Meat Research
Vol 4, Issue 3: 1-6, Article 93, June 2024
ISSN: 2790-1971
https://doi.org/10.55002/mr.4.3.93
http://www.bmsa.info/meatresearch

[1]Department of Animal Science,
Bangladesh Agricultural University,
Mymensingh, Bangladesh

[*]Corresponding author:
MA Hashem
E-mail: hashem_as@bau.edu.bd

Keywords:
Meat quality
Beef
Cattle

Article Info:
Received: 23 April, 2024
Accepted: 14 June, 2024
Published online: 30 June, 2024

Research Article

Sensory, nutrition and physiochemical properties of beef in relation to their genotype

MA Hashem[1*], MS Hossain[1], A Ahmmed[1], S Begum[1], M Sadakuzzaman[1]

Abstract

The study aimed to evaluate the sensory, nutritional, and physicochemical characteristics of meat from crossbred cattle (CBC) and indigenous cattle (IC) at different time intervals. Samples of M. longissimus dorsi muscle were collected from three Holstein-Friesian crossbred cattle and three indigenous cattle in the Mymensingh district. The analysis included two treatments based on cattle genotype and time intervals, labeled T_0 (0 hours) and T_{24} (24 hours), and was conducted using a 2×2 factorial design in a completely randomized format. The study assessed various factors such as sensory attributes (color, flavor, tenderness, juiciness, overall acceptability), proximate composition (dry matter, crude protein, ether extract, ash), and physicochemical properties (pH, cooking loss, drip loss, water holding capacity, CIE L*, a*, b*, saturation index, and hue angle). Results showed no significant difference in color, flavor, and overall acceptability between the two treatments. However, juiciness was significantly ($p<0.05$) higher in IC (3.83) compared to CBC (3.17). While dry matter, crude protein, and ether extract did not differ significantly between the two groups, ash content was significantly higher in IC (1.48) compared to CBC (1.05) ($p<0.05$). There were no significant differences in pH, cooking loss, drip loss, CIE L*, a*, b*, and saturation index between the two treatment groups, but water holding capacity (WHC) was significantly ($p<0.05$) higher in IC (96.03%) compared to CBC (92.67%). Aged meat (24 hours) showed better quality based on sensory attributes. Physicochemical properties like pH and WHC decreased over time, while cooking loss and hue angle increased at the 24-hour mark.

Introduction

The quality of beef is a multifaceted attribute influenced by various factors, including heat stress and genotype, which plays a significant role in determining the sensory, nutritional, and physicochemical properties of the meat (Akter et al., 2009; Alam et al., 2024a; Baset et al., 2003; Mia et al., 2023 and 2024). Consumers' preferences for beef are increasingly influenced by these properties, driving the meat industry to focus on optimizing production strategies that meet these demands (Alam et al., 2024a). Sensory attributes such as color, flavor, tenderness, juiciness, overall acceptability are paramount in consumer acceptance, while nutritional content, particularly in terms of DM, CP, EE, ash, is crucial for health-conscious consumers (Hossain et al., 2024; Rana et al., 2014; Sharker et al., 2024). Physicochemical properties, including pH, cooking loss, drip loss, water holding capacity, CIE L*, a*, b*, SI, hue angle, not only affect the meat's shelf life and processing characteristics but also contribute significantly to the overall eating experience (Ali et al., 2022; Islam et al., 2018 and 2019; Son et al., 2024). These properties are inherently linked to the genetic makeup of the cattle, making genotype a critical factor in meat science research (Hashem et al., 2023a, Hossain et al., 2021). Different cattle breeds, with their unique genetic profiles, exhibit distinct variations in muscle composition, fat distribution, and metabolic processes, all of which influence the final quality of the beef (Hashem et al., 2022). Understanding the relationship between genotype and beef quality is essential for improving meat production systems. By identifying specific genetic markers associated with desirable meat traits, breeders and producers can develop strategies to enhance beef quality, ensuring it meets both market demands and nutritional standards (Alam et al., 2024b). This research aims to explore the intricate connections between genotype and the sensory, nutritional, and physicochemical properties of beef, providing insights that could inform breeding programs and production practices to optimize beef quality

Materials and Methods

Experimental site

This experiment was conducted at Meat Science Laboratory under the Department of Animal Science, Bangladesh Agricultural University, Mymensingh.

