CHAPTER IV
RESEARCH FINDING AND DISCUSSION

A. Research Finding

1. Pharameter Specific Test of Meat

a. pH measurement

After doing pH measurement, the researcher analyzed the result of data from pH measurement. The score of pH measurement can be shown on table 4.1 as follow:

Table 4.1. score of pH measurement

Meat	pH
A	5.8
B	5.6
C	5.5
D	5.6
E	5.5

From the table 4.1 it can be seen that the score of pH is got as the result of measurement using pH meter. For meat A with the concentration of bromelain enzyme solution of 40%, pH of meat A is 5.8. For meat B with 30% concentration, pH of meat B is 5.6. pH of meat C with 20% concentration is 5.5. For meat D with 10% concentration of bromelain enzyme solution, pH of meat D is 5.6. Meat E becomes control meat, because there is no treatment for this meat. The pH of this meat is 5.5.

b. Water Holding Capacity (WHC) determination

Water Holding Capacity is acquired from the volume of water that is added minus the volume of free water which are divided by the weight of meat times one hundred percent. The score of WHC is provided in table 4.2.

Table 4.2. the score of Water Holding Capacity

Meat	WHC
A	-24%
B	-26%
C	-22%
D	-20%
E	-22%

Based on the result of research, the score of water holding capacity (WHC) for meat A with 40% concentration is -24%, for meat B with 30% concentration is -26%, for meat C with 20% concentration is -22%, for meat D with 10% concentration is -20%, and for meat E without treatment is -22%.

c. Cooking loss determination

Cooking loss is acquired from the weight of meat before being cooked minus the weight of meat after cooking which are divided by the weight of meat after cooking times one hundred percent. Table 4.3 shows us the score of cooking loss. Table 4.3. the score of cooking loss

Meat	Cooking loss
A	45%
B	44%
C	44%
D	42%
E	37%

d. Tenderness

Tenderness of meat in this research had been measured with Universal Testing Machine Zwick/ Z0.5. The score from this measurement is shown in table 4.4.

Table 4.4. the score of tenderness measurement

Meat	Tenderness
A	0.6662
B	0.7098
C	0.9134
D	0.9193
E	1,8324

B. Discussion of the Research Finding

1. Pharameter of Meat Specific Test

a. pH measurement

pH is the measurement of acid or alkaline level of meat. Meat Standard Australia (MSA) measures the acid level of the meat to ensure eating quality.[1] After livestock has been dead, lactat acid starts to form on meat. It's because the blood stream of livestock is stopped, so the oxygen to the meat is stopped too until the meat can not catch hydrogen ion from glykolysis process.[2] Overplus of hydrogen is used to change pyruvat acid to be lactat acid that causes pH decrease of meat.

In this research, pH measurement was conducted by pH meter. the pH Changing of meat in table 4.1 shows about 5.5 until 5.8. The chart of pH changing is provided in the figure 4.1. For control meat is shown with hatching block.

[1] Meat and livestock Australia, "The Effect of pH on Beef Eating Quality", in http://www.shorthornbeef.com.au/assets/files/PH_and_Beef_eating_quality.pdf, accessed on January, 12nd 2013

[2] Edi Riswandi, "Pengaruh Proses Perendaman Dalam Larutan Enzim Papain dan Penyimpanan Terhadap Sifat Mutu Daging Kambing Betina Tua", thesis, (Bogor: Technology faculty, Institute of Agriculture bogor, 2001), p. 18

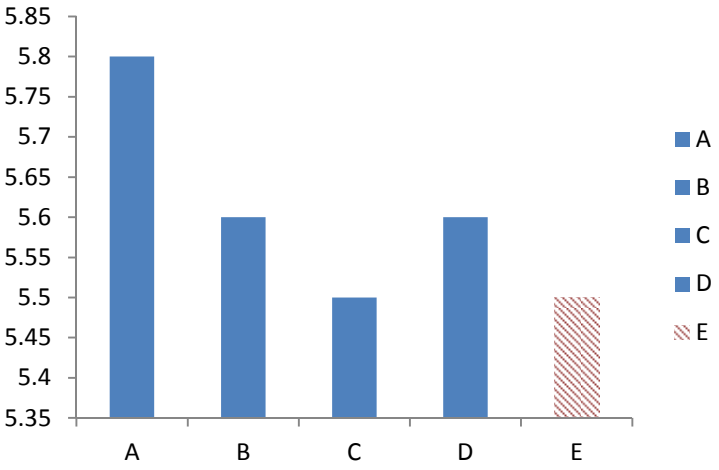

Fig. 4.1. Chart of changing of pH

After measuring with pH meter, the score of meat E is 5.5. For meats that are added with the waste of pineapple's peel solution on blue chart block have score 5.5 until 5.8. The pH measurement process is shown in figure 4.2.

