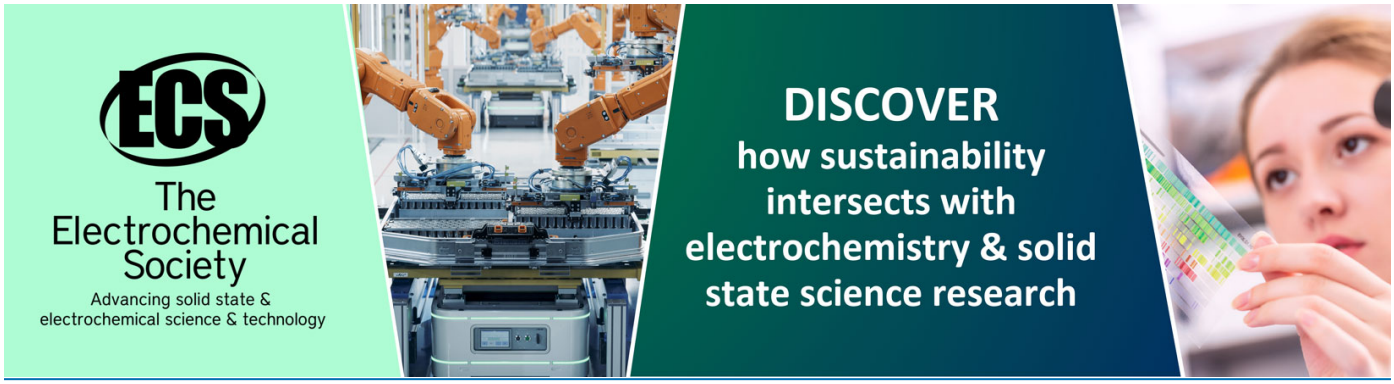
Physicochemical and organoleptic characteristics of Aceh Beef and brahman cross beef in cold temperature storage of 4°C



Physicochemical and organoleptic characteristics of Aceh Beef and brahman cross beef in cold temperature storage of 4°C

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Abstract. Meat is a source of the essential protein and the other nutrients which are needed by human. This study aimed to determine the effect of physicochemical and organoleptic characteristics of Aceh beef and Brahman Cross beef on 4°C storage temperature in different storage time. This study used a completely randomized design, consisted of two factors namely the beef type (S), including the Aceh beef and the Brahman Cross beef, and the storage time in 4°C temperature (A), which consisted of four levels of time i.e. 0, 1, 2 and 3 weeks. Result showed that Brahman Cross beef had a better physicochemical and organoleptic character quality than the Aceh beef meat.

1. Introduction

Meat is an important food ingredient in meeting the nutritional needs. Beside contain of high quality protein, meat also consist of essential amino acid content which is complete, balance and easily digestible. Along with the demands for healthy and high nutritional value of animal-based food to improve the quality of life for healthy and prosperous people, efforts to preserve or store a good and right meat are required. There are several things conducted to maintain the nutritional value and the quality of meat, including the cold temperature storage way.

Cold storage is usually carried out in a temperature range of -1°C to 4°C [1]. Storage in 4°C temperature aimed to prevent damage without causing an abnormal ripening or undesirable changes, so as to maintain the commodity in conditions that can be accepted by consumers as long as possible [2]. Consequently, until now studies which examine the differences in physical, chemical and organoleptic characteristics between Aceh beef and Brahman Cross beef with different storage times at cold temperatures of 4°C have not been widely conducted.

2. Materials and Method

The main ingredient used in this research was Aceh beef and Brahman Cross Beef. Aceh beef was taken from the traditional maintenance and cutting, while the Brahman cross beef was taken from the slaughterhouse. Moreover, filter paper, tissue paper, water, electrodes, petroleum ether, CuSO4; K2SO4, boiling stone, concentrated H2SO4, distilled water, NaOH, Erlenmeyer, saturated boric acid and HCL was used in this study. The used tool was the Intron UTM - 1140: Warner Bratzler meat shear, Hruden brand plan meter, scales, chromate [Type CR – 200], pH meter, soxhlet, oven, desiccator, cup, furnace, Bunsen, kjeldal, distillation.