Required equipment and preparation of instruments

The equipment required were Plastic pot, Refrigerator, Crucible, HANNA meat pH meter, Minolta colorimeter, Water bath, Petri dishes, knife, chopping board, water and tissue paper. All necessary instruments were cleaned with hot water and detergent powder and then autoclaved and dried properly before starting the experimental activities.

Sample collection and preparation

Beef from indigenous and crossbreed cattle were collected from local commercial markets known as Shomvugonj Bazar, Mechua Bazar, Maizbag Bazar Mymensingh at early morning immediately after slaughtering. Three indigenous and three crossbred cattle meat (Holstein-Friesian cross) were collected from that local market. The samples were collected from the longissimus dorsi muscle between the 12^{th} and 13^{th}. Then those samples were immediately transferred to the Animal Science Laboratory, Bangladesh Agricultural University, Mymensingh.

Sensory evaluation

Each meat sample was evaluated by a trained 5-member panel. The sensory questionnaires measured intensity on a 5-point balanced semantic scale (weak to strong) for the following attributes color, flavor, tenderness, juiciness, and overall acceptability (Hashem et al., 2023a). The judges evaluated the samples based on the above criterions. Panelists were selected among department staff and students and trained according to the American Meat Science Association guidelines (AMSA, 1995). Sensory evaluation was carried out in individual booths under controlled conditions of light, temperature and humidity. Prior to sample evaluation, all panelists participated in orientation sessions to familiarize with the scale attributes (color, flavor, juiciness, tenderness, overall acceptability) of meat using an intensity scale. Sensory qualities of the samples were evaluated after thawing before cook and after cook using a 5-point scoring method. Sensory scores were 5 for excellent, 4 for very good, 3 for good, 2 for fair and 1 for poor (Rahman et al., 2014). All samples were served in the petri dishes. Sensory evaluation was accomplished at 0 hour of intervals and repeated at 24 hours of intervals stored at 4°C**.**

Physicochemical properties measurements

pH value estimation

The pH value in meat was measured by direct contact between the sensitive diaphragm of the electrode and meat tissue (Torun et al., 2023). Through the diaphragm differences in electrical load between the meat and electrolyte solution (e.g. Potassium chloride, KCl) inside the glass electrode are measured and directly indicated as the pH-reading. In raw fresh meat, it is needed to spray small amounts of distilled water on to the tissue at the point of measurement (prior to inserting the electrode), because the operation requires some fluidity in the sample and the glass electrode should be thoroughly wet. The pH meter was calibrated before use and adjusted to the temperature of the tissue to be measured. The electrode was rinsed with distilled water after each measurement. pH value was determined at 0 hour and 24 hours of intervals of both indigenous and cross bred meat.

Determination of cooking loss

Cooking loss was measured by using hot water bath at 71°C internal temperature of meat sample (Rahman et al., 2014). Cooking loss was determined at 0 hour and 24 hours of intervals. Cooking loss was estimated by using following calculation:

Cooking loss = Wt. before cooking - Wt. after cooking/Wt. before cooking × 100.

Determination of drip loss

Samples were stored in refrigerator at 4°C for 24 hours for measuring drip loss. Drip loss was calculated twice for both indigenous and cross bred meat samples. For the first time drip loss was calculated at 0 hour and for the second time drip loss was calculated at 24 hours of intervals. Meat samples were suspended in tightly sealed plastic bag filled with air and kept at 4°C for 24h (Honikel, 1998). Drip loss was calculated as a percentage of the weight loss after suspension.

Water holding capacity

The WHC was measured according to (kim et al., 2020). Thawed samples (1g each) were wrapped in absorbent cotton and placed in a centrifugal tube. The tubes with samples were centrifuged in a centrifuge separator (1730R, Lynge, Denmark) at 3,000 × g for 10 min at 4°C, following which the samples were weighed. The WHC of the sample is expressed as the ratio of the sample weight after centrifugation to the initial sample weight, using the following formula:

Water holding capacity (%) = Sample weight after centrifugation (g)/Sample weight before centrifugation (g) × 100

Color value estimation

Color values like lightness (CIEL*), redness (CIEa*), and yellowness (CIEb*) for several patties were determined utilizing a colorimeter (Konica Minolta CR-400, Tokyo, Japan). The standard white plate (Y = 81.2; x = 0.3191; y = 0.3263) was employed for calibrating the colorimeter, and each sample was measured thrice. The measurement for chroma (C*) value and hue angle (h°) value was carried out utilizing two equations of {(a*+b*)1/2} and {tan−1(b*/a*)}, respectively.

