemical composition of its various body parts recorded in the present study suggest its suitability for human consumption. The present report recommends a further detailed study on the Mithun carcass characteristics for its effect on human health. However, the fatty acid profile and other meat quality parameters including collagen content, mineral content and organoleptic quality may be taken up in future for advising nutritious animal food source in mithun eating countries.

Table 2. Biometry of some visceral and non-visceral organs of Mithun

Body organs	Mean values (cm) (n=6)	
	Length	Breadth
Tongue	38.07±2.35	6.35±0.52
Larynx	0.55±0.12	0.32±0.09
Pharynx	0.75±0.10	0.20±0.01
Lungs	53.00±4.97	22.32±1.98
Heart	19.95±2.46	17.37±2.12
Liver	47.50±3.56	27.75±2.43
Spleen	46.75±3.15	14.20±1.09
Stomachs: Rumen	89.62±7.58	80.82±10.95
Reticulum	27.57±5.64	18.00±3.16
Omasum	36.75±6.29	20.50±3.51
Abomasum	49.60±6.23	25.50±4.26
Intestines: Small	36.72±5.27	2.52±0.92
Large	8.50±1.27	5.00±0.79
Testicle	10.60±1.53	5.10±1.04
Ovary	9.25±1.05	3.55±0.65

Table 3. Mean (±SE) of chemical composition (on fresh basis) of different body tissues of Mithun (n=12)

Nutrient (%)	Muscle	Liver	Kidney	Heart	Intestine	Blood	Bone	Skin
Moisture	78.82±0.53	74.73±1.38	83.14±2.61	80.01±0.96	79.59±2.53	85.46±3.45	38.87±2.38	71.14±1.32
DM	21.18±0.08	25.27±1.04	16.86±1.25	19.99±0.98	20.41±1.96	14.54±1.87	61.13±3.16	28.86±1.56
OM	20.04±1.21	22.80±1.95	14.22±1.00	19.50±1.03	19.83±1.49	13.72±1.69	40.86±2.25	28.21±2.11
Ash	1.11±0.20	1.66±0.28	1.19±0.08	0.95±0.01	0.94±0.08	0.81±0.04	33.11±3.45	0.64±0.03
CP	18.74±1.25	18.11±2.35	12.82±1.68	15.47±1.00	15.92±2.31	12.60±2.56	18.35±1.97	24.89±2.08
Ether Extract	0.48±0.03	1.59±0.53	1.47±0.06	1.72±0.30	1.08±0.59	0.09±0.00	3.58±0.95	0.40±0.05
NFE	1.03±0.74	3.89±0.01	1.50±0.27	0.88±0.07	2.46±1.00	1.32±0.84	5.87±1.24	0.00±0.00

Conflict of interest

All the authors have declared that they have no conflict of interest.

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