



Detection of Beef Type Dark, Firm, and Dry (DFD) and Pale, Soft, and Exudative (PSE) for Sale at Peunayong Market Banda Aceh

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Abstract

This study aims to determine beef types Dark, Firm, and Dry (DFD) and Pale, Soft, and Exudative (PSE) that are sold at the Peunayong Market, Banda Aceh. A total of nine samples of beef from different sellers will be used as extracts and the pH is measured three times every 1 hour for 12 hours to determine the trend of decreasing pH. Organoleptic observations were carried out to determine the visual differences shown by the meat samples. Parameters observed were meat color, meat aroma, meat texture and surface state of the meat. The data obtained from pH measurements and organoleptic tests were analyzed descriptively. Based on the results of pH measurements seen from the decreasing trend of pH in nine samples of beef, seven of them were PSE type beef with a pH value of < 5.2 and the other two samples were of good quality meat with a pH value ranging from 5.6 to 5.4. From the results of organoleptic tests for color parameters, four samples were pale, one sample was very pale and the rest were red. All the meat samples tasted normal. Meat texture and surface condition for soft-textured meat has a wet surface, while hard-textured meat has a dry surface.

Keywords: Beef, pH, DFD, PSE, organoleptic test

Background

Meat is one of the foodstuffs with a balanced nutritional composition, including protein, essential amino acids, vitamins, minerals, carbohydrates, and fats. Meat quality is the main aspect that needs to be considered (Nurwantoro and Mulyani, cited by Anamuli *et al.*, 2016). Parameters of quality and nutrition in beef include meat color, pH, water holding capacity, moisture content, crude protein content, crude fat content, and ash content (Agustina *et al.*, 2017). Meanwhile, according to Gunawan (2013), five aspects affect beef quality, namely color, texture, fat, taste and aroma of meat.

Before and after the slaughter of livestock, factors can affect the quality of meat and carcass. Factors before slaughter that can affect meat quality include genetics, species, breed, type of livestock, sex, age, feed, additives (hormones, antibiotics, and minerals) and stress (Haq *et al.*, 2015). After slaughter, factors affecting meat quality are cooking methods, meat pH, hormones, and storage methods (Gunawan, 2013).

Travel stress causes a decrease in body weight and carcass percentage, lack of

oxygen, and a decrease in muscle glycogen levels, where glycogen levels will affect lactic acid production and meat pH (Dewi, 2012). According to Supratikno cited by Nusran (2019), animals with chronic stress will result in DFD meat types whose pH remains high. Meanwhile, those who experienced acute stress resulted in the PSE type of meat whose pH decreased drastically in the first hour after slaughter.

The pH of the meat is determined by the final amount of lactic acid, which will affect the color, tenderness and water holding capacity. Cows that experience stress before slaughter, muscle glycogen will be depleted and the lactic acid formed cannot make the pH reach 5.6 (Bahar, 2003). This opinion is also in line with Wiratanaya, (2020) who said that the pH value of the muscle after slaughter of animals will decrease due to the presence of lactic acid. The pH value of standard meat ranges from 5.46-5.67 (Merthayasa, 2015). Types of meat DFD and PSE are caused by stress when moving up and down from vehicles, food and drinks on the way, transportation, surrounded by unfamiliar people, mixed with other animals, high

temperatures and unpleasant sounds (Warriss, 2000).

Materials and Method

Sample Collection

The sample in this study was beef collected from the Peunayong market, Banda Aceh. Sampling was carried out by census, where samples were taken from 9 beef sellers at the Peunayong market, Banda Aceh. Each collected weighing 100 g, 10 g will be tested for pH determination and the remainder for organoleptic tests. The meat samples used have an age of about 4 hours after slaughter.

Determination of Meat pH and Meat Extract Preparation

Prior to measurement, the pH meter was calibrated using a standard solution. First, the pH meter is calibrated with a standard solution with a pH of 4.0, then calibrated with a pH 7.0 or higher solution. After each immersion or measurement in the sample, the electrode glass must be rinsed carefully and carefully with distilled water, then carefully dried with tissue paper.

One part of meat is mixed with 10 parts of distilled water, then the meat was

put in the stomaker. Then the electrode glass was inserted into the extract. After the pH meter was calibrated with a standard solution, the pH meter was allowed to stand for a while until the pH value remained constant. Then the pH was measured three times, the pH value obtained is the average value of the three results of the three measurements.

Organoleptic Test

The researchers themselves carried out sensory testing by looking at the color difference with the standard image, texture, surface condition, and smell of meat

Results and Discussion

The pH value of beef serves as one of the parameters to see the physical quality of the meat. The pH value of standard meat ranges from 5.46 to 5.67 (Merthayasa, 2015). The final pH of DFD-type meat ranged from 5.7 to 5.9. Meanwhile, the PSE type experienced a drastic decrease in pH reaching 5.9 at 1-hour postmortem and had a final pH value of 5.2-5.3 (Anamuli *et al.*, 2016). Table 1 shows the pH measurements on beef sold at Peunayong Market, Banda Aceh.