Proximate analysis

Proximate compositions such as Dry Matter (DM), Ether Extract (EE), Crude Protein (CP) and Ash were carried out according to the methods (AOAC, 1995). All determination was done in triplicate and the mean value was reported.

Statistical model and analysis

Data were through 2 × 2 factorial experiments (2 types of meat and 2 time of interval) using SAS Statistical Discovery Software, NC, USA. DMRT test was used to determine the significance of differences among treatments means. Completely Randomized Design for drip analysis also done.

Results and Discussion

Sensory evaluation

The subjective evaluation of color score of crossbred and indigenous cattle meat at 0 h and 24 h are shown in Table 1. The range of mean value of overall observed color score at crossbred and indigenous cattle meat was 3.83 and 4.17. Most preferable color was observed from indigenous cattle meat ($p< 0.05$). The color at 0 h and 24 h was 4.50 and 3.83. There was significant difference between two different hours of interval. The data showed that the color was deteriorated with the increase storage period for both the treatments. A decrease in appearance and color scores of meat with increase in storage period observed.

The decreased color test scores during storage resulted from the denaturation of proteins, particularly the myofibrillar protein (actin and myosin) that affects gel formation. Damage of protein caused by the action of free radicals produced during lipid oxidation, in addition to the presence of transition metals, also promote the accumulation of oxidized proteins and it is probable that meat active peptides could lose their functionality (Descalzo and Sancho, 2008).

The subjective evaluation of flavor score of crossbred and indigenous cattle meat with hour of intervals are shown in Table 1. The range of mean value of overall observed flavor score at crossbred and indigenous cattle meat was 3.83 and 4.17. Most preferable flavor was observed from indigenous cattle meat. The flavor at 0 h and 24 h was 3.50 and 4.50. There was significant difference between two different hours of interval. Monson et al. (2004) conducted an experiment on influence of breed and ageing time on the sensory meat quality observed that for the severity of the beef, liver and bitter flavor, the breed effect was statistically significant.

The subjective evaluation of tenderness score of crossbred and indigenous cattle meat with hour of intervals are shown in Table 1. The range of mean value of overall observed tenderness score at crossbred and indigenous cattle meat was same and it was 4.17. Most preferable tenderness was observed from crossbred cattle meat. The tenderness at 0h and 24h was 3.83 and 4.50. There was no significant difference in tenderness between breeds but significant differences between two different hours of interval. The result of this experiment is supported by the findings of Monson et al. (2004).

The subjective evaluation of juiciness score of crossbred and indigenous cattle meat with hour of intervals are shown in Table 1. The range of mean value of overall observed juiciness score at crossbred and indigenous cattle meat was 3.17 and 3.83. There was significant difference between two breeds. Most preferable juiciness was observed from indigenous cattle meat ($p < 0.05$). The juiciness at 0 h and 24 h was 3.00 and 4.00. Ullah et al. (2016) studied the influence of breed, age and sex of indigenous cattle as sensory parameters found juiciness was significantly affected by breed.

The subjective evaluation of overall acceptability score of crossbred and indigenous cattle meat with hour of intervals are shown in Table 1. The range of mean value of overall acceptability score at crossbred and indigenous cattle meat was 4.00 and 4.17. The overall acceptability at 0h and 24h was 3.66 and 4.50. There was significant difference between two different hours of interval. Monson et al. (2004) conducted an experiment on influence of breed and ageing time on the sensory meat quality observed that overall consumer acceptability was not affected by breed but ageing affects the breed differences.

Table 1. Effect of Crossbred and Indigenous Cattle on sensory attributes at two different hours of intervals