Fig. 4.2. pH measurement with pH meter

As the result of measurement using pH meter, it prooves that adding pineapple's peel solution as the source of bromelain enzyme does not decrease the meat quality, in another word, this meat still in good quality. According to SNI 01 -3948-1995, the good quality requirement of meat is the meat with pH score of about 5.3 – 5.8.[3]

b. Water Holding Capacity (WHC) determination

The water holding capacity (WHC) of meats is related to the amount of free water released by the meat after physical pressure or force is exerted upon it.[4] Water Holding Capacity (WHC) determination in this research had been conducted with centrifugation method. The sample had been pulverized and put into 10 ml sentifuge tube. Then it was added by 5 ml aquades and kept with the temperature of 2-4^{0}C. The next process was centrifugation up to 20 minutes with the rapidity of 3500 rpm, the process is shown in figure 4.3. The decreasing of WHC can be known with ecsudation liquid that is called "Weep" on unripe meat or "Drip" on frozen unripe meat that is refreshed. Ecsudation comes from the liquid and the fat of meat.[5]

[3] Anton Sitorus, "Aplication of Enzyme Bromelain from Pineapple Extract Solution on Tenderizing Process of Old Doe Meat", Thesis, (Bogor: Animal Husbandry Faculty, Institute of Agriculture bogor, 2001), p. 34

[4] James M. Jay, "Relationship Between Water-Holding Capacity of Meats and Microbial Quality", Journal (USA: Department of Biology, Wayne State University, 1964), p.120

[5] Soeparno, *Ilmu dan Teknologi Daging*, (Yogyakarta: Gadjah mada University Press, 2009), p. 291

Fig. 4.3. sentrifusing process

The meat that is submerged in pineapple's peel solution has negatif water holding capacity score. It's provided in the figure 4.4. The chart is down to beneath with the scores -24%, -26%, -22%,- 20%, and -22%. From the data, the lowest score of water holding capacity on meat B is -26%. In this concentration it's possible for mineral salt has highest content from the others. Whereas the concentration of meat A is higher than meat B. Meat A should has the lowest score of WHC than others.

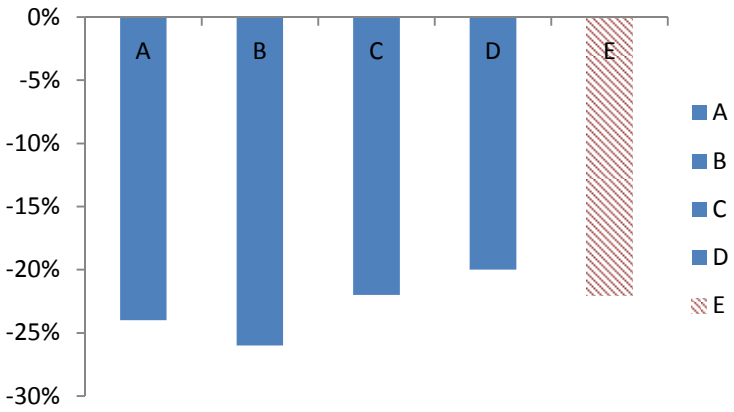

Fig. 4.4. the chart of water holding capacity

Based on the chart above, the meat has no capacity to hold the water when the meat gets treatment from outside. This may occur because the bromelain enzyme from pineapple's peel contains of

mineral salt. Callow (1931) and Hamm (1957) research explained that high ionic power of mineral salt has influence dehydration. Maximum hydration occurs when the ionic power reaches about 0.8 – 1.0. it's equivalent with 5 -8 % of NaCl for meat with or without the addition of 60% water.[6]

c. Cooking loss determination

Cooking is a process of heating beef at sufficiently high temperatures that denatures proteins and makes it less tough and easy to consume.[7] Cooking loss is one of meat quality pharameters. The meat is with lower cooking loss has better quality than the meat with bigger cooking loss, because nutrient that lose is just little during cooking process.