2.1. *Data Analysis*

This study used the Factorial Complete Random Design [CRD] [3] with two factors, namely beef type [factor I] and storage time [factor II].

Factor I: beef type

1. Aceh beef
2. Brahman beef

Factor II: Meat storage in 4^{o}C

P0: 0 week storage
P1: one week storage
P2: two weeks storage
P3: three weeks storage

Combination number of the Treatment or Treatment Combination [TC] is a combination factors as much as 2 x 4 = 8 and the level of accuracy was conducted 3 times for each treatment.

3. Results and Discussion

3.1. Texture test (Hardness)

Results of statistical analysis showed a very significant effect (P <0.01) of different beef types on the texture (hardness) of meat significantly. The longer cold temperature storage time at 4^{o}C resulted a decreasement of meat hardness due to the changes in the connective tissue that affected the meat softness along with the cold temperature storage duration (Figure 1).

Table 1. Results of the influence of beef type and storage time treatments to warded several parameters

Parameters	Beef Type	Treatments			
		Week- 0	Week-1	Week-2	Week-3
Hardness Texture	Aceh Beef	0.2652	0.2449	0.1894	0.1264
	Brahman Beef	0.2081	0.2008	0.1917	0.1204
Water Binding Ability	Aceh Beef	56.5446	47.7675	46.1383	39.8895
	Brahman Beef	35.0881	34.2888	33.9153	33.9407
Shrinkage	Aceh Beef	41.7363	43.1229	40.2509	42.6419
	Brahman Beef	44.8352	47.2435	40.3241	44.8555
Beef Colour	Aceh Beef	32.3233	30.5667	29.7700	24.3267
	Brahman Beef	33.6167	31.0267	30.8500	29.6033
Ph.	Aceh Beef	6.5000	5.6000	5.7667	5.5667
	Brahman Beef	6.2333	6.7000	5.4333	5.0333
Lipid Content	Aceh Beef	5.5991	4.7750	2.5691	1.6719
	Brahman Beef	4.8147	3.5827	2.9825	2.5035
Water Content	Aceh Beef	66.7357	69.7115	72.9737	75.5893
	Brahman Beef	69.0011	73.6155	76.5965	78.5202
Ash Content	Aceh Beef	1.6082	1.3530	1.1866	0.7939
	Brahman Beef	1.2507	0.9792	0.8415	0.7650
Protein Content	Aceh Beef	19.7628	18.6602	16.0972	113.8030
	Brahman Beef	21.8711	20.1809	17.6013	15.9198

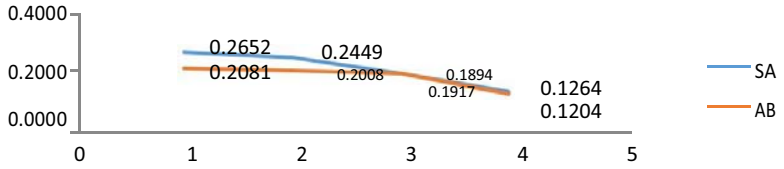

Figure 1. Result of hardness test

3.2. Water binding ability test

Result of statistical analysis showed a very significant effect (P <0.01) of different beef types on the meat water binding ability significantly. The longer cold temperature storage time at 4°C resulted a decreasement of meat water binding ability. According to Lawrie [4], meat water binding ability was strongly influenced by pH, a higher final pH resulted a higher water binding ability or a low H_2O mg value. The decreasement level in post-mortem pH affected the water binding ability is showed in Figure 2.