Sensory Evaluation		**Treatments**			**Level of Significance**		
Parameters	**Hour of intervals**	**Crossbred Cattle (CBC)**	**Indigenous Cattle (IC)**	**Mean± SEM**	**CBC**	**IC**	**CBC*IC**
	0	4.33±0.33	4.67±0.33	$4.50^{a}\pm0.33$			
Color	24	3.33±0.33	3.67±0.33	$3.83^{b}\pm0.33$	0.35	0.01	1.00
	Mean± SEM	$3.83^{a}\pm0.33$	$4.17^{a}\pm0.33$				
	0	3.33±0.33	3.66±0.33	$3.50^{b}\pm0.33$			
Flavor	24	4.33±0.33	3.66±0.33	$4.50^{a}\pm0.33$	0.35	1.00	1.00
	Mean± SEM	$3.83^{a}\pm0.33$	$4.17^{a}\pm0.33$				
	0	4.00±0.00	3.67±0.33	$3.83^{b}\pm0.16$			
Tenderness	24	4.33±0.33	4.66±0.33	$4.50^{a}\pm0.33$	0.19	0.02	1.00
	Mean± SEM	$4.17^{a}\pm0.16$	$4.17^{a}\pm0.16$				
	0	2.67±0.33	3.33±0.33	$3.00^{b}\pm0.33$			
Juiciness	24	3.66±0.33	4.33±0.33	$4.00^{a}\pm0.33$	0.01	0.34	1.00
	Mean± SEM	$3.17^{b}\pm0.33$	$3.83^{a}\pm0.33$				
	0	3.66±0.33	3.66±0.33	$3.66^{b}\pm0.33$			
Overall acceptability	24	4.33±0.33	4.66±0.33	$4.50^{a}\pm0.33$	0.43	0.43	1.00
	Mean± SEM	$4.00^{a}\pm0.33$	$4.17^{a}\pm0.45$				

Sensory Scores were 5 for excellent, 4 for very good, 3 for good, 2 for fair, and 1 for poor. Mean in each row having different superscript varies significantly at values $p<0.05$, CBC= Crossbred Cattle, IC= Indigenous Cattle, CBC*IC= interaction of Crossbred cattle and Indigenous Cattle.

Proximate analysis

The subjective evaluation of dry matter content of crossbred and indigenous cattle meat with hour of intervals is shown in Table 2. Between two treatments the lower amount of dry matter content observed at CBC group and the higher amount observed at IC group. There was no significant difference between two groups in case of DM content. The CBC DM content was 23.96 and the IC DM content was 25.12. DM content at 0h was 23.94 and at 24h were 25.14. The DM content was increased with the increase storage period because moisture loss was decreased with the increase storage period. There was no significant difference between two treatments and two different hours of interval. Similar result was reported by (Bressan et al., 2011).

The subjective evaluation of crude protein content of crossbred and indigenous cattle meat with hour of intervals is shown in Table 2. Between two treatments the lower amount of crude protein content observed at CBC group and the slightly higher amount observed at IC group. There was no significant difference between two groups in case of CP content. The CBC crude protein content was 28.78 and the IC crude protein content was 29.32. CP content at 0 h was 28.46 and at 24h was 29.63. There was no significant difference between two treatments and two different hours of interval. Bressan *et al.* (2011) analyzed physicochemical properties meat from *Bos indicus* and *Bos taurus* found crude protein content both in fresh and aged meat, there were no differences between the *B. taurus* and *B. indicus* groups ($P>0.05$).

The subjective evaluation of ether extract content of crossbred and indigenous cattle meat with hour of intervals is shown in table 2. Between two treatments the lower amount of ether extract content observed at CBC group and the higher amount observed at IC group. There was no significant difference between two groups in case of EE content. The CBC ether extract content was 1.35 and the IC ether extract content was 2.64. EE content at 0h was 1.85 and at 24h were 2.15. There was no significant difference between two treatments and two different hours of interval. There were no statistically significant changes between the three breeds across ages ($p > 0.05$) for fat levels were not affected by breed or aging period ($p > 0.05$) reported by Fan et al. (2020).

The subjective evaluation of ash content of crossbred and indigenous cattle meat with hour of intervals is shown in Table 2. Between two treatments the lower amount of ash content observed at CBC group and the higher amount observed at IC group. The ash content of IC was significantly higher than the CBC group. The CBC ash content was 1.05 and the IC crude protein content was 1.48. The EE content at 0h was 1.19 and at 24h was 1.48. There were significant ($p< 0.05$) difference between two treatments and but significant at two different hours of interval. Similar result was reported by (Park et al., 2000).

