

# THE EFFECT OF THE LENGTH OF SOAKING WITH PINEAPPLE JUICE TOWARD THE TENDERNESS OF ONGOLE CROSS MEAT

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## Abstract

*The purpose of this research was to know the effect of the long soaking with pineapple juice toward tenderness of meat of Ongole Cross meat. The research used experiment method based on Completely Randomized Design, with 7 long soaking (without soaking, 10 minutes, 20 minutes, 30 minutes, 40 minutes, 50 minutes, and 60 minutes), each treatment was 4 replicated. Variable values that measured were tenderness (objective test and subjective test), pH, water contents, and soluble protein content. Result indicated that meat tenderness increase with the long of soaking with pineapple juice. The best tenderness of Ongole Cross meat was from 40 minutes soaking with pineapple juice.*

**Key words:** Tenderness, meat, Ongole Cross

## INTRODUCTION

Cow hybrid Ongole was cattle crossing between Ongole cow with local cow. This cow was adaptable, good cow type of work and superior beef cattle beside Grati cow, Bali cow and Madura cow. Therefore, farmers sold when it is no longer productive.

The cow which was hired and cut on the old age would produce low quality of tenderness because of least marbling and number of connective tissue in the muscle. The number of connective tissue was effected by activity of the meat. Meat with lower activity had little woven tie and number of fat between the muscle tissue so that the meat more tender<sup>6</sup>.

Tenderness that occurred after slaughtering caused by changes in micro-cell structure, from a closed structure into an open structure. Speed of these changes were influenced by the pH of meat<sup>1</sup>. The closed structure had relatively thick muscle fibers, minimum space amount and volume between the fibers, and high pH. In a high pH, meat had hard texture, solid, sticky, dark color, and difficult to suppress the water out. In the open structure, muscle protein would be shortened, the bond between the muscle fibers broke down, and volume of the space between the fibers expanded, low pH meat and high tenderness.

Meat tenderness can be improved by the use of proteolytic enzyme, an enzyme which can break down proteins<sup>20</sup>. enzyme distribution depends on the time, the temperature and the concentration of enzymes<sup>2</sup>. providing proteolytic enzyme papain for 30 minutes before the meat is cooked can produce tender meat<sup>9</sup>. During the process of meat tendering, hydrolysis process of protein of muscle fibers and woven tie occur<sup>10</sup>

Pineapple has 4 types enzymes, there are protease bromelin, oksidase, peroksidase, and phospatase<sup>4</sup>. Almost half of protein in a pineapple is protease enzyme<sup>13</sup>. Bromelin systematically coded with EC. 3.4.22.4<sup>11</sup>. Bromelin enzyme found in all parts of the pineapple plant, but the most is on the stump (0,6%), in the flesh (0,08%), fruit skin (0,1%), the stem (0,06%), and slightly in the leaves<sup>12</sup>.

Bromelin activity from the stump toward casein was higher than the fruit<sup>13</sup>. Enzyme Activity proteolitik bromelin from pineapple fruit 0,521 units/mg at fruit<sup>21</sup>, whereas 107,80 units/ml from stump<sup>5</sup>. The specific activity differences was because of the content of different amino acid. Bromelin from the stump was alkaline<sup>13</sup>, while bromelin from the fruit was acid<sup>7</sup>. Bromelin activity was low on the flowering of pineapple plants but in two weeks the activity would increase<sup>4</sup>, and would decrease at the end of the rippening<sup>8</sup>.

Optimum activity of bromelin enzyme from the stump was around 35-50°C<sup>1</sup>.

Bromelin was one of proteolytic enzymes, but the use of this enzymes was not as popular as papain enzyme, so interesting to be researched about how the effect of bromelin enzyme toward meat tenderness.

### MATERIAL AND METHOD

This research used thigh meat of seven years old Ongole Cross cow, and used experimental procedure. The meat was cut in 2,5 x 2,5 x 2,5 cm<sup>3</sup> and soaked in pineapple juice accordance with the treatment. Pineapple juice was from the stump of Cayene pineapple before ripe. Treated meat was heated until 40°C and continued until done.

This research used Completely Randomized Design with seven treatments,

i.e one treatment without soaking (controlled) and six treatments with bromelin juice soaking during 10 minutes, 20 minutes, 30 minutes, 40 minutes, 50 minutes, 60 minutes. Each treatment was repeated four times. Test between treatment's used Duncan test.

The measured variables were (1) meat tenderness, used penetrometer with a load 85 gram, (2) pH, used pH meter, (3) water content with gravimetric method, (3) soluble protein, used Kyldahl method (4) acceptability (tenderness and flavor) used 5 point of hedonic scale.