In this research, cooking loss determination was conducted with the meats which were cooked with the temperature 90^0C during 30 minutes. Then samples were submerged in the flowing water during 30 minutes. The process is keeping them in the temperature of 1-2^0C a night. After that, Samples are weighed. The cooking process is shown in figure 4.5.

Fig.4.5. cooking process

[6] Edi Riswandi, "Pengaruh Proses Perendaman Dalam Larutan Enzim Papain dan Penyimpanan Terhadap Sifat Mutu Daging Kambing Betina Tua", thesis, (Bogor: Technology faculty, Institute of Agriculture bogor, 2001), p. 22

[7] N. Jama, *et.al.*, "Cooking loss components of beef from Nguni, Bonsmara and Angus steers", Journal of Agricultural Research (Replubic of South Africa: Department of Livestock and Pasture Science, University of Fort Hare, 2008), p.416

From that treatment, the highest score of cooking loss falls to meat A with the score of 45%. The lowest score is 37% which is fallen to meat E. The meat with the highest score of cooking loss is the meat that was submerged in pineapple's peel solution with the concentration of 40%. And the lowest score is the meat without treatment or control meat. The chart of cooking loss can be seen in figure 4.6.

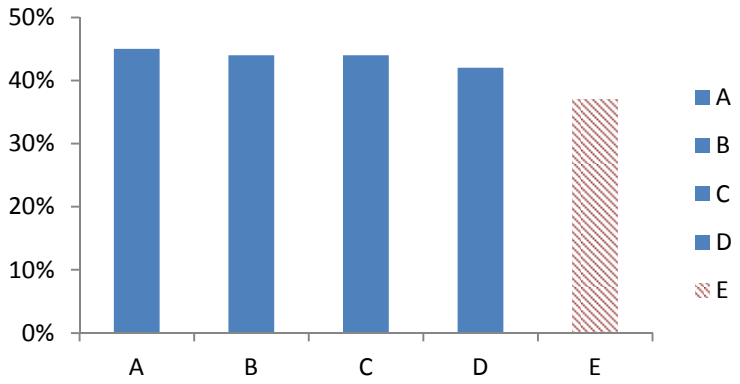

Fig. 4.3. the chart of cooking loss

According to Offer and Knight (1988) research, increasing of cooking loss influence the hardness of meat if it's observed from the water factor. Increasing of hardness is related to changing of distribution of water in the meat. But increasing of cooking loss for part of consumers can give profit, because the increasing of cooking loss can decrease the amount of fat in the meat.[8]

d. Tenderness

Tenderness is one of the most determining pharameters of meat quality. The tenderness of meat is detemined by about three factors.

[8] Edi Riswandi, "Pengaruh Proses Perendaman Dalam Larutan Enzim Papain dan Penyimpanan Terhadap Sifat Mutu Daging Kambing Betina Tua", thesis, (Bogor: Technology faculty, Institute of Agriculture bogor, 2001), p. 28

They are structur of myofibilar and contraction status, the content of bond tissue, and water holding capacity of meat protein.[9]

The level of tenderness is determined by the amount of protein in bond tissue and myofibrilar. They are colagen protein, actomiosin and elastin. According to Lawrie, 1995, the older age the livestock is the harder meat the livestock will be have. Protein of meat can be hydrolized by proteolytic enzyme to be simpler compound. The cutting of cross bonding between proteins by proteolytic enzyme causes the tissue of meat more tender when it's consumed.[10] The reaction of proteolytic enzyme can be shown in figure 2.3.

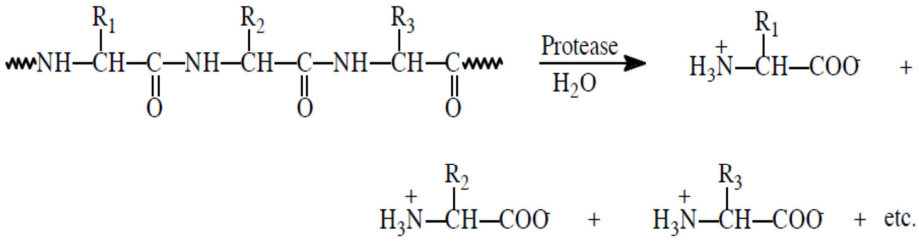

Fig. 2.3 reaction of proteolytic enzyme.