Table 2. Effect of Crossbred and indigenous cattle on proximate components at two different hours of intervals

Proximate components	Treatments				Level of Significance		
Parameters	Hour of intervals	Crossbred Cattle (CBC)	Indigenous Cattle (IC)	Mean± SEM	CBC	IC	CBC*IC
	0	23.34±0.62	24.54±0.12	23.94^a±0.37			
DM	24	24.58±0.83	25.70±0.93	25.14^a±0.88	0.13	0.12	0.95
	Mean± SEM	23.96^a±0.72	25.12^a±0.52				
	0	29.49±0.33	27.44±0.88	28.46^a±0.68			
CP	24	28.07±0.65	31.20±0.68	29.63^a±0.76	0.44	0.11	0.004
	Mean± SEM	28.78^a±0.67	29.32^a±0.78				
	0	1.52±0.24	2.18±0.66	1.85^a±0.45			
EE	24	1.19±0.09	3.11±1.00	2.15^a±0.54	0.06	0.64	0.33
	Mean± SEM	1.35^a±0.16	2.64^a±0.83				
	0	1.15±0.06	1.23±0.07	1.19^a±0.06			
Ash	24	0.95±0.01	1.73±0.12	1.34^a±4.06	0.005	0.08	0.001
	Mean± SEM	1.05^b±0.03	1.48^a±0.09				

** CP (crude protein), DM (dry matter), EE (ether extract)

a-b means (±SE) within a raw showing different subscripts are significantly different ($p<0.05$). Duncan's least significance multiple range lest was applied to compare means.

Physicochemical properties evaluation

The subjective evaluation of pH score of crossbred and indigenous cattle meat with hour of intervals are shown in Table 3. The range of mean value of overall observed pH score at crossbred and indigenous cattle meat was 6.00 and 6.03. The pH at 0h and 24h was 6.26 and 5.77. The data showed that the pH was deteriorated with the increase storage period for both the treatment. There was no significant difference between two treatments and two different hours of interval. The result of this experiment is supported by Bressan et al. (2011).

The subjective evaluation of cooking loss score of crossbred and indigenous cattle meat with hour of intervals are shown in Table 3. The range of mean value of overall observed cooking loss score at crossbred and indigenous cattle meat was 25.47 and 22.24. The cook loss at 0h and 24h was 21.48 and 26.08. Most preferable cooking loss was observed at fresh condition. The data showed that the cooking loss was deteriorated significantly ($p > 0.05$) with the increase storage period. Similar result was reported by (Bressan et al., 2011).

The subjective evaluation of water holding capacity score of crossbred and indigenous cattle meat with hour of intervals are shown in Table 3. The range of mean value of overall observed WHC score at crossbred and indigenous cattle meat was 92.67 and 96.03. Most preferable WHC was observed from indigenous cattle meat at 0h ($p < 0.05$). The WHC at 0h and 24h was 97.05 and 91.65. Most preferable WHC was observed at fresh condition. The data showed that the drip loss was deteriorated with the increase storage period for both the treatment. The data showed that the hue angle value was deteriorated significantly ($p < 0.05$) with the increase storage period for both the treatment. The result of this experiment is supported by (Kerth et al., 2007).

The subjective evaluation of L* (lightness) crossbred and indigenous cattle meat with hour of intervals are shown in Table 3. The range of mean value of overall observed L* value at crossbred and indigenous cattle meat was 37.52 and 36.40. Most preferable L* value was observed from crossbred meat. The L* value at 0h and 24h was 34.43 and 39.49. Most preferable L* value was observed at 24 hours of storage. The data showed that there was no significant difference between two treatments and two different hours of interval. Similar result was reported by (Hashem et al., 2023; Sadowska et al., 2020).

The subjective evaluation of a* (redness) of crossbred and indigenous cattle meat with hour of intervals are shown in Table 3. The range of mean value of overall observed a* value at crossbred and indigenous cattle meat was 16.46 and 12.72. Most preferable a* value was observed from crossbred meat. The a* value at 0h and 24h was 13.77 and 15.42. Most preferable a* value was observed at 24 hours of storage. The data showed that there was no significant difference between two treatments and two different hours of interval. The result of this experiment is supported by (Alam et al., 2024a, Hashem et al., 2024; Sadowska et al., 2020).

The subjective evaluation of b*(yellowness) of crossbred and indigenous cattle meat with hour of intervals are shown in Table 3. The range of mean value of overall observed b* value crossbred and indigenous cattle meat was 8.76 and 6.53. Most preferable b* value was observed from indigenous cattle meat. The b* value at 0h and 24h was 5.88 and 9.41. Most preferable b* value was observed at 24 hours of storage. The data showed that there was no significant difference between two treatments and two different hours of interval. Similar result was reported by (Sadowska et al., 2020).

The subjective evaluation of SI (Saturation Index) of crossbred and indigenous cattle meat with hour of intervals is shown in Table 3. The range of mean value of overall observed SI value at crossbred and indigenous cattle meat was 18.70 and 14.40. Most preferable SI value was observed from crossbred meat. The SI value at 0h and 24h was 15.00 and 18.10. Preferable SI value was observed at 24 hours of storage condition. The data showed that there was no significant difference between two treatments and two different hours of interval. Similar result was reported by (Fan et al., 2020).