### RESULTS AND DISCUSSIONS

Measurements of the effect of meat soaking with pineapple juice toward meat tenderness of Ongole Cross cow was on Table 1.

Table 1. Tenderness, pH, water content and soluble protein content of meat Onggole Cross for all treatment

Variable measure	Long soaking (minute)						
	0	10	20	30	40	50	60
Tenderness (mm)	8.05 <sup>a</sup>	9.17 <sup>b</sup>	10.08 <sup>c</sup>	11.30 <sup>d</sup>	12.03 <sup>e</sup>	12.35 <sup>f</sup>	12.83 <sup>g</sup>
pH	5.79 <sup>a</sup>	5.79 <sup>a</sup>	5.72 <sup>ab</sup>	5.69 <sup>b</sup>	5.67 <sup>b</sup>	5.65 <sup>b</sup>	5.63 <sup>b</sup>
Water content (%)	70.48 <sup>a</sup>	69.53 <sup>ab</sup>	69.53 <sup>ab</sup>	67.36 <sup>c</sup>	69.25 <sup>abc</sup>	67.95 <sup>abc</sup>	67.54 <sup>bc</sup>
Soluble protein content (%)	5.17 <sup>a</sup>	6.23 <sup>b</sup>	7.56 <sup>c</sup>	8.38 <sup>d</sup>	8.66 <sup>de</sup>	8.96 <sup>e</sup>	9.51 <sup>f</sup>

Value in a column with different superscripts are significantly different (P<0.05)

Data in table 1 showed that the meat soaking with pineapple juice could increase the tenderness, because of bromelin, which was protease enzyme, on the juice<sup>4</sup>. Almost half of protein content in pineapple was protease enzyme<sup>13</sup>. Longer soaking would make the meat more tender. This showed that more and more soaking made more protein from muscle fibers hydrolyzed into peptide bond, resulting in soft tissue. According to Wang *et al.*, papain destroyed sarcolemma and loss collagen capacity, and become amorphous material<sup>21</sup>.

The meat which was soaked 30 minutes with pineapple juice could decrease pH of the meat significantly, but longer soaking didn't give any significant effect. This showed that 30 minutes soaking caused decrease optimum pH. pH decrease due to the process of glycolysis, process of muscle glycogen solution into lactic acid. The research's result showed that pineapple juice could accelerate glycolysis process, therefore

could accelerate the decline of pH meat. According to Steward, there was a relationship between pH and meat tenderness, where the more faster the decline of pH, the more higher the meat of tenderness<sup>17</sup>.

Water content of the meat was highest in 30 minutes soaking and significantly different with 10 and 20 minutes soaking time, but didn't give significant effect to 40, 50 and 60 minutes soaking. This showed that, based on the water content, the best soaking time with pineapple juice was 30 minutes. Due to the decline of water content reduced meat protein to bind water because meat protein was broken down by bromelin enzymes in the pineapple juice. It was suitable with Webb, who said that the reduction of bound water in line with increasing tenderness<sup>19</sup>.

The long soaking time with pineapple juice would be followed by the increasing of soluble protein. The highest soluble protein was on 60 minutes soaking. This showed that

long soaking time would give more opportunity to bromelin enzyme in pineapple juice to decompose protein in meat. This was

suitable with Reed's opinion, who said that bromelin enzyme had ability to hydrolyzed protein in the meat and connective tissue<sup>14</sup>.

Table 2. Organoleptic test (tenderness and flavor) of meat Onggole Cross for all treatment

Hedonic scale 1 until 5	Long soaking (minute)						
	0	10	20	30	40	50	60
Tenderness	1.50	2.23	2.90	3.14	3.37	3.97	4.37
Flavor	2.30	2.30	2.97	2.67	3.00	3.00	2.67

Table 2 showed that the increasing of soaking time was followed by the increasing of panelist's favorite to meat tenderness. According to Rogers *et al.*, papain was found to have more profound influence on this palatability<sup>15</sup>. According to the result of research of Smalling *et al.*, cured ham from pigs with treatment of antemortem injection of papain produced higher tenderness score<sup>16</sup>. For the flavor, 40 and 50 minutes soaking treatment with pineapple juice produced taste panelist preferred. This was caused by the longer soaking which would occur further hydrolysis from meat protein which produced bitter taste. In a similar study by Smalling *et al.*, had scored that flavor dry cured hams without treatment was prefer than treatment with the papain<sup>16</sup>.

### CONCLUSIONS

Research result indicated that meat tenderness would increased with longer soaking in pineapple juice. For acceptability, 40 minutes soaking produced meat with preferred flavor.

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