In this research, the tenderness measurement had been conducted by Universal Testing Machine Zwick/ Z0.5 in the laboratory of technology of Agriculture faculty, Gadjah Mada University Yogyakarta with a laborant named Rachmat on April, 4th 2013. The process of tenderness measurement is ilustrated in figure 4.7.

[9] Soeparno, *Ilmu dan Teknologi Daging*, (Yogyakarta: Gadjah mada University Press, 2009), p. 300

[10] Adi Magna PN, "Pemanfaatan Pepaya Muda dan Daun Pepaya Untuk Meningkatkan Kualitas Daging Itik Afkir", in http://www.academia.edu/2303108/Pemanfaatan_Pepaya_Muda_dan_Daun_Pepaya_Untuk_Meningkatkan_Kualitas_Daging_Itik_Afkir , accessed on June, 13rd 2013

Fig. 4.8. Tenderness measurement process

Data in table 4.4 and appendix 4 is shown that the highest tenderness of meat A is 0.6662 with the concentration of 40% and the lowest tenderness of meat E (control meat) is 1.8324. The chart of tenderness measurement is provided in the figure 4.8.

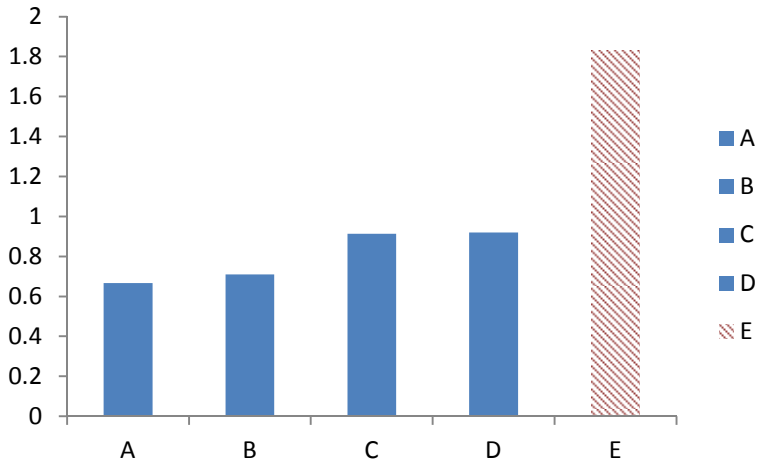

Fig. 4.4. chart of tenderness measurement

It means that the waste of pineapple's peel as the source of bromelain enzyme can influence the tenderness of meat. It prooves that

the meat with treatment with pineapple's peel solution has higher tenderness than meat without treatment (control meat).

2. Organoleptic Test

Organoleptic testing is generally used to verify the conformity of the seasoning specification. These tests include flavor, taste, texture, aroma, and overal mouthfeel sensation when the product is consumed.[11] In this research, researcher used six specification including appearance, smell, tenderness, flavor, juiceness, and pleasure.

a. Appearance

The appearance of meat deals with the visual identification of meat quality based on color, marbling, and water holding capacity.[12] Marbling is a small streak of fat that is found within the muscle and can be seen in the meat cut. Marbling has a beneficial effect on juiciness and flavour of meat.[13]

In this research, after conducting organoleptic test, the lowest score of appearance is on meat A and meat C with the score of 2.93 (appendix 5). It means that on meat A and C with the pineapple's peel solution concentration of 40% and 20% as the source of bromelain enzyme has less coarse appearance after being submerged in that solution.

Whereas the hihgest score of appearance is on meat D, 3.40 with the concentration of 10 %. It means based on appraisal of panelist,

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[11] Y.H.Hui, et.al., *Meat Science and Applications*, (New York: Marcel Dekker.Inc, 2005), p.385

[12] Carrie Eichenberger, et.al, "Sheep Processing: Start to Finish", in http://ag.ansc.purdue.edu/sheep/ansc442/Semprojs/2004/process/index.htm, accessed on June, 16th 2013

[13] FAO's Animal Production and Health, "Meat Quality", in http://www.fao.org/ag/againfo/themes/en/meat/quality_meat.html, accessed on June, 16th 2013

meat submersion in this research with the 10 % concentration of bromelain enzyme has better appearance than control meat and others.

b. Smell and Flavor

Another quality factor is smell. The product should have a normal smell. This will be different for each of the species (i.e. beef, pork, chicken), but should vary only slightly within the species. Any rancid or strange smelling meat should be avoided.[14]

Smell and flavor of meat are the complex sensation and concerned each other. Smell is main sensation that the most difficult to be defined by objective test. Smell of meat is depended on age, sex, species, fat, and woof of livestock.[15]

Based on organoleptic test, the lowest score of smell of meat in this research is meat E (control meat) with the score of 3.07 and the highest score is meat B, it's 3.47. It means the panelis of organoleptic test smells medium until less smelly.