The subjective evaluation of Hue angle of crossbred and indigenous cattle meat with hour of intervals is shown in Table 3. The range of mean value of overall observed hue angle value at crossbred and indigenous cattle meat was 27.54 and 26.43. Most preferable hue angle value was observed from live indigenous meat. The hue angle value at 0h and 24h was 22.66 and 31.33. Preferable hue angle value was observed at 24 hours of storage. The data showed that there was no significant difference between two treatments and two different hours of interval. Similar result was reported by (Fan et al., 2020).

Table 3. Effect of Crossbred and Indigenous cattle on physicochemical attributes at two different hours of intervals

Physicochemical attributes	**Treatments**				**Level of Significance**		
Parameters	Hour of Intervals	Crossbred Cattle (CBC)	Indigenous Cattle (IC)	Mean±SEM	CBC	IC	CBC*IC
	0	6.21±0.06	6.32±0.09	6.26^{a}±0.07			
pH	24	5.79±0.03	5.75±0.03	5.77^{b}±0.03	0.58	<0.001	0.25
	Mean±SEM	6.00^{a}±0.04	6.03^{a}±0.06				
	0	22.44±1.31	20.52±0.53	21.48^{b}±0.92			
CL	24	28.50±2.68	23.97±1.55	26.08^{a}±2.12	0.09	0.02	0.46
	Mean±SEM	25.47^{a}±2.00	22.24^{a}±1.04				
	0	95.69±0.60	98.41±0.13	97.05^{a}±0.37			
WHC	24	89.66±1.18	93.65±0.46	91.65^{b}±0.82	0.001	<0.001	0.39
	Mean±SEM	92.67^{b}±0.89	96.03^{a}±0.30				
	0	32.46±6.66	36.40±1.02	34.43^{a}±3.84			
L*	24	42.56±2.24	36.41±5.94	39.49^{a}±4.09	0.82	0.30	0.30
	Mean±SEM	37.52^{a}±4.45	36.40^{a}±3.48				
	0	15.54±3.62	12.00±0.40	13.77^{a}±2.01			
a*	24	17.38±1.76	13.46±0.35	15.42^{a}±1.06	0.10	0.44	0.93
	Mean±SEM	16.46^{a}±2.69	12.72^{a}±0.38				
	0	7.25±1.84	4.52±0.59	5.88^{b}±1.22			
b*	24	10.27±1.66	8.56±0.52	9.41^{a}±1.10	0.12	0.02	0.70
	Mean±SEM	8.76^{a}±1.76	6.53^{a}±0.56				
	0	17.16±4.04	12.84±0.56	15.00^{a}±2.30			
Saturation Index	24	20.24±2.21	15.96±0.44	18.10^{a}±1.33	0.10	0.22	0.99
	Mean±SEM	18.70^{a}±3.13	14.40^{a}±0.50				
	0	24.84±1.15	20.47±2.00	22.66^{b}±1.78			
Hue Angle	24	30.25±3.02	32.41±1.61	31.33^{a}±2.32	0.62	0.003	0.16
	Mean±SEM	27.54^{a}±2.29	26.43^{a}±1.81				

**DL (drip loss), CL (cooking loss), WHC (water holding capacity)

a-b means (±SE) within a raw showing different subscripts are significantly different ($p<0.05$). Duncan's least significance multiple range lest was applied to compare means.

The subjective evaluation of drip loss score of crossbred and indigenous cattle meat with hour of intervals are shown in bar graph (Figure 3). The range of mean value of overall observed drip loss score at crossbred and indigenous cattle meat was taken at 24 h after sample collection. The drip loss between two treatments was not significantly different. Drip loss of CBC was 3.91 and indigenous cattle meat was 3.60. There was no significant difference between two treatments. Similar result was reported by (Aroeira et al., 2016).