Table 1. pH value of beef sold at Peunayong Market Banda Aceh

Time	Sampel								
	1	2	3	4	5	6	7	8	9
1	5.5	6	4.8	5.4	6	5.3	4.8	5.7	4.8
2	5.5	5.9	4.8	5.4	6	5.2	4.8	5.7	4.8
3	5.4	5.9	4.7	5.3	6	5.1	4.8	5.7	4.8
4	5.5	5.8	4.7	5.2	5.9	5.2	4.8	5.6	4.8
5	5.3	5.7	4.7	5.1	5.8	5.2	4.8	5.5	4.8
6	5.1	5.8	4.7	5	5.8	5.1	4.7	5.4	4.7
7	5	5.7	4.7	4.8	5.7	5	4.8	5.4	4.7
8	4.8	5.6	4.7	4.6	5.5	5	4.6	5.3	4.6
9	4.7	5.6	4.6	4.4	5.4	4.9	4.5	5.2	4.5
10	4.7	5.6	4.5	4.4	5.3	4.7	4.4	5.1	4.4
11	4.7	5.6	4.4	4.4	5.3	4.6	4.4	5	4.3
12	4.6	5.6	4.4	4.5	5.4	4.4	4.4	4.9	4.4
Description	PSE	Good	PSE	PSE	Good	PSE	PSE	PSE	PSE

The pH measurements shown in the table are the results of pH measurements on meat samples approximately 4 hours after the cattle were slaughtered. Based on the results of pH measurements on nine samples

of beef sold at the Peunayong market in Banda Aceh, the results were quite varied. It was found that two out of nine samples had good quality, namely the pH value, which decreased gradually with the final pH value

between 5.4 and 5.6. In addition to finding good quality meat, seven other samples were meat with PSE quality whose final pH value was between 4.3-4.9 and among the nine samples there was no meat with DFD quality (Figure 1).

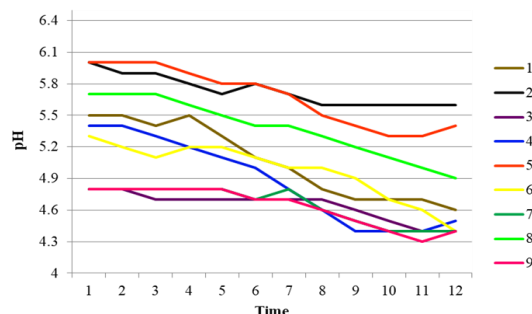


Figure 1. Graph of the decrease in pH of beef sold at the Peunayong market

Meat pH is one of the determinants of meat quality. The pH value of the meat will decrease at postmortem. The decrease in pH value occurs due to the anaerobic glycolysis process, which converts glycogen into lactic acid (Septinova *et al.*, 2018). The difference in pH between all samples can be caused by glycogen levels in muscle tissue, which impacts the accumulation of lactic acid in meat (Risnajat, 2010). The low pH is caused by the rapid and excessive rate of glycolysis in muscle, especially in the early stages when muscle temperature is high,

denaturing muscle protein, which is the cause of meat PSE (Zhou *et al.*, 2019).

Organoleptic Test

In the organoleptic test of the color of the meat sample, it showed three samples with normal color, one sample with a slightly dark color, four samples with pale color and one sample with very pale color. For more details can be seen in Table 2.

Kim *et al.* (2014) said that muscle color depends on the concentration of pigments, especially myoglobin. The pH value of the meat also affects the color of the meat. A drastic decrease in pH can result in paler meat color and reduced meat stability. The main factor for decreasing color stability is related to protein denaturation. Extrinsic factors that affect meat color are season, feed management, antemortem stress, and storage temperature. Intrinsic factors that affect meat color are pH, type of animal, race, sex, age of the animal, source of muscle, and lipid oxidation (Neethling *et al.*, 2017).

The texture and surface condition organoleptic tests showed the same results in this study. Samples 1, 2, 4, and 6 had normal values, 3, 7, and 8 had a soft texture with a wet surface, and sample 5 had a hard texture and a dry surface. as well as sample 9 which is very textured soft and very exudative.

Table 2: Tabulation of organoleptic tests of beef sold in the Peunayong market

Parameter	Beef sample								
	1	2	3	4	5	6	7	8	9
Color	normal	normal	pale	pale	dark	pale	pale	normal	very pale
Aroma	normal	normal	normal	normal	normal	normal	normal	normal	normal
Texture	normal	normal	soft	normal	firm	normal	soft	soft	very soft
Surface state	normal	normal	exudative	normal	dry	normal	exudative	exudative	very exudative

Conclusion

Based on the results obtained, it can be concluded that a decrease in pH was found after 12 hours of measurement and the meat could be categorized as PSE type meat, where the pH value was below 5.2.

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