Flavor and aroma are intertwined to create the sensation the consumer has during eating. These perceptions rely on the smell through the nose and on the sensations of salty, sweet, sour and bitter on the tongue. Meat flavour is affected by types of species, diet, cooking method and method of preservation.[16] According to Moncrieff

[14] FAO's Animal Production and Health, "Meat Quality", in http://www.fao.org/ag/againfo/themes/en/meat/quality_meat.html, accessed on June, 16th 2013

[15] Edi Riswandi, "Pengaruh Proses Perendaman Dalam Larutan Enzim Papain dan Penyimpanan Terhadap Sifat Mutu Daging Kambing Betina Tua", thesis, (Bogor: Technology faculty, Institute of Agriculture bogor, 2001), p. 34

[16] FAO's Animal Production and Health, "Meat Quality", in http://www.fao.org/ag/againfo/themes/en/meat/quality_meat.html, accessed on June, 16th 2013

(1951), flavor is used as one of pharameters of organoleptic test, because ti's one of factors of consumer selection.[17]

The flavor analysis of meat shows that the highest score is on meat D, it's 3.80. The lowest score is on meat B with the score of 2.87. It means that panelist feels that the flavor of meat is medium until flavored.

c. Tenderness

Tenderness of meat is affected by pre slaughter and post slaughter factors. Pre slaughter factors include species, breed, age, sex, feeding and management, genetic influence and stress conditions. Post slaughter factors that influence meat tenderness include, postmortem glycolysis, postmortem shortening, conditioning, processing and cooking methods.[18]

In this research, tenderness of meat is tested by objective and subjective test. For objective test, tenderness of meat is tested by Universal Testing Machine Zwick/ Z0.5 in the laboratory of technology of Agriculture faculty, Gadjah Mada University Yogyakarta. The result of this test can be seen in table 4.4.

For subjective test used organoleptic test. The result of this test, meat A with 40% concentration of bromelain enzyme is the most tender than the others, the score is 3.60. The meat with the lowest score is on meat E (control meat), the score is 2.67. Based on objective and subjective, the meat that is sumberged in bromelain enzyme solution can influence the tenderness of meat.

[17] Anton Sitorus, "Aplication of Enzyme Bromelain from Pineapple Extract Solution on Tenderizing Process of Old Doe Meat", Thesis, (Bogor: Animal Husbandry Faculty, Institute of Agriculture bogor, 2001), p. 43

[18] A.K. Maiti, et.al., "Application Of Natural Tenderizers In Meat- A Review" in http://www.arccjournals.com/pdf/Reviews/ar-29-3/ar-29-3-010.pdf, accessed on January, 12nd 2013

d. Juiceness

Juiciness depends on the amount of water retained in a cooked meat product. Juiciness increases flavour, helps soften meat - makes it easier to chew, and stimulates saliva production in the mouth. Water retention and lipid content determine juiciness. Marbling and fat around edges help hold in water. Water losses are from evaporation and drip losses.[19]

Based on organoleptic test, the appraisal score of juiceness is about very juiceless (1) until very much juiced (5). The result of this test shows that the score of meat with treatment is 2.67-3.40. it means that the juiceness of meat with treatment is about juicless until juiced. For control meat, the score of juiceness is 2.00. it means that juiceness of the control meat is juiceless.

e. Pleasure

The pleasure appraisal of panelis for both meat with treatment and meat without treatment (control meat) is very much dislike (1) until very much like (5) (Appendix 5). the pleasure of panelist on meat with treatment is 2.93 – 3.67. it means that the pleasure of panelist is about dislike until not very much like. It's not different from control meat, panelist gives appraisal for pleasure with the average score 3.33, it means not very much like.

[19] FAO's Animal Production and Health, "Meat Quality", in http://www.fao.org/ag/againfo/themes/en/meat/quality_meat.html, accessed on June, 16th 2013