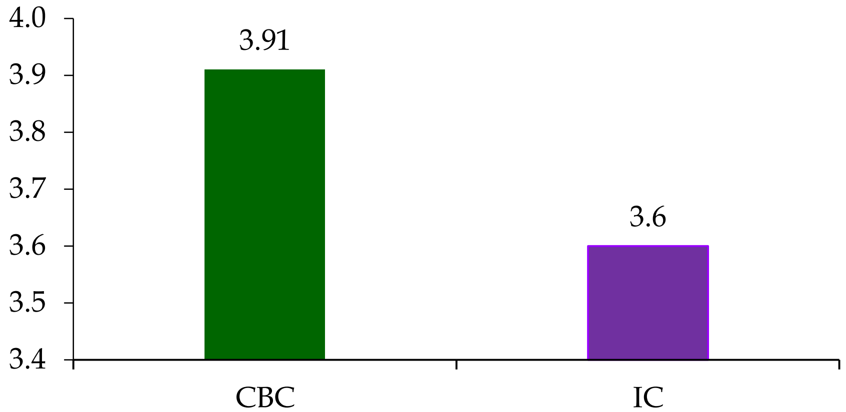

Figure 3. Effect of Crossbred (CBC) and Indigenous cattle (IC) on drip loss.

Conclusions

In conclusion, in case of sensory attributes aged meat showed better quality for both crossbred and indigenous cattle. Based on juiciness and water holding capacity of indigenous cattle meat is comparatively preferable and acceptable than crossbred cattle meat.

References

Akter H, Akhter S, Rahman SME, Rahman MM, Hossain MM, Ra CS, Kim JM, Oh DH. 2009. Effect of different preservation methods on physicochemical qualities of beef. Journal of Food Hygiene and Safety, 24 (3): 217-225.

Alam AN, Kim CJ, Kim SH, Kumari S, Lee EY, Hwang YH, Joo ST. 2024a. Scaffolding fundamentals and recent advances in sustainable scaffolding techniques for cultured meat development. Food Research International, p.114549.

Alam AN, Hashem MA, Matar AM, Ali MS, Monti JA, Hossain MJ, Yusuf HM. Mia N. 2024b. Cutting edge technologies for the evaluation of plant-based food and meat quality: A comprehensive review. Meat Research, 4(1).

Ali MS, Rahman MM, Habib M, Kabir MH, Hashem MA, Azad MAK. 2022. Quality of spent hen sausages incorporated with bee honey. Meat Research, 2(1).

AMSA 1995. Research guidelines for cookery, sensory evaluation and instrumental tenderness measurements of fresh meat. Chicago III. American Meat Science Association and Nutritional Live Stock and Meat Board.

AOAC. 1995. Official method of analysis of the Association of Official Analytical Chemists 17th edition. Association of Official Analytical Chemists, **7:** 65-68.

Aroeira CN, Torres Filho RA, Fontes PR, Gomide LA, Ramos AL, Ladeira MM, Ramos EM. 2016. Freezing, thawing and aging effects on beef tenderness from *Bos indicus* and *Bos taurus* cattle. Meat Science, 116: 118-125.

Baset MA, Rahman MM, Islam MS, Ara A, Kabir ASM. 2003. Beef cattle production in Bangladesh- A Review. Online Journal of Biological Sciences, 3 (1): 8-25.

Bressan MC, Rodrigues EC, Rossato LV, Ramos EM, Gama LT. 2011. Physicochemical properties of meat from *Bos taurus* and *Bos indicus*. Revista Brasileira de Zootecnia, 40: 1250-1259.

Descalzo AM, Sancho AM. 2008. A review of natural antioxidants and their effects on oxidative status, odor and quality of fresh beef produced in Argentina. Meat Science 79(3): 423-436.

Fan Y, Han Z, Arbab AA, Yang Y, Yang Z. 2020. Effect of aging time on meat quality of longissimus dorsi from yunling cattle: a new hybrid beef cattle. Animals, 10 (10): 1897.

Hashem MA, Ambia J, Mia N, Ali M, Rahman MM, Ali MS. 2024. Detection of adulteration of goat and sheep meat through NIRS and chemometric analysis. Meat Research, 4(2). https://doi.org/10.55002/mr.4.2.86

Hashem MA, Mamun MAA, Arafath MS, Numan AA, Hossain MM. 2023a. Influence of rearing system on the productive, carcass and meat quality attributes among three genotypes of native lambs in Bangladesh. Meat Research, 3(3).

Hashem, MA, Islam SM, Tushar ZH, Rahaman MH, Akhter S. 2023. Can live and dead broiler meat be identified through sensory and physicochemical attributes?.Meat Research, 3(5).

Hashem MA, Islam MR, Hossain MM, Alam AMMN, Khan M. 2022. Prediction of chevon quality through near infrared spectroscopy and multivariate analyses. Meat Research, 2(6).