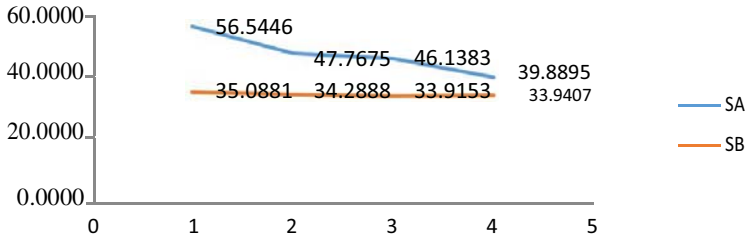

Figure 2. Result of water binding ability test

3.3. Meat cooking shrinkage test

Result of the statistical analysis showed a very significant effect (P <0.01) of different beef types on meat cooking shrinkage significantly. This showed that both types of beef were stored at cold temperature of 4°C simultaneously experienced an incensement of cooking shrinkage. This was presumably due to the incensement of water amount which entered the meat along with the cold temperature storage time which would affect the cooking shrinkage (Figure 3).

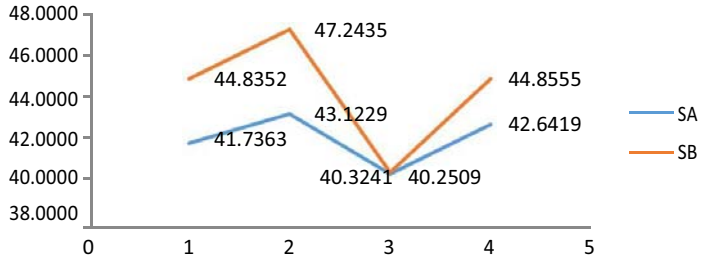

Figure 3. Result of meat cooking shrinkage test

3.4. Meat colour test

Result of statistical analysis showed a significant effect (P <0.05) of different beef types on meat colour. This showed that both types of beef were stored at a cold temperature of 4°C simultaneously experienced a decreasement of colour brightness (L) at the first, second and third week storage time. This was presumably due to the changes of oximiogobline pigment content which caused by a decreasement of meat pH along with the cold temperature storage time.

3.5. pH Value test

Result of statistical analysis showed a very significant effect (P <0.01) of the different cold temperature storage time treatment at 4°C to warded the pH value of the meat significantly in the observation after 0 week. The longer the beef was stored at a cold temperature of 4°C resulted a decreasement of the meat pH or was acidic, due to the incensement of the formed lactic acids number along with the cold temperature storage time.

3.6. Test of lipid content

Result of statistical analysis showed no significant effect (P> 0.05) of different beef types on meat lipid content. On the other hand, in the statistical analysis result showed a very significant effect (P <0.01) of the different cold temperature storage time at 4°C treatment to warded the meat lipid content significantly on the observation after week-0. A longer cold temperature storage time at 4°C of the beef resulted a decreasement of the lipid content. According to Minis and Fox [5], fat content of meat was negatively correlated to the meat content, the higher the lipid content, the lower the water content of meat.

3.7. Test of water content

Result of statistical analysis showed a very significant effect (P <0.01) of different beef types on meat water content significantly. The longer beef was stored at cold temperature storage of 4°C resulted an incensement of water content. This was presumably due to the decreasement of water binding ability which was affected by the decreasement of meat pH along with the cold storage time (Figure 4).

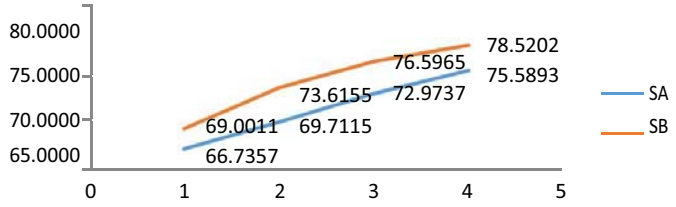

Figure 4. Result of water content

3.8. Test of ash content

Result of statistical analysis showed a very significant effect (P <0.01) of different beef types on the ash content of meat significantly. The longer the beef was stored at cold temperature storage of 4°C resulted lower ash content. This was presumably due to the decreasement of pH so that the meat mineral element changes occurred along with the duration of cold temperature storage (Figure 5).