Honikel KO. 1998. Reference methods for the assessment of physical characteristics of meat. Meat Science, 49 (4): 447-457

Hossain MJ, Alam AN, Lee EY, Hwang YH, Joo ST. 2024. Umami characteristics and taste improvement mechanism of meat. Food Science of Animal Resources, 44(3), p.515.

Hossain MA, Sun MA, Islam T, Rahman MM, Rahman MW, Hashem MA. 2021. Socio-economic characteristics and present scenario of sheep farmers at Sherpur district in Bangladesh. SAARC J. Agric., 19(1): 185-199. DOI: https://doi.org/10.3329/sja.v19i1.54789

Islam A, Sadakuzzaman M, Hossain MA, Hossain MM, Hashem MA. 2019. Effect of gamma irradiation on shelf life and quality of indigenous chicken meat. Journal of Bangladesh Agricultural University, 17(4): 560-566.

Islam F, Hossain MA, Rahman MF, Hashem MA, Rahman M, Azad MAK. 2018. Effect of synthetic or herbal preservatives on the quality of beef meatballs at different shelf-life periods. SAARC Journal of Agriculture, 16: 23-34.

Kerth CR, Braden KW, Cox R, Kerth LK, Rankins Jr DL. 2007. Carcass, sensory, fat color, and consumer acceptance characteristics of Angus-cross steers finished on ryegrass (*Lolium multiflorum*) forage or on a high-concentrate diet. Meat Science, 75(2): 324-331.

Kim KJ, Lee SY, Park DH, Kim H, Choi M. 2020. Physicochemical properties of pork neck and chicken leg meat under various freezing temperatures in a deep freezer. Food Sci Anim Resour, 40(3): 444-460.

Mia N, Alam A, Rahman MM, Ali M, Hashem MA. 2024. Probiotics to enhance animal production performance and meat quality: A review. Meat Research, *4* (2), Article No. 85. https://doi.org/10.55002/mr.4.2.85

Mia N, Rahman MM, Hashem MA. 2023. Effect of heat stress on meat quality: A review. Meat Research, *3*(6). https://doi.org/10.55002/mr.3.6.73

Monson F, Sañudo C, Sierra I. 2004. Influence of cattle breed and ageing time on textural meat quality. Meat Science 68(4) 595-602.

Park BY, Cho SH, Yoo YM, Kim JH, Lee JM, Joung SK, Kim YK. 2000. Effect of intramuscular fat contents on the physicochemical properties of beef longissimus dorsi from Hanwoo. Korean Journal of Animal Sciences, 42(2): 189-194.

Rahman MH, Hossain MM, Rahman SME, Hashem MA, Oh DH. 2014. Effect of repeated freeze-thaw cycles on beef quality and safety. Korean journal for food science of animal resources, 34(4), 482.

Rana MS, Hashem MA, Akhter S, Habibullah M, Islam MH, Biswas RC. 2014. Effect of heat stress on carcass and meat quality of indigenous sheep of Bangladesh. Bangladesh Journal of Animal Science, 43 (2): 147-153.

Sadowska A, Świderski F, Kostyra E, Rachtan-Janicka J, Najman K. 2020. Effect of ageing time on quality characteristics of different bovine muscles. International Journal of Food Science & Technology 55(3) 1189-1198.

Sharker B, Mia N, Ali MS, Hashem MA, Rahman MM, Khan M. 2024. Effect of freezing period on the quality of doe liver. Meat Research, 4(2). https://doi.org/10.55002/mr.4.2.90

Son YM, Lee EY, Alam AN, Samad A, Hossain MJ, Hwang YH, Seo JK, Kim CB, Choi JH, Joo ST. 2024. The application of high-intensity ultrasound on wet-dry combined aged pork loin induces physicochemical and oxidative alterations. Food Science of Animal Resources, 44(4), p. 899.

Torun MMR, Khan MMH, Rahman MM, Sadakuzzaman M, Hashem MA. 2023. Influence of degree of doneness temperature on the sensory, physiochemical, nutritional, and microbial properties of beef. Meat Research, 3(5).

Ullah N, Shah AA, Nazar M, Ali G, Khan IU, Rahman A, Kaka NA, Mugabe W, Shah IA. 2016. Influence of breed, age and sex of indigenous cattle on sensory parameters of raw and cooked beef meat at Peshawar. Journal of Life Science and Biotechnology, 1: 477-506.