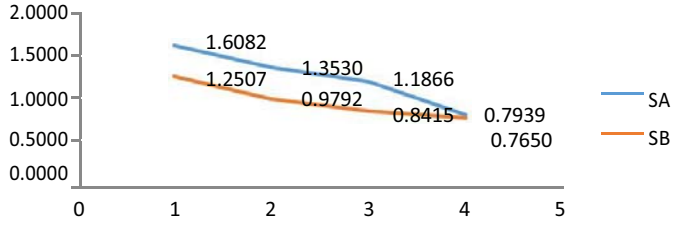

Figure 5. Result of ash content

3.9. Test of protein content

Result of statistical analysis showed a very significant effect (P <0.01) of different beef types on meat protein content significantly. The longer the beef was stored at a cold temperature of 4°C would resulted a decreasement of the meat protein content due to the meat pH decreasement along with the cold storage time so that the meat was acidic which facilitated the microbes to break down the protein.

3.10. Aroma test (odor)

Result of statistical analysis showed no significant effect (P> 0.05) of different beef types on the aroma (odor) of meat. On the other hand, the result of statistical analysis showed a very significant effect (P<0.01) of the different 4^{o}C cold temperature storage time treatment to warded the aroma (odor) of the meat significantly on observation after week 0. The longer the beef was stored at cold temperature storage of 4°C resulted an incensement of the disliked aroma (odor) of meat.

3.11. Texture test

Result of statistical analysis showed no significant effect (P>0.05) of different beef types on the meat texture. On the other hand, results of statistical analysis showed a significant effect (P<0.05) of different 4^{o}C cold temperature storage time treatment to warded the meat texture on observation after week 0. The longer the beef was stored at a cold temperature of 4°C resulted an incensement of the disliked meat texture.

3.12. Taste test

Result of statistical analysis showed a significant effect (P<0.05) of different beef types on the meat taste. The longer the beef was stored at 4^{o}C cold temperature resulted an incensement of the disliked

meat taste. An incensement of taste hedonic scale value showed a decreasement of the preference level toward the stored meat in a cold temperature in a relative long time (Figure 6).

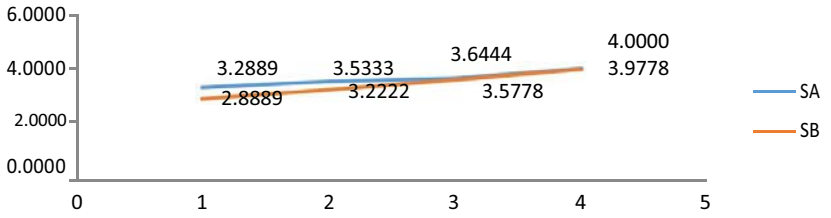

Figure 6. Result of taste test

3.13. Tenderness test

Result of statistical analysis showed a significant effect ($P < 0.05$) of different beef types on the meat tenderness. The longer the beef was stored at a 4^{o} C cold temperature resulted an increasement of the disliked meat tenderness Figure 7.

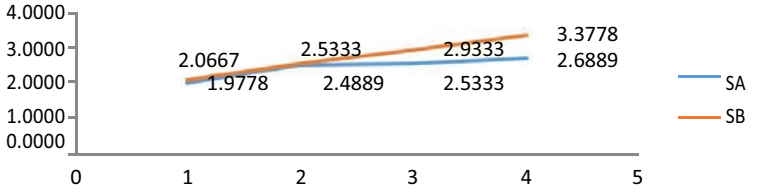

Figure 7. Result of meat tenderness test

4. Conclusion

Results of the influence of beef types (Aceh and Brahman Cross Beef) and the storage time at 4°C cold temperature toward the physicochemical characteristics found in the meat types showed that Brahman Cross beef had a better meat quality physically, chemically and organoleptic ally than the Aceh beef meat; and the storage time of 4°C cold temperature could reduce the physical and chemical properties of meat including the water binding ability, cooking shrinkage and meat colour (L, a and b), pH, lipid content, ash content, and protein content.

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